
Utility FGD Survey January - December 1987

Design Performance Data for Operating FGD Systems

Volume 2 (Part 2 of 3)

June 1989

DOE Contract No. DE-AC05-84OR21400

Prepared for:

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

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

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UTILITY FLUE GAS DESULFURIZATION SURVEY

JANUARY - DECEMBER 1987

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SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	INDIANAPOLIS POWER & LIGHT	
PLANT NAME	PETERSBURG	
UNIT NUMBER	3	
CITY	PETERSBURG	
STATE	INDIANA	
REGULATORY CLASSIFICATION	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	1690	
GROSS UNIT GENERATING CAPACITY - MW	532	
NET UNIT GENERATING CAPACITY W/FGD - MW	510	
NET UNIT GENERATING CAPACITY WO/FGD - MW	523	
EQUIVALENT SCRUBBED CAPACITY - MW	479	

** 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	1061.77	(2250000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.2	(279 F)
STACK HEIGHT - M	188.	(616 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25005.	(10750 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10200-11000
AVERAGE ASH CONTENT - %	10.50	
RANGE ASH CONTENT - %	8-12	
AVERAGE MOISTURE CONTENT - %	10.75	
RANGE MOISTURE CONTENT - %	10.5-16.5	
AVERAGE SULFUR CONTENT - %	3.25	
RANGE SULFUR CONTENT - %	2.8-4.5	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	2
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	RESEARCH-COTTRELL
INLET FLUE GAS CAPACITY - CU.M/S	464.1 (983500 ACFM)
INLET FLUE GAS TEMPERATURE - C	137.2 (279 F)
PRESSURE DROP - KPA	0.4 (2. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.3

** 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

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	ADIPIC ACID; DIBASIC ACI
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
A-E FIRM	GIBBS & HILL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.30
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	2.4
CURRENT STATUS	1
COMMERCIAL START-UP	4/1986
INITIAL START-UP	12/1977
CONTRACT AWARDED	1/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.50	
DESIGN COAL HEAT CONTENT - J/G	25004.5	(10750 BTU/LB)
DESIGN COAL ASH CONTENT - %	15.00	
DESIGN MOISTURE CONTENT - %	12.00	
DESIGN CHLORIDE CONTENT - %	0.06	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	120.0	

** QUENCHER/PRESATURATOR

NUMBER	4	
TYPE	HORIZONTAL SPRAY CHAMBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET GAS FLOW - CU. M/S	265.44	(562500 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
LIQUID RECIRCULATION RATE - LITERS/S	16.	(250 GPM)
L/G RATIO - L/CU. M	0.1	(0.4 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	MOBILE BED PACKING	
TRADE NAME/COMMON TYPE	TURBULENT CONTACT ABSORBER	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
DIMENSIONS - FT	30.0 X 30.0 X 100.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NEOPRENE LS-576	
GAS CONTACTING DEVICE TYPE	GRIDS	
NUMBER OF CONTACTING ZONES	3	
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	30.5	(12.0IN)
LIQUID RECIRCULATION RATE - LITER/S	1386.	(22000 GPM)
L/G RATIO - L/CU.M	7.8	(58.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.1	(8.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	4.4	(14.5 FT/S)
INLET GAS FLOW - CU. M/S	176.96	(375000 ACFM)
INLET GAS TEMPERATURE - C	47.8	(118 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
PARTICLE REMOVAL EFFICIENCY - %	99.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	8
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

MANUFACTURER	STRUCTURE-LITE 'UOP HAS PATENT!
CONFIGURATION	HORIZONTAL
NUMBER OF PASSES PER STAGE	3
FREEBOARD DISTANCE - M	0.91 (3.0 FT)
VANE ANGLES - DEGREES	90
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER
WASH WATER SOURCE	THICKENER OVERFLOW, MAKEUP, TRAP-OUT TRAY RETURN
WASH FREQUENCY	CONTINUOUS
** REHEATER	
NUMBER	2
NUMBER OF SPARES	0
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
LOCATION	EXTERNAL
PERCENT GAS BYPASSED - AVG	10.0
TEMPERATURE INCREASE - C	16.7 (30 F)
INLET FLUE GAS FLOW RATE - CU. M/S	149.59 (317000 ACFM)
INLET FLUE GAS TEMPERATURE - C	47.8 (118 F)
OUTLET FLUE GAS FLOW RATE - CU. M/S	74.80 (158500 ACFM)
OUTLET FLUE GAS TEMPERATURE - C	64.4 (148 F)
NUMBER OF HEAT EXCHANGER BANKS	1
NUMBER OF BUNDLES PER BANK	1
NUMBER OF TUBES PER BUNDLE	565
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	224.15 (475000 ACFM)
FLUE GAS TEMPERATURE - C	137.2 (279 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	2
FUNCTION	CONTROL
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	SIDE-ENTRY GUILLOTINE
MANUFACTURER	ANDCO
MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY 'SEALS!
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; IRON BASE/NICKEL-CHROMIUM-COPPER-MOLY
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	ANDCO
MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY 'SEALS!
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; IRON BASE/NICKEL-CHROMIUM-COPPER-MOLY
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	ANDCO

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY 'SEALS!
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; IRON BASE/NICKEL-CHROMIUM-COPPER-MOLY
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY 'SEALS!
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; IRON BASE/NICKEL-CHROMIUM-COPPER-MOLY
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	ANDCO
MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY 'SEALS!
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; IRON BASE/NICKEL-CHROMIUM-COPPER-MOLY
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
MANUFACTURER	ANDCO
MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; HIGH ALLOY 'SEALS!
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; IRON BASE/NICKEL-CHROMIUM-COPPER-MOLY
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	SCRUBBER INLET
CONFIGURATION	CIRCULAR
DIMENSIONS	16 FT DIA
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	CIRCULAR
DIMENSIONS	18 FT 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
** DUCTWORK	
LOCATION	BYPASS
CONFIGURATION	RECTANGULAR
DIMENSIONS	16 FT X 20 FT
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

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

** 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	38.1 (42 TPH)
PRODUCT QUALITY - % SOLIDS	35.0

** TANKS

SERVICE	NUMBER
REAGENT PREP PRODUCT	2
WASTE SLURRY BLEED	1
ABSORBER RECYCLE	4
THICKENER OVERFLOW	1
SLURRY TRANSFER	1
ME WASH	1

** PUMPS

SERVICE	NUMBER
ABSORBER RECIRCULATION	12
SLURRY TRANSFER	2
WASTE SLURRY	4
WASTE SLURRY BOOSTER	2
THICKENER UNDERFLOW	2
RECLAIMED WATER 'THICKENER OVERFLOW!	2
ME WASH	2
SEAL WATER	3
REHEATER CONDENSATE RETURN	2

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
CONFIGURATION	HORIZONTAL
DIMENSIONS - FT	10 DIA X 20.5
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	COAL TAR EPOXY
BELT GENERIC MATERIAL TYPE	ORGANIC
BELT SPECIFIC MATERIAL TYPE	POLYPROPYLENE
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	28% SOLIDS
OUTLET STREAM CHARACTERISTICS	55% SOLIDS
OUTLET STREAM DISPOSITION	SLUDGE STABILIZATION
OVERFLOW STREAM DISPOSITION	RETURNED TO SYSTEM

** SOLIDS CONCENTRATING/DEWATERING

DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	165 DIA X 12
CAPACITY	2000000
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	COAL TAR EPOXY
FEED STREAM CHARACTERISTICS	7-15% SOLIDS
OUTLET STREAM CHARACTERISTICS	28% SOLIDS
OUTLET STREAM DISPOSITION	TO VACUUM FILTER
OVERFLOW STREAM DISPOSITION	TO QUENCHER, ME WASH TANK, BALL MILL, RECYCLE TA

*** SALEABLE BYPRODUCTS

NATURE	NONE

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	38.1 (42.0 TPH)
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - %	60.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
SITE SERVICE LIFE - YRS	8
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	ABSORBER RECYCLE
CHEMICAL PARAMETERS	PH, INLET SO ₂ , OUTLET SO AT STACK
PHYSICAL VARIABLES	FLUE GAS OUTLET FLOW
CONTROL LEVELS	PH 5.5-5.9
MONITOR TYPE	LEEDS & NORTHRUP
MONITOR LOCATION	RECYCLE SLURRY LINE
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
RECEIVING WATER STREAM	NONE
MAKEUP WATER ADDITION - LITERS/S	55.6 (882 GPM)
SOURCE OF MAKEUP WATER	RIVER WATER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	96% CaCO ₃ , 3% MgCO ₃
SOURCE/SUPPLIER	SOUTHERN INDIANA QUARRY
CONSUMPTION	500 TPD
UTILIZATION - %	83.0
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
BALL MILL - %	0.0
VACUUM FILTER - %	50.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
BALL MILL	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	0.5
THICKENER	0.0
VACUUM FILTER	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/77	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
	THE BOILER BEGAN COMMERCIAL OPERATIONS ON NOVEMBER 29, 1977.									
	OPERATION OF ALL FOUR MODULES COMMENCED DURING DECEMBER. CURRENTLY PH ADJUSTMENTS AND OTHER SHAKEDOWN PROCEDURES ARE IN PROGRESS.									
	REPAIRS TO THE RECYCLE TANK AGITATOR WERE REQUIRED.									
	COLD WEATHER ARRIVED EARLIER THAN EXPECTED. TEMPORARY ENCLOSURES WERE CONSTRUCTED AROUND SOME FGD COMPONENTS. THESE ENCLOSURES WILL BE REMOVED WHEN INSTALLATION OF HEAT TRACING CAN BE COMPLETED.									
1/78	SYSTEM							744		0
	** PROBLEMS/SOLUTIONS/COMMENTS									
	INSTALLATION OF HEAT TRACING ON FGD SYSTEM COMPONENTS WAS COMPLETED DURING THE PERIOD.									
2/78	SYSTEM							672		0
	** PROBLEMS/SOLUTIONS/COMMENTS									
	THE BOILER WAS TAKEN OFF LINE ON FEBRUARY 24 TO ALLOW CORRECTION OF THE PROBLEMS ASSOCIATED WITH THE FLYASH REMOVAL SYSTEM.									
	PIPE AND VALVE FREEZE-UP DAMAGE WAS ENCOUNTERED AND REPAIRED.									
	REPAIRS WERE MADE ON THE ISOLATION DAMPERS.									
3/78	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
	INSULATION WAS INSTALLED ON FGD SYSTEM COMPONENTS DURING A SCHEDULED SYSTEM OUTAGE.									
	A BROKEN PINION GEAR IN THE THICKENER WAS REPAIRED DURING THE SYSTEM OUTAGE.									
	INSTRUMENTATION MAINTENANCE WAS PERFORMED DURING THE SYSTEM OUTAGE.									
	PROBLEMS WITH THE FLYASH HANDLING SYSTEM HAVE NOT YET BEEN SOLVED.									
4/78	SYSTEM							720		
	** PROBLEMS/SOLUTIONS/COMMENTS									
	THE FGD SYSTEM WAS PUT BACK ON LINE IN MID-APRIL.									
	ALL CONTROL VALVES WERE RETURNED TO THE FACTORY FOR MODIFICATIONS. BOTH CONTROL VALVES AND PIPING HAVE BEEN PROBLEM AREAS FOR THIS SYSTEM.									
5/78	SYSTEM							744		
	** PROBLEMS/SOLUTIONS/COMMENTS									
	THE MAIN POWER TRANSFORMER FAULTED CAUSING THE SYSTEM TO SHUTDOWN.									
6/78	SYSTEM							720		

INDIANAPOLIS POWER & LIGHT: PETERSBURG 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 SYSTEM SHUTDOWN RESULTING FROM THE MAIN POWER TRANSFORMER FAILURE
 IN MAY, LASTED THROUGH JUNE 16.

7/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS STILL EXPERIENCING SHAKEDOWN PROBLEMS. DURING THIS
 PERIOD SOME DESIGN CHANGES HAVE BEEN MADE TO IMPROVE OPERATIONS.

VALVE PROBLEMS WERE ENCOUNTERED DURING JULY. MANY VALVES HAD TO BE
 REMOVED AND REPAIRED.

8/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS HAVE BEEN EXPERIENCED WITH INSTRUMENTATION.

CRACKING PROBLEMS HAVE BEEN EXPERIENCED WITH FIBERGLASS PIPING. THE PROB
 LEM WAS SOLVED BY REPLACING SECTIONS WITH RUBBER LINED STEEL PIPING, NEW
 FRP PIPING, AND PROVIDING ADDITIONAL PIPE SUPPORTS.

9/78 SYSTEM

720

10/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

BYPASS DAMPER PROBLEMS WERE EXPERIENCED.

AN SO2 COMPLIANCE TEST WAS INVALID DUE TO BYPASS DAMPER PROBLEMS.

11/78 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

FREEZE-UPS IN THE LIME DELIVERY SYSTEM WERE EXPERIENCED.

AN INSTRUMENTATION POWER TRANSFORMER FAILURE FORCED THE SYSTEM OUT OF
 SERVICE FOR ABOUT SIX DAYS.

12/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

MONTHLY OPERATIONAL HOURS ARE NOT YET AVAILABLE. THE UTILITY REPORTED
 THAT THE SYSTEM HAS NOT YET PASSED AN ACCEPTANCE TEST.

THE FOLLOWING CUMULATIVE FGD SYSTEM UTILIZATION FIGURES FOR THE PERIOD
 SEPTEMBER 15 THROUGH DECEMBER 29, 1978 WERE CALCULATED BASED UPON UTILITY
 REPORTED FGD SYSTEM HOURS FOR THE SAME PERIOD.

A MODULE	22.1%
B MODULE	21.7%
C MODULE	34.6%
D MODULE	34.1%
SYSTEM	28.1%

REPORTED FGD SYSTEM HOURS FOR THIS PERIOD WERE 562, 551, 880 AND 868 FOR
 MODULES A, B, C AND D RESPECTIVELY.

1/79 SYSTEM

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUTDOWN ON JANUARY 1, 1979 AS A RESULT OF SEVERE WINTER WEATHER CONDITIONS.

2/79	SYSTEM						672			

3/79	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FROM JANUARY 1 TO MARCH 15 DUE TO SEVERE WINTER WEATHER.

4/79	SYSTEM						722			

** PROBLEMS/SOLUTIONS/COMMENTS

DUE TO THE FORMER STACK LINING PEELING AWAY, THE STEEL SHELL WAS SAND BLASTED AND RIGIFLAK 4850 APPLIED BY TROWEL.

ALL MIST ELIMINATORS WERE CLEANED DUE TO SEVERE SCALING PROBLEMS.

EXTENSIVE REPAIRS WERE MADE TO THE INLET DAMPERS, THE OUTLET DUCTS WERE LINED WITH RESISTIFLAK 1150, AND MAJOR REPAIRS WERE MADE TO BONNETS BECAUSE OF ACID CORROSION.

THE SYSTEM HAS BEEN DOWN SINCE MID-MARCH FOR INSPECTION AND MAINTENANCE.

5/79	SYSTEM						744			

6/79	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM RAN ABOUT THREE DAYS TOTAL DURING THIS PERIOD.

PROCESS CONTROL HAS BEEN A MAJOR PROBLEM AREA SINCE THE SYSTEM BEGAN INITIAL OPERATIONS.

MIST ELIMINATOR PLUGGING CONTRIBUTED TO THE OUTAGE TIME ACCUMULATED DURING THIS PERIOD.

7/79	SYSTEM						744			

8/79	SYSTEM						744			

9/79	SYSTEM				0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUTDOWN FOR A SCHEDULED BOILER AND SCRUBBER OVERHAUL IN SEPTEMBER.

10/79	SYSTEM				0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR A SCHEDULED BOILER/TURBINE/FGD SYSTEM OUTAGE FOR FOUR WEEKS. THE UNIT STARTED UP AGAIN AFTER THE OUTAGE BUT HAD TO SHUTDOWN AFTER ONLY A FEW DAYS BECAUSE OF BOILER PROBLEMS.

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

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

INSTRUMENTATION IS A CONTINUING PROBLEM. THE MODULE PRESSURE MONITORS,
 AND SO2 AND PH MONITORS ARE ALL INOPERATIVE. THE UTILITY HAS BEEN UNABLE
 TO KEEP THE FGD SYSTEM ON LINE FOR MORE THAN 10 DAYS WITHOUT HAVING AT
 LEAST ONE MODULE FORCED OUT OF SERVICE.

11/79 SYSTEM 720 360

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE AGAIN IN MID-NOVEMBER AFTER RESOLUTION OF
 BOILER PROBLEMS.

12/79 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER THE UTILITY REPORTED THAT THERE WERE NO NEW
 MAJOR PROBLEMS.

1/80 SYSTEM 744

2/80 SYSTEM 696

3/80 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER OF 1980, THE ENTIRE SCRUBBER PACKING BED WAS LOST
 DUE TO EXCESSIVE WEAR OF THE NEOPRENE FOAM PACKING BALLS. THE UNIT
 WILL BE TAKEN OFF LINE IN APRIL TO ACCOMMODATE NECESSARY REPAIRS AND
 REPLACEMENT OF THE BALLS.

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

4/80 SYSTEM 720

5/80 SYSTEM 744

6/80 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THE PERIOD APRIL 1980 THROUGH JUNE
 1980.

7/80 SYSTEM 744

8/80 SYSTEM 744

9/80 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE OPERATIONAL DATA FOR THE THIRD QUARTER 1980 WERE NOT AVAILABLE FOR
 PUBLICATION.

10/80 SYSTEM 744

11/80 SYSTEM 720

12/80 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 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 OPERATIONAL DATA FOR FGD OPERATIONS AT PETERSBURG 3 ARE STILL UNAVAILABLE FOR RELEASE.

1/81 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY, ALL OF THE PACKING SPHERES WERE REMOVED FROM THE FOUR ABSORBER MODULES. THE SUPPORTING GRIDS WERE LEFT INTACT AND THE MODULES ARE BEING UTILIZED AS GRID TOWERS.

ALSO DURING JANUARY, REPAIRS TO FREEZE DAMAGED PIPING WERE COMPLETED. THE FRP RECLAIM WATER PIPING WAS RESET IN PLACES WHERE IT HAD PULLED APART AND THE WASTE SLURRY AND SLUDGE TREATMENT WATER LINES WERE THAWED. SOME PIPIN GASKETS AND HEAT TRACING CIRCUITS WERE REPAIRED AND UPGRADED. IN ADDITION SOME DRAIN VALVES WERE ADDED TO IMPROVE THE CAPABILITY TO DRAIN PIPING AND AVOID FUTURE FREEZE DAMAGE.

2/81 SYSTEM

672

3/81 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER, PUMP REPAIRS INCLUDED REBUILDING THE CASING OF A MIST ELIMINATOR WASH PUMP, OVERHAULING A RECYCLE PUMP, AND REPAIRING ONE RECLAIM WATER PUMP AND MOTOR.

4/81 SYSTEM

720

5/81 SYSTEM

744

6/81 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER, REMAINING PORTIONS OF THE FRP RECLAIM WATER PIPING WERE RESET AND ALIGNED.

SCALE FORMATION WAS REMOVED FROM ALL MIST ELIMINATOR ASSEMBLIES DURING THE SECOND QUARTER.

THE GUNNITE LINING IN THE PRESATURATOR DUCT SECTIONS OF THE FOUR ABSORBER MODULES WERE REPLACED DURING THE THREE MONTH PERIOD.

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR	
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				
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1981 THROUGH MARCH 1983											
4/83	SYSTEM						720				
5/83	SYSTEM						744				
6/83	SYSTEM						720				
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 1981 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				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

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

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 PERIOD OF JANUARY THROUGH
 SEPTEMBER OF 1984.

10/84	SYSTEM						744
11/84	SYSTEM						720
12/84	SYSTEM						744

** 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
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 THEY HAD BEGUN TESTING A NEW MIST ELIMINATOR
 WASH SYSTEM WHICH WAS COMPLETED DURING THE SPRING AND FALL 1985 SCHEDULED
 BOILER/TURBINE MAINTENANCE OUTAGES. CHANGES ARE BEING MADE IN ORDER TO
 IMPROVE SCALE REMOVAL. THE MODIFICATIONS INCLUDE USING FRESH WATER
 INSTEAD OF PLANT SERVICE WATER AND CONVERTING OVER TO A PULSE TYPE SYSTEM
 VERSUS CONTINUOUS SPRAY.

THE UTILITY ALSO REPORTED IMPLEMENTING THE FULL-TIME USE OF ADIPIC/DIBASIC
 ACIDS TO THEIR SYSTEM DURING THE MONTH OF DECEMBER. ADIPIC ACID POWDER
 WILL BE USED DURING COLD WEATHER MONTHS AND LIQUID DIBASIC ACIDS DURING

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	PERFORMANCE DATA		% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				RELIABILITY	UTILIZATION						
HOT WEATHER MONTHS.											
1/86	A	90.1	90.3	96.9	85.1						
	B	85.2	85.2	98.2	80.3						
	C	95.8	88.9	97.7	83.8						
	D	94.5	91.0	97.8	85.8						
	SYSTEM	91.4	88.8	97.6	83.8			744	702	623	67.7
2/86	A	72.6	72.1	84.6	71.2						
	B	80.0	76.7	85.4	75.7						
	C	47.8	46.3	82.3	45.7						
	D	75.5	76.6	88.2	75.6						
	SYSTEM	69.0	67.9	85.1	67.0			672	663	451	66.7
3/86	A	92.7	78.3	100.0	67.4						
	B	92.0	82.0	100.0	70.6						
	C	84.2	79.1	100.0	68.1						
	D	90.5	70.7	98.4	60.9						
	SYSTEM	89.8	77.5	99.6	66.7			744	640	497	44.5
4/86	A	36.9	19.1	100.0	6.3						
	B	41.5	88.3	100.0	29.3						
	C	28.4	85.6	100.0	28.4						
	D	32.8	68.7	100.0	22.8						
	SYSTEM	34.9	65.4	100.0	21.7			720	239	156	17.3
5/86	A	96.2	80.0	100.0	80.0						
	B	92.1	69.6	100.0	69.6						
	C	99.1	86.2	100.0	86.2						
	D	98.2	92.1	100.0	92.1						
	SYSTEM	96.4	82.0	100.0	82.0			744	744	610	67.2
6/86	A	94.1	80.0	90.3	77.2						
	B	93.1	75.8	96.6	73.2						
	C	94.8	90.2	94.7	87.0						
	D	94.1	83.3	94.1	80.3						
	SYSTEM	94.0	82.3	93.9	79.4			720	695	572	67.0
7/86	A	98.8	87.7	99.7	87.3						
	B	96.1	57.9	100.0	57.6						
	C	98.6	84.7	100.0	84.4						
	D	100.0	93.2	100.0	92.8						
	SYSTEM	98.4	80.9	99.9	80.5			744	741	599	66.0
8/86	A	99.2	80.1	96.1	80.1						
	B	94.3	87.4	100.0	87.4						
	C	97.5	92.2	100.0	92.2						
	D	98.6	83.1	100.0	83.1						
	SYSTEM	97.4	85.7	99.0	85.7			744	744	638	57.8
9/86	A	98.8	96.6	100.0	96.6						
	B	98.0	94.4	100.0	94.4						
	C	99.7	96.3	100.0	96.3						
	D	99.7	82.2	100.0	82.2						
	SYSTEM	99.0	92.4	100.0	92.4			720	720	665	66.4
10/86	A	8.4	85.9	100.0	8.4						
	B	9.4	83.7	97.4	8.2						
	C	8.4	77.9	100.0	7.6						
	D	3.2	29.2	100.0	2.9						
	SYSTEM	7.4	69.2	99.4	6.8			744	73	51	5.3
11/86	A	84.6	76.9	94.3	72.2						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/86	B	90.2	81.7	95.3	76.8						
	C	92.0	79.1	99.2	74.4						
	D	92.3	89.0	99.3	83.7						
	SYSTEM	89.8	81.7	97.0	76.8			720	677	553	60.2
	A	97.2	85.1	98.3	83.4						
	B	97.6	83.0	100.0	81.3						
	C	97.6	87.0	100.0	85.2						
	D	97.6	77.4	100.0	75.8						
	SYSTEM	97.5	83.1	99.6	81.4			744	729	606	62.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE IDENTIFIED BY THE UTILITY FOR THE JANUARY-DECEMBER PERIOD

1/87	A	87.2	85.5	94.1	73.6						
	B	89.9	86.6	94.9	74.5						
	C	91.0	85.0	94.6	73.1						
	D	89.7	79.9	93.6	68.8						
	SYSTEM	89.4	84.3	94.3	72.5			744	640	540	66.4
2/87	A	99.5	83.2	99.8	83.2						
	B	94.3	85.8	99.8	85.8						
	C	98.2	96.2	100.0	96.2						
	D	99.5	79.8	100.0	79.8						
	SYSTEM	97.9	86.3	99.9	86.3			672	672	580	64.7
3/87	A	95.9	77.7	100.0	77.6						
	B	96.7	94.0	100.0	93.8						
	C	99.7	92.2	100.0	91.9						
	D	99.2	77.9	100.0	77.7						
	SYSTEM	97.9	85.5	100.0	85.2			744	742	634	62.2
4/87	A	99.0	90.3	99.9	90.3						
	B	98.6	88.9	99.9	88.9						
	C	99.2	94.3	99.7	94.3						
	D	99.4	83.4	99.7	83.4						
	SYSTEM	99.0	89.2	99.8	89.2			720	720	642	68.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH APRIL 1987.

5/87	A	49.3	64.2	100.0	32.2						
	B	50.0	88.8	100.0	44.6						
	C	50.0	92.3	100.0	46.3						
	D	46.7	67.9	100.0	34.0						
	SYSTEM	49.0	78.3	100.0	39.3			744	373	292	31.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS OUT OF SERVICE FOR SCHEDULED MAINTENANCE FROM MAY 15 TO MAY 30.

6/87	A	99.7	90.9	99.9	90.8						
	B	99.4	89.4	99.8	89.3						
	C	98.5	81.0	98.7	80.9						
	D	99.6	87.2	99.9	87.1						
	SYSTEM	99.3	87.1	99.6	87.0			720	719	627	66.9
7/87	A	99.3	89.5	100.0	89.5						
	B	99.4	72.1	100.0	72.1						

INDIANAPOLIS POWER & LIGHT: PETERSBURG 3 (CONT.)

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

8/87	C	99.3	87.6	100.0	87.6							
	D	99.6	88.6	100.0	88.6							
	SYSTEM	99.4	84.5	100.0	84.5							
	A	97.0	69.8	97.5	69.8							
	B	97.4	78.0	97.7	78.0							
	C	97.1	75.1	97.5	75.1							
	D	97.1	83.5	97.7	83.5							
	SYSTEM	97.1	76.6	97.6	76.6							
	9/87	A	59.4	74.5	100.0							44.4
	B	59.0	85.6	100.0	51.0							
C	59.4	94.0	100.0	56.0								
D	56.2	52.2	100.0	31.1								
SYSTEM	58.5	76.6	100.0	45.6								
10/87	A	69.7	77.0	95.5	53.1							
B	67.8	81.2	95.7	56.0								
C	69.7	70.9	95.0	48.9								
D	66.3	86.6	95.9	59.8								
SYSTEM	68.4	78.9	95.5	54.4								
11/87	A	98.6	86.0	98.4	86.0							
B	96.3	73.6	98.2	73.6								
C	98.6	84.7	98.4	84.7								
D	98.6	73.9	98.2	73.9								
SYSTEM	98.0	79.6	98.3	79.6								
12/87	A	100.0	72.4	100.0	72.4							
B	98.3	69.9	100.0	69.9								
C	60.5	60.5	100.0	60.5								
D	100.0	72.4	100.0	72.4								
SYSTEM	89.7	68.8	100.0	68.8								

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JUNE
THROUGH DECEMBER 1987.

SECTION 13

DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	INDIANAPOLIS POWER & LIGHT
PLANT NAME	PETERSBURG
UNIT NUMBER	4
CITY	PETERSBURG
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	1690
GROSS UNIT GENERATING CAPACITY - MW	526
NET UNIT GENERATING CAPACITY W/FGD - MW	515
NET UNIT GENERATING CAPACITY WO/FGD - MW	526
EQUIVALENT SCRUBBED CAPACITY - MW	473
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	928.23 (1967000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** 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	25586. (11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	*****
RANGE ASH CONTENT - %	9.0-10.0
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	3.50
RANGE SULFUR CONTENT - %	3.0-3.5
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** ESP	
NUMBER	2
TYPE	COLD SIDE
SUPPLIER	WHEELABRATOR-FRYE
INLET FLUE GAS CAPACITY - CU.M/S	928.2 (1967000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9 (300 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
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL
A-E FIRM	STONE & WEBSTER
DEVELOPMENT LEVEL	FULL SCALE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 4 (CONT.)

NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
ENERGY CONSUMPTION - %	2.1	
CURRENT STATUS	1	
COMMERCIAL START-UP	3/1986	
INITIAL START-UP	1/1986	
CONTRACT AWARDED	0/1978	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	COMBINATION TOWER	
SPECIFIC TYPE	SPRAY/PACKED	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	RESEARCH-COTTRELL	
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	MUNTERS PACKING	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	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	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
PERCENT GAS BYPASSED - AVG	10.0	
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	

INDIANAPOLIS POWER & LIGHT: PETERSBURG 4 (CONT.)

** REAGENT PREPARATION EQUIPMENT
 FUNCTION WET BALL MILL
 DEVICE COMPARTMENTED
 DEVICE TYPE NR

** PUMPS
 SERVICE NUMBER

 NR ****

** SOLIDS CONCENTRATING/DEWATERING
 DEVICE NA

*** 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
 LOCATION ON-SITE
 SITE TREATMENT NONE

** 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

1/86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL SHAKEDOWN/DEBUGGING OPERATIONS BEGAN IN JANUARY 1986.

2/86 SYSTEM 672

3/86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH FD BOOSTER FAN MOTORS REQUIRED REPLACEMENT ON THE UNIT 4 SCRUBBING
 SYSTEM DURING THE FIRST QUARTER OF 1986.

4/86 SYSTEM 720

5/86 TWR A 38.2 98.8 98.8 38.2
 TWR B 37.6 97.2 100.0 37.6
 TWR C 38.7 100.0 100.0 38.7
 SYSTEM 38.2 98.7 99.6 38.2 744 288 284 62.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 4 (CONT.)

-----PERFORMANCE DATA-----
 PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 S02 PART. HOURS HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

PETERSBURG 4 BEGAN OPERATIONS IN JANUARY 1986. SHAKEDOWN/DEBUGGING
 OPERATIONS CONTINUED UNTIL APRIL 1986 WHEN THE SYSTEM WAS DECLARED
 COMMERCIAL. NSPS TESTING WAS UNDERTAKEN IN MAY 1986.

6/86	TWR A	99.3	98.7	99.3	98.5				
	TWR B	92.5	87.4	92.3	87.3				
	TWR C	92.3	88.6	99.4	88.4				
	SYSTEM	94.7	91.5	97.0	91.4	720	719	658	73.1
7/86	TWR A	86.7	97.2	99.7	81.0				
	TWR B	85.5	92.8	99.7	77.4				
	TWR C	86.7	96.7	99.7	80.6				
	SYSTEM	86.3	95.6	99.7	79.7	744	620	593	59.1
8/86	TWR A	92.4	91.4	100.0	83.1				
	TWR B	92.3	93.7	100.0	85.2				
	TWR C	91.4	65.8	99.3	59.8				
	SYSTEM	92.0	83.6	99.8	76.0	744	676	566	52.0
9/86	TWR A	61.5	75.1	100.0	47.5				
	TWR B	61.2	91.2	100.0	57.6				
	TWR C	57.9	85.1	100.0	53.8				
	SYSTEM	60.2	83.8	100.0	52.9	720	455	381	39.5
10/86	TWR A	91.0	92.0	100.0	85.0				
	TWR B	91.3	94.7	100.0	87.5				
	TWR C	90.3	89.1	100.0	82.4				
	SYSTEM	90.9	91.9	100.0	85.0	744	688	632	69.0
11/86	TWR A	99.5	70.6	100.0	70.6				
	TWR B	100.0	91.5	100.0	91.5				
	TWR C	99.5	86.5	100.0	86.5				
	SYSTEM	99.7	82.9	100.0	82.9	720	720	597	62.8
12/86	TWR A	92.5	72.9	99.2	63.2				
	TWR B	95.1	88.4	99.9	76.6				
	TWR C	93.6	87.7	100.0	76.0				
	SYSTEM	93.7	83.0	99.7	71.9	744	645	535	53.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE IDENTIFIED BY THE UTILITY FOR THE
 MAY THROUGH DECEMBER 1986 PERIOD.

1/87	TWR A	77.3	84.9	94.7	61.7				
	TWR B	80.5	88.0	99.2	64.0				
	TWR C	76.9	96.2	95.1	69.9				
	SYSTEM	78.2	89.7	96.3	65.2	744	541	485	53.8
2/87	TWR A	94.2	73.1	98.8	73.1				
	TWR B	98.6	88.5	99.0	88.5				
	TWR C	94.8	86.8	98.7	86.8				
	SYSTEM	95.9	82.8	98.8	82.8	672	672	556	66.0
3/87	TWR A	91.6	79.8	100.0	79.8				
	TWR B	95.3	86.3	100.0	86.3				
	TWR C	97.2	90.7	100.0	90.7				
	SYSTEM	94.7	85.6	100.0	85.6	744	744	637	72.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

INDIANAPOLIS POWER & LIGHT: PETERSBURG 4 (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 SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY
 THROUGH MARCH 1987.

4/87	TWR A	33.0	82.3	100.0	40.2				
	TWR B	47.1	90.4	99.1	44.1				
	TWR C	47.2	87.9	99.5	42.9				
	SYSTEM	42.4	86.9	99.5	42.4	720	352	305	33.3

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 4 WAS OUT OF SERVICE FOR SCHEDULED MAINTENANCE FROM APRIL 9 TO APRIL
 24.

5/87	TWR A	97.7	88.1	98.6	88.1				
	TWR B	98.8	93.2	98.7	93.2				
	TWR C	98.7	87.5	98.6	87.5				
	SYSTEM	98.4	89.6	98.6	89.6	744	744	667	76.3
6/87	TWR A	98.3	88.3	100.0	86.2				
	TWR B	98.0	79.6	99.9	77.7				
	TWR C	96.4	80.5	99.9	78.6				
	SYSTEM	97.6	82.8	99.9	80.8	720	703	582	65.3
7/87	TWR A	98.6	88.1	99.4	88.1				
	TWR B	92.8	82.6	100.0	82.6				
	TWR C	98.9	89.8	100.0	89.8				
	SYSTEM	96.8	86.9	99.8	86.9	744	744	646	73.9
8/87	TWR A	99.0	80.5	100.0	80.5				
	TWR B	99.7	89.0	100.0	89.0				
	TWR C	99.9	91.2	100.0	91.2				
	SYSTEM	99.5	86.9	100.0	86.9	744	744	646	73.9
9/87	TWR A	100.0	87.2	100.0	84.4				
	TWR B	100.0	81.1	100.0	78.5				
	TWR C	98.5	89.7	100.0	86.8				
	SYSTEM	99.5	86.0	100.0	83.2	720	697	599	67.9
10/87	TWR A	28.8	90.9	100.0	24.6				
	TWR B	27.6	72.7	100.0	19.7				
	TWR C	28.8	81.8	100.0	22.1				
	SYSTEM	28.4	81.8	100.0	22.1	744	201	165	18.1
11/87	TWR A	34.7	78.7	100.0	20.7				
	TWR B	34.7	63.0	100.0	16.6				
	TWR C	34.7	71.3	100.0	18.7				
	SYSTEM	34.7	71.0	100.0	18.7	720	189	134	12.3
12/87	TWR A	99.6	88.1	100.0	87.1				
	TWR B	100.0	91.8	100.0	90.8				
	TWR C	98.1	72.7	100.0	71.9				
	SYSTEM	99.2	84.2	100.0	83.3	744	736	620	68.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD MAY
 THROUGH DECEMBER 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	JACKSONVILLE ELEC AUTHORITY	
PLANT NAME	ST. JOHNS RIVER PWR PARK	
UNIT NUMBER	1	
CITY	JACKSONVILLE	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	327.	(0.760 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1100	
GROSS UNIT GENERATING CAPACITY - MW	674	
NET UNIT GENERATING CAPACITY W/FGD - MW	640	
NET UNIT GENERATING CAPACITY WO/FGD - MW	659	
EQUIVALENT SCRUBBED CAPACITY - MW	674	

** 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	1255.25	(2660000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	195.	(641 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	****	
AVERAGE ASH CONTENT - %	*****	
RANGE ASH CONTENT - %	6.0 - 18.0	
AVERAGE MOISTURE CONTENT - %	*****	
RANGE MOISTURE CONTENT - %	4.0 - 15.0	
AVERAGE SULFUR CONTENT - %	2.50	
RANGE SULFUR CONTENT - %	0.5 - 4.0	
AVERAGE CHLORIDE CONTENT - %	0.30	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** ESP

NUMBER	2	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	589.9	(1250000 ACFM)
INLET FLUE GAS TEMPERATURE - C	129.4	(265 F)
PRESSURE DROP - KPA	0.7	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.7	

** PARTICLE SCRUBBER

NUMBER	0
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON NAME	NA
SHELL GENERIC MATERIAL	NA
SHELL SPECIFIC MATERIAL	NA
LINER GENERIC MATERIAL	NA
LINER SPECIFIC MATERIAL	NA

*** 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

JACKSONVILLE ELEC AUTHORITY: ST.JOHNS RIVER PWR PARK 1 (CONT.)

NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.78	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	2.8	
CURRENT STATUS	1	
COMMERCIAL START-UP	3/1987	
INITIAL START-UP	12/1986	
CONTRACT AWARDED	11/1982	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL ASH CONTENT - %	18.00	
DESIGN MOISTURE CONTENT - %	15.00	
DESIGN CHLORIDE CONTENT - %	0.30	
** QUENCHER/PRESATURATOR		
NUMBER	3	
TYPE	COCURRENT	
SUPPLIER	RESEARCH-COTTRELL	
INLET GAS FLOW - CU. M/S	589.87	(1250000 ACFM)
INLET GAS TEMPERATURE - C	165.6	(330 F)
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	1008.	(16000 GPM)
L/G RATIO - L/CU. M	2.0	(15.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** ABSORBER		
NUMBER	3	
NUMBER OF SPARES	1	
GENERIC TYPE	DOUBLE LOOP	
SPECIFIC TYPE	NA	
TRADE NAME/COMMON TYPE	NA	
SUPPLIER	RESEARCH-COTTRELL	
DIMENSIONS - FT	48 FT DIA	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NA	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	NA	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	4838.	(76800 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	2.9	(9.6 FT/S)
INLET GAS FLOW - CU. M/S	589.87	(1250000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA	
NUMBER PER SYSTEM	2	
GENERIC TYPE	NA	
SPECIFIC TYPE	NA	
TRADE NAME/COMMON TYPE	NA	
MANUFACTURER	RESEARCH - COTTRELL	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	4	
FREEBOARD DISTANCE - M	0.76	(2.5 FT)
PRESSURE DROP - KPA	0.0	(0.2 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.9	(9.6 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	POLYPROPYLENE	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	19.5 MIN/H AND 1.3 MIN/H	
WASH RATE - L/S	7.6	(120 GAL/MIN)

JACKSONVILLE ELEC AUTHORITY: ST.JOHN'S RIVER PWR PARK 1 (CONT.)

** REHEATER	
NUMBER	1
NUMBER OF SPARES	0
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL STEAM HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM COIL WITH AMBIENT AIR
INLET FLUE GAS TEMPERATURE - C	73.9 (165 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	SA-214
** FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	UNIT
APPLICATION	FD
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	294.94 (625000 ACFM)
FLUE GAS TEMPERATURE - C	165.6 (330 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	8
FUNCTION	CONTROL & SHUT OFF
GENERIC TYPE	CONTROL=LOUVER/SHUT-OFF=GUILLOTINE
SPECIFIC TYPE	OPPOSED BLADE/TOP ENTRY/THRUST SEAT
MANUFACTURER	BACHMAN
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NA
SHELL SPECIFIC MATERIAL TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	MARCY
NUMBER	1
NUMBER OF SPARES	0
** PUMPS	
SERVICE	NUMBER
-----	-----
REAGENT FEED/QUENCHER/ABSORBER RECYC	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	HYDROCLONES/VACUUM FILTERS
*** SALEABLE BYPRODUCTS	
NATURE	GYPSUM
FULL LOAD QUANTITY - M T/H	59.86 (66.00 TPH)
QUALITY - %	95.0
DISPOSITION	MARKETED
NATURE OF END PRODUCT	WALLBOARD
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	53.9 (59.4 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	10.0
% CASO3 - DRY	0.5
% CASO4 - DRY	95.0
% CAO ₂ - DRY	0.0
% CACO3 - DRY	1.5
% ASH - DRY	1.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

JACKSONVILLE ELEC AUTHORITY: ST.JOHN'S RIVER PWR PARK 1 (CONT.)

** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	NA
PROPRIETARY PROCESS	NA
INLET QUALITY - %	50.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NA
SITE DIMENSIONS	560 ACRES X 60' HIGH
SITE CAPACITY - CU.M	24460000 (20000.0 ACRE-FT)
SITE SERVICE LIFE - YRS	40

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

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

THE UTILITY REPORTED THAT INITIAL STARTUP OF THE FGD SYSTEM OCCURRED IN DECEMBER 1986.

1/87	SYSTEM									744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OFF-LINE 6 DAYS IN JANUARY DUE TO OVER PRESSURIZATION.

2/87	SYSTEM									672	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS SHUTDOWN FOR 10 DAYS DURING THE MONTHS OF FEBRUARY AND MARCH DUE TO TURBINE-RELATED PROBLEMS.

3/87	SYSTEM									744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

JACKSONVILLE ELEC AUTHORITY: ST. JOHNS RIVER PWR PARK 1 (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 ANNOUNCED THAT UNIT 1 WAS DECLARED COMMERCIAL ON MARCH 27, 1987.							
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 MINOR PROBLEMS WITH SCALE BUILDUP ON THE PACKING, CEILCOTE LINER FAILURES IN THE QUENCHER SUMP, AND POOR GYPSUM QUALITY WHEN THE UNIT WAS BURNING HIGH SULFUR COAL. THESE PROBLEMS ARE CURRENTLY BEING ADDRESSED BY THE UTILITY.							
NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD APRIL THROUGH DECEMBER 1987. THE UTILITY REPORTED THAT THE FGD SYSTEM IS OPERATING VERY WELL AND WITHOUT ANY MAJOR INCIDENCES.							

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS CITY POWER & LIGHT	
PLANT NAME	LA CYGNE	
UNIT NUMBER	1	
CITY	LA CYGNE	
STATE	KANSAS	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	55.	(0.128 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	1290.	(3.000 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1450	
GROSS UNIT GENERATING CAPACITY - MW	740	
NET UNIT GENERATING CAPACITY W/FGD - MW	670	
NET UNIT GENERATING CAPACITY WO/FGD - MW	694	
EQUIVALENT SCRUBBED CAPACITY - MW	740	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1302.44	(2760000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	213.	(700 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.0	(23.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	21864.	(9400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9000-9700
AVERAGE ASH CONTENT - %	25.00	
RANGE ASH CONTENT - %	25.0-35.0	
AVERAGE MOISTURE CONTENT - %	8.60	
RANGE MOISTURE CONTENT - %	9.0-10.0	
AVERAGE SULFUR CONTENT - %	5.39	
RANGE SULFUR CONTENT - %	5.0-6.0	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	0.02-0.03	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	8	
NUMBER OF SPARES	0	
INITIAL START-UP DATE	2/1973	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/SIDE-MOVABLE BLOCKS	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	18.0 X 22.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED MORTAR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	315.0	(5000 GPM)
L/G RATIO - LITER/CU.M	1.9	(14.5 GAL/1000ACF)
PH CONTROL ADDITIVE	LIMESTONE	
PRESSURE DROP - KPA	2.5	(10.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	48.8	(160.0 FT/S)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

INLET GAS FLOW RATE - CU.M/S	162.8	(345000 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICIENCY - %	22.0	
PARTICLE REMOVAL EFFICIENCY - %	95.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00
ENERGY CONSUMPTION - %	3.2
CURRENT STATUS	1
COMMERCIAL START-UP	6/1973
INITIAL START-UP	12/1972
CONTRACT AWARDED	3/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	*****
SPACE REQUIREMENTS - SQ M	18765.8 (202000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	300.0

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	8
NUMBER OF SPARES	0
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	BABCOCK & WILCOX
DIMENSIONS - FT	32.0 X 16.0 X 65.0
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	PERFORATED TRAYS
NUMBER OF CONTACTING ZONES	2
DISTANCE BETWEEN GAS CONTACTING ZONES - CM	121.9 (48.0IN)
LIQUID RECIRCULATION RATE - LITER/S	630. (10000 GPM)
L/G RATIO - L/CU.M	5.6 (41.9 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7 (3.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.6 (8.5 FT/S)
INLET GAS FLOW - CU. M/S	112.55 (238500 ACFM)
INLET GAS TEMPERATURE - C	50.0 (122 F)
SO2 REMOVAL EFFICIENCY - %	80.0
PARTICLE REMOVAL EFFICIENCY - %	95.0

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRECOLLECTOR
NUMBER PER SYSTEM	8
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	1
GENERIC TYPE	BULK SEPARATION
SPECIFIC TYPE	PERFORATED TRAYS
TRADE NAME/COMMON TYPE	SIEVE TRAY
MANUFACTURER	BABCOCK & WILCOX
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
FREEBOARD DISTANCE - M	1.68 (5.5 FT)

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

SUPERFICAL GAS VELOCITY - M/S	2.6	(8.5 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
WASH WATER SOURCE	NONE	
WASH FREQUENCY	N/A	
** REHEATER		
NUMBER	8	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	BARE TUBE	
LOCATION	TOP OF ABSORBER VESSEL	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	16.7	(30 F)
INLET FLUE GAS FLOW RATE - CU. M/S	112.55	(238500 ACFM)
INLET FLUE GAS TEMPERATURE - C	50.0	(122 F)
OUTLET FLUE GAS TEMPERATURE - C	66.7	(152 F)
NUMBER OF HEAT EXCHANGER BANKS	4	
NUMBER OF BUNDLES PER BANK	4	
NUMBER OF TUBES PER BUNDLE	32	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
** FANS		
NUMBER	6	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	207.64	(440000 ACFM)
FLUE GAS TEMPERATURE - C	66.7	(152 F)
PRESSURE DROP - KPA	7.0	(23.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	WESTINGHOUSE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
PRESSURE DROP - KPA	6.1	(20.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	8	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MANUFACTURER	NR	
MODULATION	OPEN/CLOSED	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)
SERVICE CONDITIONS	285	
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	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
MANUFACTURER	AIR CLEAN	
MODULATION	NR	
SEAL AIR FLOW - CU. M/S	0.00	(0 ACFM)

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

SERVICE CONDITIONS	122
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	8
FUNCTION	SHUT-OFF
GENERIC TYPE	BUTTERFLY
SPECIFIC TYPE	N/A
MANUFACTURER	NR
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
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
** DAMPERS	
NUMBER	6
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	NR
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
SERVICE CONDITIONS	175
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	6
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	NR
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.00 (0 ACFM)
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, RECTANGULAR
DIMENSIONS	20 FT DIA, 10.5 FT X 10.5 FT
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	BREECHING TO STACK
CONFIGURATION	CIRCULAR
DIMENSIONS	20 FT DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	INERT FLAKE-FILLED VINYL ESTER
** DUCTWORK	
LOCATION	OUTLET
CONFIGURATION	CIRCULAR, RECTANGULAR
DIMENSIONS	12 FT DIA, 13 FT X 13 FT
SHELL GENERIC MATERIAL TYPE	CARBON STEEL

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	INERT FLAKE-FILLED VINYL ESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	KOPPERS HARDINGE
NUMBER	2
NUMBER OF SPARES	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	99.9 (110 TPH)
PRODUCT QUALITY - % SOLIDS	20.0
** TANKS	
SERVICE	NUMBER
-----	-----
REAGENT PREP PRODUCT 1	2
ABSORBER RECYCLE	8
REAGENT PREP PRODUCT 2	2
SLURRY BOOSTER HOLD	1
** PUMPS	
SERVICE	NUMBER
-----	-----
POND RETURN	2
SLURRY FEED	2
ABSORBER RECIRCULATION	8
SCRUBBER RECIRCULATION	8
CLASSIFIER FEED	4
SPENT SLURRY BOOSTER	2
RECIRCULATION TANK DRAIN	1
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
MOISTURE CONTENT - % TOTAL FREE WATER	76.0
** 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	160 ACRES X 11 FT DEEP
SITE CAPACITY - CU.M	2152480 (1760.0 ACRE-FT)
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	500 ACRES X 11 FT DEEP
SITE CAPACITY - CU.M	6726500 (5500.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

** PROCESS CONTROL AND INSTRUMENTATION

PROCESS STREAM	VENTURI
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	PH 5.6-5.8
MONITOR TYPE	UNILOC
MONITOR LOCATION	VENTURI INLET
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	OPEN
MAKEUP WATER ADDITION - LITERS/S	72.3 (1148 GPM)

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	91% CaCO ₃ , 1% MgCO ₃
SOURCE/SUPPLIER	BATES COUNTY ROCK 'SUPPLIER!
CONSUMPTION	81 TPH MAX., 70 TPH TYPICAL
POINT OF ADDITION	BALL MILL

** FGD SPARE CAPACITY INDICES

SCRUBBER - %	0.0
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	17.0
BALL MILL - %	100.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	0.0

** FGD SPARE COMPONENT INDICES

SCRUBBER	0.0
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	1.0
BALL MILL	1.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	0.0

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

12/72 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FIRST TRIAL OPERATION BEGAN ON DECEMBER 26, 1972 AND WAS PLAGUED WITH NUMEROUS PROBLEMS. SOME OF THESE PROBLEMS, SUCH AS VIBRATIONS OF THE INDUCED-DRAFT FANS AND THEIR SENSITIVITY TO IMBALANCE, OCCURRED EVEN BEFORE THE BOILER WAS FIRED. AS THESE FABRICATION PROBLEMS WERE CORRECTED AND THE FGD SYSTEM WENT INTO OPERATION TWO OTHER TYPES OF PROBLEMS APPEARED. THE FIRST TYPE ASSOCIATED WITH THE WET LIMESTONE PROCESS, INCLUDED PLUGGING OF THE MIST ELIMINATORS AND STRAINERS. THE CORROSION ASSOCIATED WITH CONDENSATION OF ACID VAPORS FROM THE GAS ON THE REHEATER TUBE BUNDLES WAS CONTROLLED BY INJECTION OF SLIP STREAMS OF HOT AIR FROM THE BOILER COMBUSTION AIR HEATER INTO THE SCRUBBED FLUE GASES AT THE INLET TO THE REHEATER UNITS. THIS PRACTICE WHICH REDUCED THE MAXIMUM GENERATING CAPACITY OF THE BOILER BY LIMITING THE AIR AVAILABLE FOR COAL COMBUSTION, IS NO LONGER NECESSARY BECAUSE OF SYSTEM DESIGN MODIFICATIONS.

6/73	A	20.0
	B	21.0
	C	40.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D				21.0						
	E				27.0						
	F				30.0						
	G				23.0						
	SYSTEM	64.0			26.0			720	294	187	15.2
7/73	A				7.0						
	B				24.0						
	C				25.0						
	D				41.0						
	E				27.0						
	F				25.0						
	G				31.0						
	SYSTEM	64.0			26.0			744	303	195	15.2
8/73	A				79.0						
	B				64.0						
	C				65.0						
	D				74.0						
	E				47.0						
	F				48.0						
	G				70.0						
	SYSTEM	68.0			64.0			744	699	476	42.1
9/73	A				13.0						
	B				0.0						
	C				13.0						
	D				13.0						
	E				13.0						
	F				0.0						
	G				0.0						
	SYSTEM	53.0			7.0			720	95	50	3.5
10/73	A				28.0						
	B				41.0						
	C				34.0						
	D				54.0						
	E				33.0						
	F				3.0						
	G				46.0						
	SYSTEM	56.0			34.0			744	452	253	19.7
11/73	A				48.0						
	B				1.0						
	C				38.0						
	D				4.0						
	E				63.0						
	F				59.0						
	G				49.0						
	SYSTEM	57.0			37.0			720	463	266	18.1
12/73	A				42.0						
	B				20.0						
	C				5.0						
	E				26.0						
	D				31.0						
	F				11.0						
	G				32.0						
	SYSTEM	53.0			24.0			744	339	179	10.3
0/74	SYSTEM										

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 KANSAS CITY POWER & LIGHT: LA CYGNE 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 1974 FIGURES ARE BASED UPON ACTUAL SYSTEM OPERATION HOURS AS A
 FUNCTION OF ACTUAL BOILER HOURS

1/74	A	49.0					
	B	32.0					
	C	44.0					
	D	87.0					
	E	23.0					
	F	37.0					
	G	81.0					
	SYSTEM	50.0	24.0	744	364	182	6.0
2/74	A	66.0					
	B	68.0					
	C	59.0					
	D	76.0					
	E	52.0					
	F	100.0					
	G	65.0					
	SYSTEM	69.0	37.0	672	364	251	16.0
3/74	SYSTEM		0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUTDOWN FOR THE ENTIRE MONTH OF MARCH.

4/74	A	67.0					
	B	70.0					
	C	75.0					
	D	88.0					
	E	74.0					
	F	100.0					
	G	88.0					
	SYSTEM	80.0	37.0	720	332	266	15.0
5/74	A	69.0					
	B	83.0					
	C	78.0					
	D	85.0					
	E	78.0					
	F	84.0					
	G	80.0					
	SYSTEM	80.0	54.0	744	500	400	27.0
6/74	A	92.0					
	B	84.0					
	C	83.0					
	D	90.0					
	E	82.0					
	F	83.0					
	G	87.0					
	SYSTEM	86.0	57.0	720	480	413	32.0
7/74	A	75.0					
	B	80.0					
	C	80.0					
	D	81.0					
	E	85.0					
	F	79.0					

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS HOURS	FGD HOURS	CAP. FACTOR
	G	77.0							
	SYSTEM	80.0			34.0		744	313	250 19.0
8/74	A	90.0							
	B	90.0							
	C	73.0							
	D	81.0							
	E	81.0							
	F	78.0							
	G	99.0							
	SYSTEM	85.0			65.0		744	571	485 39.0
9/74	A	69.0							
	B	88.0							
	C	73.0							
	D	76.0							
	E	83.0							
	F	89.0							
	G	86.0							
	SYSTEM	81.0			68.0		720	606	491 36.0
10/74	A	71.0							
	B	61.0							
	C	59.0							
	D	81.0							
	E	79.0							
	F	93.0							
	G	89.0							
	SYSTEM	76.0			68.0		744	662	503 39.0
11/74	A	90.0							
	B	71.0							
	C	60.0							
	D	61.0							
	E	84.0							
	F	85.0							
	G	84.0							
	SYSTEM	76.0			41.0		720	386	293 23.0
12/74	SYSTEM				0.0		744	0	0 0.0
0/75	SYSTEM								
** PROBLEMS/SOLUTIONS/COMMENTS									
THE 1975 FIGURES ARE BASED UPON SYSTEM AVAILABLE HOURS AS A FUNCTION OF HOURS IN THE PERIOD.									
1/75	SYSTEM	100.0			0.0		744	0	0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE BOILER WAS SHUTDOWN DURING JANUARY AND FEBRUARY FOR TURBINE/GENERATOR REPAIR.									
2/75	SYSTEM	100.0			0.0		672	0	0 0.0
3/75	A	82.0							
	B	96.0							
	C	90.0							
	D	77.0							
	E	93.0							
	F	92.0							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

G 96.0
 SYSTEM 89.0 744 694 41.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING REDUCED LOAD CONDITIONS SOME OF THE MODULES WERE NOT REQUIRED AND THEREFORE SHUT DOWN ALTHOUGH THEY WERE AVAILABLE. AVAILABILITY WAS THERE FOR HIGHER THAN SOME OF THE POSTED FIGURES INDICATE.

4/75 SYSTEM 100.0 720 3.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE BOILER WAS OFF LINE FOR 25 DAYS DUE TO NECESSARY GENERATOR REPAIRS.

5/75 A 95.0
 B 85.0
 C 94.0
 D 90.0
 E 90.0
 F 89.0
 G 83.0
 SYSTEM 89.0 744 683 56.0

6/75 A 88.0
 B 85.0
 C 84.0
 D 85.0
 E 84.0
 F 86.0
 G 89.0
 SYSTEM 86.0 720 667 56.0

7/75 A 78.0
 B 90.0
 C 90.0
 D 84.0
 E 85.0
 F 87.0
 G 85.0
 SYSTEM 86.0 744 590 50.0

8/75 A 75.0
 B 88.0
 C 87.0
 D 78.0
 E 92.0
 F 85.0
 G 83.0
 SYSTEM 84.0 744 630 50.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES A AND D ARE USED FOR RESEARCH TESTS. ONE MODULE IS SHUT DOWN EACH EVENING FOR CLEANING.

9/75 A 78.0
 B 84.0
 C 84.0
 D 85.0
 E 79.0
 F 78.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

	G	74.0									
	SYSTEM	80.0						720	610		42.0
10/75	A	66.0									
	B	77.0									
	C	46.0									
	D	74.0									
	E	72.0									
	F	73.0									
	G	65.0									
	SYSTEM	68.0						744	231		13.0
11/75	A	93.0									
	B	91.0									
	C	80.0									
	D	93.0									
	E	96.0									
	F	89.0									
	G	94.0									
	SYSTEM	91.0						720	346		29.0
** PROBLEMS/SOLUTIONS/COMMENTS											
THE SYSTEM WAS DOWN OCTOBER 16 TO NOVEMBER 13 OWING TO PROBLEMS WITH THE GENERATOR AND ID AIR FAN.											
AVAILABILITY FIGURES FOR OCTOBER AND NOVEMBER DO NOT INCLUDE THE OUTAGE TIME FROM OCTOBER 16 TO NOVEMBER 13.											
12/75	A	91.0									
	B	87.0									
	C	81.0									
	D	85.0									
	E	87.0									
	F	89.0									
	G	84.0									
	SYSTEM	86.0						744	597		47.0
** PROBLEMS/SOLUTIONS/COMMENTS											
THREE BOILER OUTAGES OCCURRED DURING DECEMBER.											
1/76	A	86.0									
	B	85.0									
	C	91.0									
	D	72.0									
	E	84.0									
	F	82.0									
	G	84.0									
	SYSTEM	83.0						744	621		51.0
2/76	A	94.0									
	B	90.0									
	C	86.0									
	D	91.0									
	E	92.0									
	F	93.0									
	G	95.0									
	SYSTEM	92.0						696	595		55.0
3/76	A	92.0									
	B	90.0									
	C	88.0									

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

	D	93.0									
	E	94.0									
	F	91.0									
	G	91.0									
	SYSTEM	91.0						744	643		57.0

4/76	A	92.0									
	B	91.0									
	C	89.0									
	D	97.0									
	E	96.0									
	F	98.0									
	G	95.0									
	SYSTEM	94.0						720	143		13.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUT DOWN ON APRIL 6 FOR A SCHEDULED BOILER AIR PREHEATER, AND STACK BREECHING OVERHAUL. THE UNIT WAS RESTARTED ON MAY 10.

DURING THE OUTAGE SOME MAINTENANCE WAS PERFORMED ON THE SCRUBBER DUCTWORK, PRIMARILY BECAUSE OF CORROSION PROBLEMS.

5/76	A	97.0									
	B	92.0									
	C	94.0									
	D	96.0									
	E	89.0									
	F	95.0									
	G	96.0									
	SYSTEM	94.0						744	436		38.0

** PROBLEMS/SOLUTIONS/COMMENTS

FROM MAY 10 TO THE END OF THE MONTH FOUR UNIT OUTAGES WERE ENCOUNTERED.

6/76	A	93.0									
	B	94.0									
	C	94.0									
	D	95.0									
	E	92.0									
	F	94.0									
	G	91.0									
	SYSTEM	93.0						720	656		56.0

** PROBLEMS/SOLUTIONS/COMMENTS

FOUR FORCED MINOR SCRUBBER OUTAGES OCCURRED DURING JUNE.

7/76	A	96.0									
	B	95.0									
	C	92.0									
	D	93.0									
	E	93.0									
	F	94.0									
	G	94.0									
	SYSTEM	94.0						744	688		60.0

** PROBLEMS/SOLUTIONS/COMMENTS

TWO MINOR SCRUBBER OUTAGES OCCURRED DURING JULY.

THE UNIT RECORDED ITS LARGEST MW-HOUR MONTH SINCE INITIATION OF COMMERCIAL OPERATION (359,028).

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

8/76	A	94.0						
	B	93.0						
	C	92.0						
	D	93.0						
	E	92.0						
	F	90.0						
	G	88.0						
	SYSTEM	92.0		744	521			46.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OUT OF SERVICE AUGUST 24 FOR REPAIR OF A TURBINE BLADE
 THE UNIT WAS RETURNED TO SERVICE ON OCTOBER 20. OPERATION WAS INTERMIT-
 TENT PENDING TURBINE BLADE REBALANCING AND REESTABLISHMENT OF NORMAL
 OPERATING CONDITIONS.

DURING THE TURBINE REPAIR PERIOD THE UTILITY COATED THE STACK INNER
 STRUCTURE WITH PLASTITE 4005.

THE AUGUST AVAILABILITY FIGURES DO NOT INCLUDE THE OUTAGE TIME.

9/76	SYSTEM	100.0	0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS DOWN DUE TO TURBINE REPAIR.

10/76	A	97.0					
	B	97.0					
	C	98.0					
	D	89.0					
	E	96.0					
	F	96.0					
	G	96.0					
	SYSTEM	96.0		744	256		15.0

11/76	A	95.0					
	B	93.0					
	C	94.0					
	D	95.0					
	E	94.0					
	F	91.0					
	G	94.0					
	SYSTEM	94.0		720	627		59.0

12/76	A	87.0					
	B	89.0					
	C	81.0					
	D	94.0					
	E	94.0					
	F	95.0					
	G	91.0					
	SYSTEM	90.0		744	706		60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-MODULE VENTURI RECYCLE PUMP EXPERIENCED SOME PROBLEMS AND WAS
 REPAIRED.

THE C-MODULE REHEAT STEAM TUBE BUNDLES WERE INCREASED IN NUMBER FROM
 FOUR TO EIGHT.

1/77	A	94.0					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	90.0									
	C	95.0									
	D	95.0									
	E	95.0									
	F	92.0									
	G	90.0									
	SYSTEM	93.0						744	539		43.0
2/77	A	93.0									
	B	93.0									
	C	93.0									
	D	94.0									
	E	93.0									
	F	94.0									
	G	88.0									
	SYSTEM	93.0						672	590		58.0
3/77	A	94.0									
	B	92.0									
	C	86.0									
	D	94.0									
	E	91.0									
	F	94.0									
	G	90.0									
	SYSTEM	92.0						744	558		50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE EIGHTH MODULE HAS BEEN INSTALLED.

THE MIST ELIMINATORS IN TWO MODULES HAVE BEEN MODIFIED TO THE POINT WHERE THEY HAVE BEEN OPERATING CONTINUOUSLY CLEAN.

ADDITIONAL BANKS OF STEAM TUBE BUNDLES HAVE BEEN INSTALLED IN SOME MODULES. 50 F OF REHEAT HAS BEEN DETERMINED AS THE NECESSARY TEMPERATURE BOOST AT LA CYGNE TO PRECLUDE STACK PROBLEMS RELATED TO ACID DEW POINT.

THE WATER LOOP IS NOW 95% CLOSED.

A NEW SETTLING POND IS BEING INSTALLED AT THE PLANT.

THE PLANT IS STILL GENERATING 700-720 MW DURING THE DAY AND 500-570 MW AT NIGHT.

4/77	A	96.0								
	B	94.0								
	C	97.0								
	D	94.0								
	E	95.0								
	F	96.0								
	G	95.0								
	SYSTEM	95.0					720	384		31.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE EIGHTH MODULE HAS BEEN RUN FOR TWO DAYS.

5/77	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN IN MAY DUE TO TURBINE PROBLEMS. THE UNIT RESTARTED JULY 5, 1977.

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

THE MIST ELIMATOR WASHING CONFIGURATION IS BEING CHANGED TO WORK
 COUNTERCURRENT TO THE GAS FLOW.

ADDITIONAL STEAM TUBE BUNDLES ARE BEING ADDED TO INCREASE THE REHEAT AREA

THE NEW SETTLING POND IS STILL BEING DRAWN UP. EXCAVATION HAS NOT BEGUN.

6/77	SYSTEM	100.0		0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR CLEANOUT AND REPAIR WORK WAS DONE ON THE SCRUBBING SYSTEM DURING
 THE TURBINE OUTAGE.

7/77	A	95.0						
	B	93.0						
	C	94.0						
	D	95.0						
	E	95.0						
	F	95.0						
	G	95.0						
	H	95.0						
	SYSTEM	95.0			744	485		36.0

** PROBLEMS/SOLUTIONS/COMMENTS

RESUMPTION OF OPERATIONS WAS CONDUCTED WITH EIGHT SCRUBBER MODULES IN THE
 FLUE GAS PATH, ENABLING THE UNIT TO OPERATE AT A MAXIMUM CONTINUOUS LOAD
 CAPACITY OF 800-820 MW.

8/77	A	89.0						
	B	55.0						
	C	93.0						
	D	93.0						
	E	90.0						
	F	93.0						
	G	93.0						
	H	93.0						
	SYSTEM	87.0			744	501		43.0

** PROBLEMS/SOLUTIONS/COMMENTS

PARTICLE REMOVAL TESTS WERE CONDUCTED IN LATE AUGUST AND UNIT NO.1 HAS
 PASSED THE COMPLIANCE REQUIREMENTS (0.13 LB/MM BTU).

MODULE B HAD LOW AVAILABILITY DUE TO THE BURNING OF THE MOTOR ON
 THE RECIRCULATING PUMP. IT WAS REMOVED FROM SERVICE AND STARTED AGAIN
 AFTER 12 DAYS.

9/77	A	93.0						
	B	94.0						
	C	89.0						
	D	90.0						
	E	93.0						
	F	95.0						
	G	92.0						
	H	93.0						
	SYSTEM	92.0			720	524		50.0

10/77	A	91.0						
	B	96.0						
	C	89.0						
	D	94.0						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

	E	93.0								
	F	94.0								
	G	89.0								
	H	93.0								
	SYSTEM	92.0					744	457		

** PROBLEMS/SOLUTIONS/COMMENTS

A 12 DAY OUTAGE IN OCTOBER WAS REQUIRED TO DESLAG THE BOILER.

11/77	A	93.0								
	B	96.0								
	C	93.0								
	D	94.0								
	E	92.0								
	F	93.0								
	G	96.0								
	H	95.0								
	SYSTEM	94.0					720	234		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN NOVEMBER 15 BECAUSE OF A NECESSARY TURBINE OVERHAUL. THE BOILER WENT BACK ON LINE DECEMBER 25.

12/77	A	98.0								
	B	98.0								
	C	96.0								
	D	96.0								
	E	96.0								
	F	97.0								
	G	98.0								
	H	99.0								
	SYSTEM	97.0					744	300		

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE A FEW SMALL BOILER RELATED OUTAGES IN DECEMBER.

1/78	A	90.0								
	B	95.0								
	C	95.0								
	D	95.0								
	E	93.0								
	F	94.0								
	G	94.0								
	H	94.0								
	SYSTEM	94.0					744	597		

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE SOME BOILER RELATED OUTAGES IN JANUARY, TOTALING ABOUT 50 HOURS.

THE FGD SYSTEM CONTINUED TO OPERATE WITHOUT ANY PROBLEMS.

2/78	A	92.0								
	B	93.0								
	C	95.0								
	D	94.0								
	E	91.0								
	F	97.0								
	G	96.0								

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	H	93.0							
	SYSTEM	94.0						672 578	58.0
3/78	A	95.0							
	B	95.0							
	C	90.0							
	D	95.0							
	E	94.0							
	F	95.0							
	G	89.0							
	H	93.0							
	SYSTEM	93.0						744 741	62.0
4/78	A	91.0							
	B	92.0							
	C	93.0							
	D	91.0							
	E	90.0							
	F	92.0							
	G	91.0							
	H	91.0							
	SYSTEM	91.0						720 620	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN A TOTAL OF 100 HOURS IN APRIL. THIS TIME INCLUDED THREE OUTAGES DUE TO BOILER LEAKS AND LACK OF LOAD REQUIREMENT.

DURING THE BOILER OUTAGES MODIFICATIONS TO THE FGD SYSTEM INCLUDED CHANGING THE REHEAT TUBE BUNDLES.

5/78	A	89.0							
	B	92.0							
	C	92.0							
	D	93.0							
	E	92.0							
	F	91.0							
	G	93.0							
	H	86.0							
	SYSTEM	91.0						744 593	

** PROBLEMS/SOLUTIONS/COMMENTS

IN MAY THE BOILER WAS DOWN TWICE FOR A TOTAL OF 151 HOURS. OUTAGES WERE AGAIN CAUSED BY BOILER LEAKS.

GENERAL MAINTENANCE AND REPAIRS ON THE FGD SYSTEM CONTINUED.

6/78	SYSTEM							720 15	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS UP FOR ONLY 15 HOURS IN JUNE. IN THE FIRST PART OF JUNE THERE WERE BOILER TUBE LEAKS. FROM JUNE 8 TO JUNE 17 A BOILER OUTAGE WAS NECESSARY FOR GENERATOR REPAIR.

7/78	A	88.0							
	B	97.0							
	C	92.0							
	D	94.0							
	E	88.0							
	F	93.0							
	G	93.0							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	H	95.0								
	SYSTEM	93.0						744	341	
8/78	A	92.0								
	B	93.0								
	C	95.0								
	D	96.0								
	E	93.0								
	F	94.0								
	G	95.0								
	H	95.0								
	SYSTEM	94.0						744	577	

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE TWO BOILER OUTAGES IN AUGUST.

THE UTILITY IS EXPERIMENTING WITH A 3-STAGE MIST ELIMINATOR AND SOME DOUBLE STAGE MIST ELIMINATORS. BETTER MIST ELIMINATION AT THE SCRUBBER EXIT WOULD REDUCE THE FREQUENCY OF REHEATER CLEANING.

9/78	A	96.0								
	B	96.0								
	C	96.0								
	D	96.0								
	E	96.0								
	F	96.0								
	G	95.0								
	H	97.0								
	SYSTEM	96.0						720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE JULY-SEPTEMBER PERIOD TWO ID FAN ROTERS WERE REPLACED.

10/78	A	96.0								
	B	96.0								
	C	98.0								
	D	97.0								
	E	97.0								
	F	98.0								
	G	97.0								
	H	96.0								
	SYSTEM	97.0						744	255	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER.

11/78	A	92.0								
	B	95.0								
	C	94.0								
	D	93.0								
	E	94.0								
	F	93.0								
	G	94.0								
	H	96.0								
	SYSTEM	94.0						720	720	

KANSAS CITY POWER & LIGHT: LA CYGNE 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 UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER.

12/78	A	93.9		
	B	92.9		
	C	94.0		
	D	95.0		
	E	94.7		
	F	90.5		
	G	94.4		
	H	94.7		
	SYSTEM	93.8	744	239

1/79	A	95.6		
	B	96.5		
	C	97.2		
	D	96.3		
	E	90.7		
	F	97.2		
	G	97.2		
	H	95.4		
	SYSTEM	95.8	744	205

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE DECEMBER-JANUARY PERIOD THE UNIT EXPERIENCED A MULTITUDE OF BOILER OUTAGES.

2/79	A	95.0		
	B	94.6		
	C	92.6		
	D	93.5		
	E	95.1		
	F	94.3		
	G	94.1		
	H	93.8		
	SYSTEM	94.1	672	342

3/79	A	96.1		
	B	96.0		
	C	93.2		
	D	95.6		
	E	96.5		
	F	94.8		
	G	95.7		
	H	93.4		
	SYSTEM	95.2	744	314

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR FEBRUARY OR MARCH.

THE UTILITY HAS REPORTED THAT MANY TUBE LEAKS AND CYCLONE LEAKS WERE EXPERIENCED WITH THE BOILER.

4/79	A	95.5		
	B	95.7		
	C	94.4		
	D	91.4		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	E	95.5							
	F	96.2							
	G	95.9							
	H	95.7							
	SYSTEM	95.0					720	638	
5/79	A	96.5							
	B	96.3							
	C	96.7							
	D	95.3							
	E	95.4							
	F	95.7							
	G	96.3							
	H	95.5							
	SYSTEM	96.0					744	476	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS HAD OCCURRED.									
6/79	SYSTEM	100.0			0.0		720	0	0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS REMOVED FROM SERVICE THE LATTER PART OF MAY FOR SCHEDULED BOILER OVERHAUL AND REMAINED OUT OF SERVICE THROUGH JUNE.									
7/79	SYSTEM	100.0			0.0		744	0	0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE TURBINE WAS OVERHAULED DURING JULY. DURING THE OUTAGE SOME MINOR MAINTENANCE WAS PERFORMED ON THE SCRUBBING SYSTEM.									
8/79	A	86.8							
	B	95.9							
	C	96.3							
	D	96.3							
	E	95.9							
	F	96.2							
	G	88.5							
	H	96.9							
	SYSTEM	94.1					744	231	
9/79	A	96.0							
	B	96.1							
	C	95.6							
	D	94.3							
	E	96.7							
	F	96.1							
	G	96.0							
	H	96.9							
	SYSTEM	96.0					720	618	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE FGD UNITS OPERATED WITH NO MAJOR PROBLEMS AND ONLY REGULAR MAINTENANCE WAS PERFORMED DURING AUGUST AND SEPTEMBER.									
10/79	A	95.3							
	B	95.8							
	C	94.7							
	D	92.7							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

	E	94.4									
	F	94.9									
	G	94.7									
	H	94.5									
	SYSTEM	94.6						744	436		
11/79	SYSTEM	0.0			0.0			720	0	0	0.0
12/79	SYSTEM	0.0			0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WENT DOWN FOR AN OVERHAUL ON OCTOBER 19 AND WAS OUT OF SERVICE THROUGH DECEMBER.

EXTENSIVE MAINTENANCE WORK BEGAN ON THE FGD SYSTEM LATE IN OCTOBER CAUSING THE SYSTEM TO BE UNAVAILABLE DURING NOVEMBER AND DECEMBER. SOME ITEMS INCLUDED IN THE MAINTENANCE WERE:

THE INSTALLATION OF TWO NEW SPRAY HEADERS IN SIX OF THE MODULES, REPLACEMENT OF THE ABSORBER SIDEWALLS, REPLACEMENT OF THE MODULE OUTLET DUCTS AND DAMPERS, AND VARIOUS DUCTWORK PATCHING.

1/80	SYSTEM	0.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM REMAINED UNAVAILABLE DURING JANUARY DUE TO THE ON-GOING GENERATOR/TURBINE OVERHAUL AND THE EXTENSIVE FGD SYSTEM MODIFICATIONS BEING PERFORMED.

2/80	A	98.2	84.1	95.7	20.0					
	B	98.2	58.3	92.9	13.2					
	C	97.4	66.2	89.7	14.9					
	D	99.1	45.9	92.3	10.3					
	E	98.2	93.0	97.3	21.0					
	F	99.1	91.7	97.3	20.7					
	G	99.1	91.7	97.3	20.7					
	H	99.6	92.4	97.3	20.8					
	SYSTEM	98.6	77.7	95.3	17.5		696	157	122	10.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE TURBINE/GENERATOR OVERHAUL WAS COMPLETED IN FEBRUARY AND THE BOILER AND FGD SYSTEM RETURNED TO SERVICE ON FEBRUARY 20. THE FGD SYSTEM WAS AVAILABLE FOR OPERATION MOST OF THE MONTH.

3/80	A	94.6	100.0	100.0	4.3					
	B	96.2	100.0	100.0	4.3					
	C	96.1	100.0	100.0	4.3					
	D	96.1	100.0	100.0	4.3					
	E	95.8	93.8	100.0	4.0					
	F	94.7	53.1	100.0	2.3					
	G	93.3	31.3	100.0	1.3					
	H	95.7	0.0		0.0					
	SYSTEM	95.3	72.3	100.0	3.1		744	32	23	1.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OPERATED FOR ONLY 23 HOURS IN MARCH AS A RESULT OF GENERATOR/TURBINE PROBLEMS. SOME ROUTINE CLEANING AND INSPECTIONS OF THE FGD SYSTEM WERE PERFORMED DURING THE OUTAGE TIME.

4/80	A	96.3	94.1	94.5	61.7					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

	B	95.1	78.4	91.4	51.4					
	C	95.0	97.5	92.9	63.9					
	D	96.7	93.6	94.8	61.4					
	E	95.3	86.0	92.3	56.4					
	F	92.5	76.3	87.2	50.0					
	G	97.0	68.4	93.9	44.9					
	H	97.0	62.9	93.4	41.3					
	SYSTEM	95.6	82.2	92.6	53.9		720	472	388	37.6

5/80	A	96.4	89.4	96.0	84.1					
	B	94.6	87.9	93.9	82.7					
	C	95.7	88.3	95.2	83.1					
	D	95.9	83.9	95.1	78.9					
	E	96.1	84.4	95.3	79.4					
	F	96.5	89.3	96.2	84.0					
	G	96.1	96.0	94.0	90.3					
	H	96.8	82.3	96.2	77.4					
	SYSTEM	96.0	87.7	95.5	82.5		744	700	614	49.9

6/80	A	98.2	89.5	97.2	46.0					
	B	98.1	90.3	96.8	46.4					
	C	97.4	96.6	96.7	49.7					
	D	98.1	92.5	98.0	47.5					
	E	98.1	87.6	97.9	45.0					
	F	98.3	91.1	98.5	46.8					
	G	98.8	88.2	97.3	45.3					
	H	99.3	87.3	98.6	44.9					
	SYSTEM	98.3	90.4	98.9	46.4		720	370	334	35.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR THE SECOND QUARTER OF 1980

7/80	A	89.7	86.9	87.1	69.9					
	B	97.8	97.6	97.3	78.5					
	C	97.3	96.9	96.6	77.9					
	D	98.1	98.0	97.7	78.8					
	E	98.2	97.6	97.8	78.4					
	F	98.6	98.6	98.3	79.3					
	G	98.1	97.9	97.6	78.7					
	H	97.7	96.9	97.1	77.9					
	SYSTEM	96.9	96.3	96.2	77.4		744	598	576	60.9

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR JULY.

8/80	A	94.6	92.7	93.9	66.9					
	B	97.9	97.3	97.2	70.3					
	C	98.1	97.3	97.3	70.3					
	D	97.7	96.8	97.4	69.9					
	E	97.2	96.2	96.7	69.5					
	F	98.7	97.2	98.1	70.2					
	G	97.6	96.9	96.7	69.9					
	H	97.3	96.4	96.3	69.6					
	SYSTEM	97.4	96.4	96.7	69.6		744	537	518	54.7

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/80	A	98.9	90.4	98.0	53.9					

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	B	98.6	91.1	97.5	54.3				
	C	97.8	90.7	96.0	54.0				
	D	94.9	84.8	90.8	50.6				
	E	98.6	91.1	97.5	54.3				
	F	99.2	93.0	98.5	55.4				
	G	99.2	93.0	98.5	55.4				
	H	98.8	90.2	97.7	53.8				
	SYSTEM	98.2	90.7	97.0	54.0		720	429	389 43.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OFF LINE SEVERAL TIMES FOR A TOTAL OF 118 HOURS BECAUSE OF BOILER TUBE LEAKS.

THE BOILER WENT DOWN ON SEPTEMBER 27, 1980 FOR A SCHEDULED MAINTENANCE OVERHAUL. THE FGD SYSTEM WAS AVAILABLE DURING THIS TIME.

10/80	SYSTEM	100.0		0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE BOILER REMAINED OUT OF SERVICE DUE TO AN ANNUAL TURBINE BOILER OVERHAUL. THE FGD SYSTEM WAS AVAILABLE DURING THIS TIME.

11/80	A	99.9	92.1	98.3	8.0				
	B	100.0	100.0	100.0	10.0				
	C	100.0	100.0	100.0	10.0				
	D	90.0	0.0	0.0	0.0				
	E	100.0	100.0	100.0	10.0				
	F	100.0	100.0	100.0	10.0				
	G	99.7	85.7	96.4	7.5				
	H	100.0	59.5	100.0	5.2				
	SYSTEM	87.5	87.3	85.9	7.6		720	63	55 8.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE BOILER WAS IN SERVICE APPROXIMATELY 63 HOURS DUE TO THE ANNUAL TURBINE/BOILER OVERHAUL. THE FGD SYSTEM WAS AVAILABLE 98.7% DURING THIS TIME.

MODULE D WAS OUT OF SERVICE DUE TO REPAIRS CAUSED BY FIRE DAMAGE RECEIVED ON OCTOBER 13, 1980.

12/80	A	97.8	96.7	96.9	66.7				
	B	98.0	96.3	97.0	66.4				
	C	98.1	97.1	97.3	66.9				
	D	0.0	0.0	0.0	0.0				
	E	98.5	97.7	97.8	67.3				
	F	98.2	93.8	97.4	64.6				
	G	95.2	90.6	92.8	62.5				
	H	98.9	93.6	98.1	64.5				
	SYSTEM	85.6	93.6	98.1	64.5		720	513	427 45.2

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE D REMAINED OUT OF SERVICE THE ENTIRE MONTH DUE TO THE NECESSARY REPAIRS CAUSED BY FIRE DAMAGE IN OCTOBER.

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

1/81	A	96.9	100.0	96.1	76.5
	B	94.1	100.0	92.9	76.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	94.4	100.0	93.2	77.0						
	D	18.3	1.5	1.1	1.0						
	E	95.8	100.0	94.9	76.9						
	F	97.0	100.0	96.4	78.6						
	G	96.8	100.0	96.1	79.4						
	H	97.2	100.0	96.6	79.8						
	SYSTEM	86.6	100.0	83.3	68.3			744	465	508	62.5
2/81	A	99.6	100.0	99.4	72.0						
	B	99.3	100.0	98.8	68.0						
	C	99.4	99.7	99.1	65.2						
	D	99.3	100.0	99.0	72.9						
	E	99.1	93.1	98.5	60.9						
	F	99.1	92.9	98.6	60.7						
	G	99.7	95.2	99.4	62.2						
	H	99.6	100.0	99.2	66.2						
	SYSTEM	99.4	100.0	99.1	66.1			672	439	444	47.3
** PROBLEMS/SOLUTIONS/COMMENTS											
DURING PART OF JANUARY AND FEBRUARY MODULE D WAS OUT OF SERVICE FOR REPAIR DUE TO FIRE DAMAGE.											
3/81	A	97.2	100.0	96.9	86.9						
	B	97.7	96.5	97.3	82.1						
	C	95.6	100.0	95.1	85.8						
	D	96.8	96.1	96.2	81.2						
	E	97.2	98.4	96.7	83.7						
	F	97.8	89.8	97.3	76.5						
	G	97.3	93.3	96.7	79.4						
	H	97.7	87.3	97.0	74.3						
	SYSTEM	97.2	95.5	96.6	81.3			744	633	605	68.7
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO OTHER MAJOR FGD-RELATED PROBLEMS WERE EN- COUNTERED DURING THE FIRST QUARTER 1981.											
4/81	A	97.4	97.3	94.5	45.7						
	B	97.5	98.2	94.9	46.1						
	C	97.1	97.3	94.0	45.7						
	D	97.2	97.6	94.0	45.8						
	E	97.4	97.3	94.5	45.7						
	F	97.4	97.6	94.3	45.8						
	G	97.4	97.6	94.6	45.8						
	H	97.1	96.7	94.0	45.4						
	SYSTEM	97.3	97.5	94.4	45.8			720	338	330	36.1
5/81	A	99.7	53.3	94.1	5.4						
	B	99.7	81.3	96.8	8.2						
	C	100.0	84.0	100.0	8.5						
	D	100.0	84.0	100.0	8.5						
	E	100.0	33.3	100.0	3.4						
	F	100.0	0.0		0.0						
	G	100.0	0.0		0.0						
	H	100.0	0.0		0.0						
	SYSTEM	99.9	42.0	98.2	4.3			744	75	32	12.6
6/81	A	99.7	100.0	98.6	19.6						
	B	99.3	100.0	96.5	19.2						
	C	99.0	100.0	94.3	16.0						
	D	99.2	100.0	95.8	19.0						
	E	79.4	20.2	12.9	3.1						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	F	99.6	100.0	97.9	19.3					
	G	99.9	20.6	95.8	3.2					
	H	100.0	0.0		0.0					
	SYSTEM	97.0	67.6	84.5	12.4		720	109	89	4.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE, MODULE E WAS UNAVAILABLE FOR 572 HOURS AS A RESULT OF PROBLEM
ENCOUNTERED WITH THE VENTURI PUMP MOTOR.

7/81	A	96.9	95.8	95.4	64.2					
	B	97.2	93.0	95.7	62.4					
	C	97.4	73.9	95.1	49.6					
	D	96.0	89.4	93.7	59.9					
	E	96.1	82.2	93.4	55.1					
	F	98.0	69.1	95.8	46.4					
	G	97.2	75.8	95.0	50.8					
	H	97.8	60.5	95.0	40.6					
	SYSTEM	97.1	80.0	94.9	53.6		744	499	399	37.0
8/81	A	94.4	100.0	93.3	77.8					
	B	95.9	100.0	95.4	86.0					
	C	93.1	100.0	91.3	72.5					
	D	94.9	100.0	94.0	79.9					
	E	94.3	97.5	92.5	70.4					
	F	96.2	100.0	95.0	73.2					
	G	95.9	99.4	94.7	71.8					
	H	96.4	93.4	94.9	67.4					
	SYSTEM	95.1	100.0	95.1	74.9		744	537	557	57.7
9/81	A	30.6	100.0	91.2	27.9					
	B	29.5	100.0	88.5	29.5					
	C	31.6	100.0	94.8	31.6					
	D	30.4	100.0	91.3	30.2					
	E	32.3	97.8	96.1	26.9					
	F	32.3	100.0	96.6	30.5					
	G	32.4	95.6	96.6	26.3					
	H	32.9	83.7	98.4	23.0					
	SYSTEM	31.5	100.0	93.9	28.4		720	198	203	13.8

** PROBLEMS/SOLUTIONS/COMMENTS

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

DURING SEPTEMBER THE FGD SYSTEM WAS OFF-LINE 504 HOURS FOR A SCHEDULED
OVERHAUL.

10/81	A	50.8	100.0	97.9	40.3					
	B	48.3	100.0	92.6	41.7					
	C	51.4	100.0	99.4	40.9					
	D	51.6	100.0	100.0	42.0					
	E	48.3	83.8	98.8	30.0					
	F	47.3	90.0	99.3	32.2					
	G	51.5	74.3	99.8	26.6					
	H	51.5	72.9	99.7	26.1					
	SYSTEM	50.6	97.9	98.2	35.0		744	266	260	19.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE SYSTEM WAS OFF-LINE 345 HOURS TO COMPLETE A SCHEDULED
OVERHAUL.

11/81	A	97.4	100.0	97.0	85.6					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	95.9	100.0	95.1	79.6						
	C	92.3	100.0	90.3	71.8						
	D	92.9	100.0	91.8	79.8						
	E	96.0	100.0	94.6	69.6						
	F	90.1	97.3	86.4	62.7						
	G	94.1	98.4	91.6	63.4						
	H	91.8	100.0	89.1	66.9						
	SYSTEM	93.8	100.0	92.1	72.4			720	464	521	41.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

12/81	A	96.4	100.0	95.6	78.7					
	B	93.4	100.0	91.0	66.6					
	C	98.7	100.0	98.0	64.9					
	D	98.2	100.0	97.2	62.5					
	E	99.3	100.0	98.6	51.5					
	F	98.7	94.2	97.4	46.4					
	G	99.1	83.0	98.0	41.1					
	H	99.4	73.3	98.4	36.2					
	SYSTEM	97.9	93.8	96.8	56.0		744	386	417	25.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/82	A	88.0	78.5	81.8	53.9					
	B	93.2	98.7	90.9	67.8					
	C	95.9	100.0	95.2	80.1					
	D	91.5	100.0	89.2	70.3					
	E	92.3	83.1	88.2	57.1					
	F	85.0	94.7	81.2	65.0					
	G	97.0	75.6	94.5	52.0					
	H	97.3	100.0	96.5	73.2					
	SYSTEM	92.5	91.3	89.7	64.9		744	511	483	33.4

2/82	A	94.7	100.0	92.1	60.9					
	B	96.9	100.0	95.7	68.1					
	C	96.8	100.0	95.3	64.8					
	D	98.1	100.0	97.0	64.0					
	E	95.7	100.0	93.7	62.8					
	F	95.5	83.2	90.6	43.1					
	G	96.5	73.8	91.6	38.2					
	H	97.1	67.4	92.2	34.9					
	SYSTEM	96.4	90.6	93.5	58.3		672	348	367	24.0

3/82	A	97.3	100.0	96.6	77.5					
	B	95.1	100.0	93.2	67.7					
	C	96.4	100.0	95.0	69.2					
	D	91.5	100.0	87.8	61.0					
	E	95.2	95.8	92.1	56.8					
	F	98.0	100.0	100.0	96.8					
	G	95.4	59.0	88.4	35.0					
	H	97.7	95.3	96.1	56.5					
	SYSTEM	95.8	93.8	93.2	60.4		744	441	449	33.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1982 THE UTILITY REPORTED EXPERIENCING NO MAJOR FGD-RELATED PROBLEMS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

4/82	A	97.7	100.0	94.9	42.4				
	B	98.5	100.0	96.4	41.3				
	C	99.2	100.0	98.2	42.4				
	D	98.9	100.0	97.4	41.2				
	E	99.0	100.0	97.6	40.3				
	F	99.7	96.9	99.2	38.0				
	G	99.4	68.1	97.9	26.7				
	H	98.7	92.4	96.7	36.2				
	SYSTEM	98.9	94.7	97.3	38.6	720	282	278	20.5

** PROBLEMS/SOLUTIONS/COMMENTS

ON APRIL 16 THRU APRIL 30 THE UNIT WAS OUT OF SERVICE FOR AN OVERHAUL.

5/82	SYSTEM	100.0		0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE UNIT WAS SHUT DOWN FOR A SCHEDULED MAINTENANCE OUTAGE.
 DURING THIS TIME GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM;
 HOWEVER, THE SYSTEM WAS AVAILABLE FOR OPERATION IF NEEDED.

6/82	A	99.2	94.3	97.1	25.8				
	B	98.7	100.0	95.8	30.2				
	C	95.0	98.2	84.3	26.9				
	D	99.5	100.0	98.7	36.3				
	E	99.5	90.0	98.1	24.6				
	F	89.9	68.6	64.9	18.8				
	G	99.2	100.0	97.7	34.8				
	H	98.9	100.0	96.7	31.9				
	SYSTEM	97.5	93.9	91.7	28.7	720	197	206	13.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/82	A	97.5	100.0	97.4	90.9				
	B	95.4	100.0	94.9	85.8				
	C	95.8	100.0	95.3	86.3				
	D	97.1	100.0	96.7	85.4				
	E	98.1	98.5	97.7	79.4				
	F	95.1	92.2	93.8	74.3				
	G	97.3	97.7	96.7	78.8				
	H	97.3	100.0	96.9	83.2				
	SYSTEM	96.7	100.0	96.2	83.0	744	600	618	53.8

8/82	A	98.0	100.0	97.6	82.6				
	B	96.9	100.0	96.6	86.7				
	C	97.6	100.0	97.4	86.9				
	D	97.3	100.0	96.9	83.1				
	E	98.7	100.0	98.5	86.3				
	F	98.1	100.0	97.8	85.4				
	G	96.7	100.0	96.2	83.0				
	H	98.5	99.0	98.1	76.4				
	SYSTEM	97.7	100.0	97.4	83.8	744	574	623	46.2

9/82	A	92.1	100.0	90.7	77.2				
	B	97.2	100.0	96.3	72.0				
	C	96.2	100.0	95.3	77.3				
	D	91.7	100.0	89.7	72.5				
	E	98.0	100.0	97.2	71.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	F	97.2	100.0	96.1	70.1						
	G	96.2	100.0	94.9	71.9						
	H	96.9	91.2	95.4	63.6						
	SYSTEM	95.7	100.0	94.5	71.9			720	502	518	43.7

** PROBLEMS/SOLUTIONS/COMMENTS

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

10/82	A	97.0	100.0	96.2	76.0					
	B	96.8	100.0	95.6	70.4					
	C	97.0	100.0	96.1	74.1					
	D	97.8	100.0	97.2	74.3					
	E	98.4	100.0	97.6	68.0					
	F	98.5	100.0	97.7	64.4					
	G	98.1	100.0	96.9	59.8					
	H	97.2	100.0	95.7	63.0					
	SYSTEM	97.6	100.0	96.6	68.8		744	440	512	35.2

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/82	A	13.2	79.2	99.0	13.2					
	B	13.2	79.2	99.5	13.2					
	C	13.1	78.3	98.5	13.1					
	D	12.8	76.7	96.5	12.8					
	E	12.8	77.1	95.9	12.8					
	F	12.8	77.1	96.7	12.8					
	G	12.8	76.7	95.8	12.8					
	H	13.3	79.6	99.5	13.3					
	SYSTEM	13.0	78.0	97.7	13.0		720	120	94	11.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED TURBINE GENERATOR PROBLEMS DURING NOVEMBER.

12/82	SYSTEM	0.0			0.0		744	0	0	0.0
1/83	SYSTEM	0.0			0.0		744	0	0	0.0
2/83	SYSTEM	0.0			0.0		672	0	0	0.0
3/83	SYSTEM	0.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OUT OF SERVICE ON NOVEMBER 7, 1982 FOR AN EXTENDED OVERHAUL. THE OUTAGE CONTINUED THROUGH MARCH 1983.

4/83	SYSTEM	0.0			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN MOST OF APRIL DUE TO EXTENSIVE BOILER REPAIRS. REPAIRS INCLUDED THE REPLACEMENT OF BOILER FLOORING, SIDE WALLS, AND SEVERAL CYCLONES.

5/83	SYSTEM	0.0			0.0		744	0	0	0.0
6/83	SYSTEM	0.0			0.0		720	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 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 SCHEDULED OUTAGE CONTINUED THROUGH THE SECOND QUARTER OF 1983 WITH TURBINE AND GENERATOR WORK BEING COMPLETED.

7/83	A	60.1	91.1	96.1	45.3			
	B	61.2	88.6	92.8	44.1			
	C	61.7	95.4	94.5	47.4			
	D	62.9	94.3	96.9	46.9			
	E	63.3	93.5	97.7	46.5			
	F	62.8	82.4	96.2	41.0			
	G	63.3	99.2	97.6	49.3			
	H	63.7	92.7	98.4	46.1			
	SYSTEM	62.4	92.2	96.3	45.8	744	370	341

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ATTRIBUTED LOW BOILER HOURS DURING JULY TO START-UP TIME AND TESTS REQUIRED FOLLOWING THE EXTENDED OUTAGE.

8/83	A	76.1	100.0	98.1	68.0			
	B	76.2	100.0	98.3	68.1			
	C	75.7	100.0	97.6	67.6			
	D	75.9	100.0	97.8	65.9			
	E	75.4	98.1	97.0	62.5			
	F	75.9	94.7	97.6	60.3			
	G	75.4	94.9	96.8	60.5			
	H	76.6	94.5	98.6	60.2			
	SYSTEM	75.9	97.8	97.7	64.1	744	474	477 17.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ATTRIBUTED LOW FGD SYSTEM AVAILABILITY DURING AUGUST TO CONTINUED TESTING ON THE BOILER AND SCRUBBER.

9/83	A				0.0			
	B				0.0			
	C				0.0			
	D				0.0			
	E				0.0			
	F				0.0			
	G				0.0			
	H				0.0			
	SYSTEM				0.0	720	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

A FORCED OUTAGE OCCURRED DURING SEPTEMBER DUE TO TURBINE GENERATOR PROBLEMS. THE UTILITY HOPED TO BE BACK IN SERVICE BY NOVEMBER, 1983.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN THE ENTIRE FOURTH QUARTER OF 1983 DUE TO CONTINUED BOILER AND TURBINE REPAIRS. THE UTILITY HOPES TO BE BACK IN SERVICE BY THE END OF JANUARY, 1984.

1/84	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----
 PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 SO2 PART. HOURS HOURS 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
8/84	SYSTEM					744
9/84	SYSTEM					720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED OUTAGES DURING THE FIRST THREE
 QUARTERS OF 1984. FGD SYSTEM AVAILABILITY WAS ESTIMATED AT 95%.

10/84	SYSTEM					744
11/84	SYSTEM					720
12/84	SYSTEM					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN PART OF OCTOBER AND NOVEMBER
 FOR A SCHEDULED FOUR WEEK OUTAGE. DURING THE OUTAGE THE ABSORBER ID
 FAN AND DUCTWORK WERE REPAIRED. THE FGD AVAILABILITY FOR THE PERIOD WAS
 REPORTED TO BE ABOVE 95%.

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 FGD-RELATED OUTAGES DURING
 THE YEAR 1985. UNIT AND FGD AVAILABILITY FOR THE YEAR WERE ESTIMATED TO
 BE APPROXIMATELY 85% AND 98%, RESPECTIVELY. SCHEDULED 3 WEEK BOILER/

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
TURBINE MAINTENANCE OUTAGES TOOK PLACE DURING THE MONTHS OF MAY AND NOVEMBER.									
1/86	SYSTEM							774	
2/86	SYSTEM							672	
3/86	SYSTEM							774	
** PROBLEMS/SOLUTIONS/COMMENTS									
NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1986.									
4/86	SYSTEM							720	
5/86	SYSTEM							774	
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE MONTHS OF APRIL AND MAY, THERE WAS A SCHEDULED 3 WEEK BOILER/TURBINE OUTAGE. NO MAJOR PROBLEMS WITH THE FGD SYSTEM WERE REPORTED.									
6/86	SYSTEM							720	
7/86	SYSTEM							774	
8/86	SYSTEM							774	
9/86	SYSTEM							720	
10/86	SYSTEM							774	
** PROBLEMS/SOLUTIONS/COMMENTS									
NO MAJOR UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD OF JUNE THROUGH OCTOBER.									
11/86	SYSTEM							720	
12/86	SYSTEM							774	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS FORCED OFF-LINE IN NOVEMBER AND REMAINED DOWN FOR THE REMAINDER OF THE YEAR DUE TO EMERGENCY TURBINE BLADE REPAIRS. DURING THIS OUTAGE, ROUTINE PATCHWORK OF THE ABSORBER OUTLET DUCTWORK WAS CONDUCTED.									
1/87	SYSTEM							744	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT THE UNIT REMAINED OFF-LINE UNTIL THE MIDDLE OF JANUARY DUE TO TURBINE REPAIRS.									
2/87	SYSTEM							672	
3/87	SYSTEM							744	
4/87	SYSTEM							720	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS CITY POWER & LIGHT: LA CYGNE 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM OPERATED UNTIL APRIL AT WHICH TIME A FORCED 2 WEEK OUTAGE WAS REQUIRED DUE TO BOILER FEED PUMP PROBLEMS.

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 CORROSION PROBLEMS ON ALL 6 CARBON STEEL SCRUBBER ID FANS. ALL 6 FAN HOUSINGS AND ROTORS WILL EITHER BE REPLACED OR REPAIRED NEXT YEAR DURING A SCHEDULED OUTAGE PERIOD. THE NEW FANS WILL BE CONSTRUCTED OF 317L STAINLESS STEEL.

THE UTILITY REPORTED THAT NO FORCED UNIT OR FGD-RELATED OUTAGES WERE ENCOUNTERED THE REMAINDER OF THE YEAR. A SCHEDULED 4 WEEK OUTAGE FOR ROUTINE BOILER/TURBINE MAINTENANCE TOOK PLACE IN THE FALL.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	JEFFREY	
UNIT NUMBER	1	
CITY	WAMEGO	
STATE	KANSAS	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	322.	(0.750 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2720	
GROSS UNIT GENERATING CAPACITY - MW	720	
NET UNIT GENERATING CAPACITY W/FGD - MW	680	
NET UNIT GENERATING CAPACITY WO/FGD - MW	698	
EQUIVALENT SCRUBBED CAPACITY - MW	540	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1312.35	(2781000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.6	(276 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	18899.	(8125 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****	
AVERAGE ASH CONTENT - %	5.80	
RANGE ASH CONTENT - %	*****	
AVERAGE MOISTURE CONTENT - %	30.00	
RANGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	0.32	
RANGE SULFUR CONTENT - %	*****	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	*****	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	2
TYPE	COLD SIDE
SUPPLIER	C.E. WALTHER
INLET FLUE GAS CAPACITY - CU.M/S	664.0 (1407000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.0 (320 F)
PRESSURE DROP - KPA	0.3 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	98.6

** 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

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00
ENERGY CONSUMPTION - %	2.5
CURRENT STATUS	1
COMMERCIAL START-UP	8/1978
INITIAL START-UP	8/1978
CONTRACT AWARDED	7/1973

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %

** QUENCHER/PRESATURATOR

NUMBER

0

** ABSORBER

NUMBER	6	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	907.	(14400 GPM)
L/G RATIO - L/CU.M	5.3	(39.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
INLET GAS FLOW - CU. M/S	171.30	(363000 ACFM)
INLET GAS TEMPERATURE - C	135.6	(276 F)
SO2 REMOVAL EFFICIENCY - %	60.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRECOLLECTOR
NUMBER PER SYSTEM	6
NUMBER OF SPARES PER SYSTEM	1
NUMBER PER MODULE	1
GENERIC TYPE	BULK SEPARATION
SPECIFIC TYPE	BAFFLE SLATS
TRADE NAME/COMMON TYPE	BULK ENTRAINMENT SEPARATOR
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER
WASH WATER SOURCE	NR

** REHEATER

NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	25.0	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
OUTLET FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
NUMBER	4
NUMBER OF SPARES	1
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS TEMPERATURE - C	135.6 (276 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	LOUVER
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	ABSORBER 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	ABSORBER OUTLET TO REHEAT ZONE
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	COAL TAR EPOXY
** DUCTWORK	
LOCATION	REHEAT ZONE TO STACK
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	CHEMICALLY-BONDED CONCRETE
** 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

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
NUMBER	3
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	10.9 (12 TPH)
PRODUCT QUALITY - % SOLIDS	60.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	4
SLUDGE STORAGE	****
SLUDGE TRANSFER	****
MIST ELIMINATOR WASH	****
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	6
ABSORBER BLEED	****
SLUDGE	****
POND RETURN	****
ADDITIVE FEED	4
ADDITIVE TRANSFER	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	AIR SPARGERS IN REACTION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	230 ACRES/80 FT
SITE SERVICE LIFE - YRS	30
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SO2
MONITOR TYPE	DUPONT & LEAR SIEGLER
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	36.4 (577 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
CONSUMPTION	12130 LB/HR
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	20.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

** FGD SPARE COMPONENT INDICES
ABSORBER

1.0

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

8/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND TURBINE WERE SYNCHRONIZED ON JUNE 11 AND THE BOILER IS NOW OPERATIONAL.

THE FGD SYSTEM IS IN THE SHAKEDOWN PHASE OF OPERATION. EACH OF THE SIX MODULES OPERATED DURING THIS PERIOD. NO MAJOR PROBLEMS WERE REPORTED. INTEGRATED OPERATION OF THE SYSTEM IS EXPECTED DURING THE FIRST HALF OF OCTOBER.

9/78 SYSTEM 720

10/78 SYSTEM 744

11/78 SYSTEM 720

12/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INTEGRATED OPERATION FOR THIS UNIT HAS NOT YET BEEN ACHIEVED. A CERTIFICATION TEST WHICH HAD BEEN SCHEDULED WAS CANCELLED DUE TO A BOILER OUTAGE. AT THIS TIME THE COLD WEATHER HAS FORCED POSTPONMENT OF THE TEST INDEFINITELY. INTERMITTENT FGD OPERATIONS ARE CONTINUING.

1/79 SYSTEM 744

2/79 SYSTEM 672

3/79 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO BOILER OR FGD SYSTEM PROBLEMS WERE REPORTED FOR FEBRUARY OR MARCH.

4/79 SYSTEM 0.0 720 0 0 0.0

5/79 SYSTEM 0.0 744 0 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN FOR WARRANTY INSPECTION ON APRIL 1 AND REMAINED OUT OF SERVICE DURING MAY.

6/79 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT RETURNED TO SERVICE THE FIRST WEEK OF JUNE AND HAS SUFFERED NO OPERATIONAL DIFFICULTIES SINCE RESTART.

7/79 SYSTEM 744

8/79 SYSTEM 744

9/79 SYSTEM 720

KANSAS POWER & LIGHT: JEFFREY 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 UNUSUAL BOILER OR FGD SYSTEM PROBLEMS WERE ENCOUNTERED DURING JULY OR AUGUST. THE UNIT PASSED THE COMPLIANCE TEST DURING THE JUNE-JULY PERIOD. THE UNIT WILL SHUT DOWN IN MID-SEPTEMBER FOR THE NORMAL TWO WEEK INSPECTION AND MAINTENANCE OUTAGE. THE UNIT IS EXPECTED BACK ON LINE ON OCTOBER 1.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS REPORTED THAT THERE HAS BEEN NO MAJOR OPERATING PROBLEMS DURING THIS REPORT PERIOD. EXCESSIVE BALL WEAR IN THE LIMESTONE BALL MILL WAS DETECTED.

AGITATOR FAILURES IN THE REACTION TANK HAVE OCCURRED. THE AGITATORS HAVE EXPERIENCED MOTOR FAILURES, PADDLE ARM DETACHMENTS AND SHAFT BREAKING.

1/80	SYSTEM					744		
2/80	SYSTEM					696		
3/80	SYSTEM	100.0	100.0	100.0	67.7	744	504	504

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WENT OFF LINE FOR TEN DAYS IN MARCH FOR A SCHEDULED INSPECTION. DURING THE BOILER OUTAGE GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM. OTHER THAN THIS OUTAGE, THE FGD UNIT OPERATED 100% OF THE TIME IN MARCH.

4/80	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
5/80	SYSTEM	100.0	100.0	100.0	100.0	744	744	744
6/80	SYSTEM	100.0	100.0	100.0	100.0	720	720	720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE APRIL THROUGH JUNE PERIOD THE FGD SYSTEM OPERATED 100% OF THE TIME.

7/80	SYSTEM	100.0	100.0	100.0	69.1	744	514	514 49.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY A 230 HOUR OUTAGE OCCURRED DUE TO AN AIR PREHEATER TUBE LEAK IN THE BOILER. NO FGD-RELATED PROBLEMS OCCURRED DURING THE MONTH.

8/80	SYSTEM	100.0	100.0	100.0	84.8	744	631	631 42.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE FOR PART OF AUGUST SO REPAIRS COULD BE CONDUCTED ON BOILER AIR PREHEATER TUBES.

9/80	SYSTEM	100.0	100.0	100.0	100.0	720	720	720 67.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 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 PROBLEMS WITH THE BOILER OR THE FGD SYSTEM WERE ENCOUNTERED DURING
 SEPTEMBER.

10/80 SYSTEM 100.0 100.0 100.0 37.4 744 278 278

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE BOILER DID NOT OPERATE FOR APPROXIMATELY 466 HOURS DUE
 TO A SCHEDULED INSPECTION.

11/80 SYSTEM 99.9 99.8 99.8 86.8 720 626 625

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 94 HOURS DUE TO BOILER
 INSPECTION AND BEARING FAILURES.

THE FGD SYSTEM WAS DOWN APPROXIMATELY ONE HOUR DUE TO AN AUTOMATIC DAMPER
 MALFUNCTION.

12/80 SYSTEM 100.0 100.0 100.0 98.5 744 733 733

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE FGD SYSTEM WAS AVAILABLE 100%.

A BOILER OUTAGE DURING THE MONTH WAS DUE TO A AIR PREHEATER PROBLEM.

1/81 SYSTEM 744

2/81 SYSTEM 672

3/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OPERATED VERY LITTLE DURING THE FIRST QUARTER OF 1981.
 THE UTILITY FIRED LOW SULFUR COAL DURING THE PERIOD.

DURING THE MONTH OF MARCH THE SYSTEM WAS DOWN FOR A PERIOD OF TWO WEEKS
 DUE TO A SCHEDULED MAINTENANCE OUTAGE.

4/81 SYSTEM 720

5/81 SYSTEM 744

6/81 SYSTEM 720

7/81 SYSTEM 744

8/81 SYSTEM 744

9/81 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 1 FGD SYSTEM OPERATED INTERMITTENTLY DURING THE SECOND AND
 THIRD QUARTERS OF 1981. FLUE GAS GENERATED FROM THE LOW SULFUR CONTENT
 COAL BURNED THROUGHOUT MUCH OF THE PERIOD DID NOT REQUIRE SCRUBBING.

10/81 SYSTEM 720

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
11/81	SYSTEM						720
12/81	SYSTEM						744
** PROBLEMS/SOLUTIONS/COMMENTS							
THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER.							
1/82	SYSTEM						744
2/82	SYSTEM						672
3/82	SYSTEM						744
** PROBLEMS/SOLUTIONS/COMMENTS							
THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982. SOMETIME DURING THE FIRST AND/OR SECOND QUARTER 1982, THE UNIT WILL BE SHUTDOWN FOR A SCHEDULED 2 WEEK SPRING OUTAGE.							
4/82	SYSTEM						720
5/82	SYSTEM						744
6/82	SYSTEM						720
** PROBLEMS/SOLUTIONS/COMMENTS							
THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.							
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
** PROBLEMS/SOLUTIONS/COMMENTS							
THE JEFFREY 1 AND 2 FGD SYSTEMS HAVE NOT BEEN OPERATED SINCE THE FALL OF 1982 WHILE THE FINAL INSTALLATION WORK WAS COMPLETED ON THE JEFFREY 3 FGD SYSTEM.							
THE REACTION TANKS HAVE EXPERIENCED CORROSION RELATED TO FLEXING OF THE STEEL TANK BASES. THIS HAS BEEN EVIDENCED PARTICULARLY AROUND THE MIXERS. KP&L IS NOW PUTTING IN CONCRETE TANK FLOORS TO ELIMINATE THE PROBLEM.							
THE JEFFREY 1 AND 2 FGD SYSTEMS HAVE BEEN SHOWING CORROSION IN THE DOWNSTREAM DUCTWORK PARTICULARLY IN THE REHEAT MIXING ZONE. THE PROBLEM HAS NOT YET BECOME SERIOUS.							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

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

4/83 SYSTEM 100.0 0.0 720 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 1 FGD SYSTEM REMAINED DOWN WHILE FINAL INSTALLATION WORK ON JEFFREY 3 WAS COMPLETED.

5/83 SYSTEM 100.0 0.0 744 0

6/83 SYSTEM 100.0 0.0 720 0

7/83 SYSTEM 100.0 0.0 744 0

8/83 SYSTEM 100.0 0.0 744 0

9/83 SYSTEM 100.0 0.0 720 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 1 FGD SYSTEM WAS REPORTED TO HAVE BEEN AVAILABLE DURING THE PERIOD OF MAY THROUGH SEPTEMBER. HOWEVER, DURING THIS TIME, THE FGD SYSTEM WAS ONLY OPERATED FOR 1 MONTH DUE TO A SUMMER PEAK LOAD PERIOD.

THE NEXT UNIT OUTAGE IS SCHEDULED FOR THE FIRST OF DECEMBER. DURING THIS OUTAGE, THE UTILITY PLANS TO DO SOME PATCH WORK ON THE ABSORBER OUTLET DUCTING.

10/83 SYSTEM 744

11/83 SYSTEM 720

12/83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

JEFFREY 1 WAS OUT OF SERVICE DURING THE FOURTH QUARTER OF 1983 DUE TO EXTENSIVE DUCTWORK REPAIRS.

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

JEFFREY 1 WAS OFF LINE DURING 1984. THE UTILITY REPORTED THAT THE REPLACEMENT OF CORRODING OUTLET DUCTWORK IS PLANNED FOR THE NEXT SIX MONTHS.

10/84 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/84	SYSTEM						720			
12/84	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
UTILITY REPORTED THAT THE FGD SYSTEM WAS OUT OF SERVICE DURING THE ENTIRE FOURTH QUARTER OF 1984 DUE TO DUCTWORK REPAIRS. THE UNIT IS CURRENTLY RUNNING ON BYPASS.										
1/85	SYSTEM						744			
2/85	SYSTEM						672			
3/85	SYSTEM						744			
4/85	SYSTEM						720			
5/85	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE FGD SYSTEM WAS NOT OPERATED DURING THE WINTER OR SPRING MONTHS. THE UNIT IS CURRENTLY OPERATING AND IS BURNING LOW SULFUR COMPLIANCE COAL. THE UNIT WAS DOWN FROM MARCH 10 THROUGH MAY 10 FOR A SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE.										
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 WAS NOT USED HEAVILY DURING THE PERIOD JUNE THROUGH DECEMBER 1985. THE UNIT CONTINUED TO BURN COMPLIANCE COAL VERSUS USING THE FGD SYSTEM. MODIFICATIONS TO THE REHEAT SYSTEM WERE PERFORMED DURING THE FGD OUTAGE. A LARGE COMMON BYPASS MIX DUCT WAS ADDED AND THE ABSORBER OUTLET DUCTWORK WAS MODIFIED SUCH THAT ALL MODULES NOW EXHAUST DIRECTLY INTO THIS NEW MIX DUCT PRIOR TO BEING DISCHARGED TO THE STACK.										
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			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 1 (CONT.)

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

8/86	SYSTEM						774
9/86	SYSTEM						720
10/86	SYSTEM						774
11/86	SYSTEM						720
12/86	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

DURING 1986, THE FGD SYSTEM OPERATED ONLY APPROXIMATELY 50% OF THE BOILER OPERATING HOURS. THE REMAINDER OF THE TIME IT WAS NOT NEEDED SINCE THE BOILER OPERATED ON COMPLIANCE COAL. NO MAJOR FGD-RELATED OUTAGES WERE REPORTED BY THE UTILITY FOR 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
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.

THE UTILITY REPORTED THAT JEFFREY UNITS 1,2 AND 3 BURN COMPLIANCE COAL MORE THAN 99 PERCENT OF THE TIME. WHILE BURNING COMPLIANCE COAL, THE FGD SYSTEM IS NOT NEEDED TO MEET SO2 COMPLIANCE AND IS USUALLY SHUTDOWN. HOWEVER, IN ORDER TO HANDLE THE OCCASIONAL SHIPMENT OF HIGH SULFUR COAL, THE FGD SYSTEM ON AT LEAST ONE OF THE 3 UNITS MUST REMAIN FUNCTIONAL.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	JEFFREY	
UNIT NUMBER	2	
CITY	WAMEGO	
STATE	KANSAS	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	322.	(0.750 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2720	
GROSS UNIT GENERATING CAPACITY - MW	720	
NET UNIT GENERATING CAPACITY W/FGD - MW	680	
NET UNIT GENERATING CAPACITY WO/FGD - MW	698	
EQUIVALENT SCRUBBED CAPACITY - MW	540	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1312.35	(2781000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.6	(276 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	18899.	(8125 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		*****
AVERAGE ASH CONTENT - %	5.80	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	30.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.32	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	2
TYPE	COLD SIDE
SUPPLIER	C.E. WALTHER
INLET FLUE GAS CAPACITY - CU.M/S	664.0 (1407000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.0 (320 F)
PRESSURE DROP - KPA	0.3 (1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	98.6

** 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

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00	
ENERGY CONSUMPTION - %	2.5	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/1980	
INITIAL START-UP	1/1980	
CONTRACT AWARDED	7/1973	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
NUMBER	0	
** ABSORBER		
NUMBER	6	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	907.	(14400 GPM)
L/G RATIO - L/CU.M	5.3	(39.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
INLET GAS FLOW - CU. M/S	171.30	(363000 ACFM)
INLET GAS TEMPERATURE - C	135.6	(276 F)
SO2 REMOVAL EFFICIENCY - %	60.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRECOLLECTOR	
NUMBER PER SYSTEM	6	
NUMBER OF SPARES PER SYSTEM	1	
NUMBER PER MODULE	1	
GENERIC TYPE	BULK SEPARATION	
SPECIFIC TYPE	BAFFLE SLATS	
TRADE NAME/COMMON TYPE	BULK ENTRAINMENT SEPARATOR	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	NR	
** REHEATER		
NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	25.0	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
OUTLET FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

** FANS	
NUMBER	4
NUMBER OF SPARES	1
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS TEMPERATURE - C	135.6 (276 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	LOUVER
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	ABSORBER 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	ABSORBER OUTLET TO REHEAT ZONE
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	COAL TAR EPOXY
** DUCTWORK	
LOCATION	REHEAT ZONE TO STACK
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	CHEMICALLY-BONDED CONCRETE
** 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

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

DEVICE TYPE	NR	
NUMBER	3	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	10.9	(12 TPH)
PRODUCT QUALITY - % SOLIDS	60.0	
*** TANKS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECYCLE	4	
SLUDGE STORAGE	****	
SLUDGE TRANSFER	****	
MIST ELIMINATOR WASH	****	
*** PUMPS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECIRCULATION	6	
ABSORBER BLEED	****	
SLUDGE	****	
POND RETURN	****	
ADDITIVE FEED	4	
ADDITIVE TRANSFER	3	
*** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	NONE	
*** SALEABLE BYPRODUCTS		
NATURE	NONE	
DISPOSITION	N/A	
*** SLUDGE		
*** TREATMENT		
METHOD	FORCED OXIDATION	
DEVICE	AIR SPARGERS IN REACTION TANK	
PROPRIETARY PROCESS	N/A	
*** DISPOSAL		
NATURE	FINAL	
TYPE	POND	
LOCATION	ON-SITE	
SITE TRANSPORTATION METHOD	PIPELINE	
SITE TREATMENT	CLAY LINING	
SITE DIMENSIONS	230 ACRES/80 FT	
SITE SERVICE LIFE - YRS	30	
*** PROCESS CONTROL AND INSTRUMENTATION		
CHEMICAL PARAMETERS	SO2	
MONITOR TYPE	DUPONT & LEAR SIEGLER	
*** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
MAKEUP WATER ADDITION - LITERS/S	36.4	(577 GPM)
*** CHEMICALS AND CONSUMPTION		
FUNCTION	ABSORBENT	
NAME	LIMESTONE	
CONSUMPTION	12130 LB/HR	
POINT OF ADDITION	BALL MILL	
*** FGD SPARE CAPACITY INDICES		
ABSORBER - %	20.0	
*** FGD SPARE COMPONENT INDICES		
ABSORBER	1.0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/80	SYSTEM						744			
2/80	SYSTEM						696			
3/80	SYSTEM						744			
** PROBLEMS/SOLUTIONS/COMMENTS										
INITIAL OPERATIONS AT JEFFREY 2 BEGAN IN JANUARY 1980. NO MAJOR PROBLEMS HAVE BEEN ENCOUNTERED SINCE STARTUP.										
4/80	SYSTEM						720			
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING APRIL THE SYSTEM WAS STILL IN THE SHAKEDOWN/DEBUGGING PHASE OF OPERATION.										
5/80	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
6/80	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	
** PROBLEMS/SOLUTIONS/COMMENTS										
COMMERCIAL OPERATIONS BEGAN ON MAY 1, 1980. SINCE THEN THERE HAVE BEEN NO PROBLEMS ENCOUNTERED WITH THE FGD SYSTEM. THE UNIT HAS OPERATED 100% OF THE TIME.										
7/80	SYSTEM	100.0	100.0	100.0	95.3		744	709	709	81.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING JULY A 35 HOUR OUTAGE OCCURRED DUE TO AN AIR PREHEATER TUBE LEAK IN THE BOILER. NO FGD-RELATED OUTAGES OCCURRED DURING THE MONTH.										
8/80	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	80.1
9/80	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	73.3
** PROBLEMS/SOLUTIONS/COMMENTS										
NO PROBLEMS WERE ENCOUNTERED WITH THE BOILER OR THE FGD SYSTEM DURING THE AUGUST AND SEPTEMBER PERIOD.										
10/80	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE MONTH OF OCTOBER.										
11/80	SYSTEM	100.0	100.0	100.0	56.1		720	404	404	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING NOVEMBER NO MAJOR FGD-RELATED PROBLEMS OCCURRED. HOWEVER, THE BOIL ER WAS OUT OF SERVICE APPROXIMATELY 316 HOURS DUE TO A SCHEDULE OUTAGE.										
12/80	SYSTEM	100.0	100.0	100.0	62.9		744	468	468	

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE BOILER WAS OUT OF SERVICE DUE TO SUPERHEATER TUBE PROBLEMS. DURING THIS TIME THE FGD SYSTEM WAS 100% AVAILABLE.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS NOT OPERATED MUCH DURING THE FIRST QUARTER OF 1981 BECAUSE THE UTILITY WAS ABLE TO MEET COMPLIANCE USING ONLY LOW SULFUR COAL.

THE UNIT WAS SHUT DOWN ALL OF MARCH AND PART OF FEBRUARY (SIX WEEKS) FOR AN EQUIPMENT WARRANTY 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

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 2 FGD SYSTEM OPERATED INTERMITTENTLY DURING THE SECOND AND THIRD QUARTERS OF 1981. FLUE GAS GENERATED FROM THE LOW SULFUR CONTENT COAL BURNED THROUGHOUT MUCH OF THE PERIOD DID NOT REQUIRE SCRUBBING.

10/81	SYSTEM									744
11/81	SYSTEM									720
12/81	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/82	SYSTEM									744
2/82	SYSTEM									672
3/82	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982. SOMETIME DURING THE FIRST AND/OR SECOND QUARTER 1982, THE UNIT WILL BE SHUTDOWN FOR A SCHEDULED 2 WEEK SPRING OUTAGE.

4/82	SYSTEM									720
5/82	SYSTEM									744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

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

6/82 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 1 AND 2 FGD SYSTEMS HAVE NOT BEEN OPERATED SINCE THE FALL OF 1982 WHILE THE FINAL INSTALLATION WORK WAS COMPLETED ON THE JEFFREY 3 FGD SYSTEM.

THE REACTION TANKS HAVE EXPERIENCED CORROSION RELATED TO FLEXING OF THE STEEL TANK BASES. THIS HAS BEEN EVIDENCED PARTICULARLY AROUND THE MIXERS. KP&L IS NOW PUTTING IN CONCRETE TANK FLOORS TO ELIMINATE THE PROBLEM.

THE JEFFREY 1 AND 2 FGD SYSTEMS HAVE BEEN SHOWING CORROSION IN THE DOWNSTREAM DUCTWORK PARTICULARLY IN THE REHEAT MIXING ZONE. THE PROBLEM HAS NOT YET BECOME SERIOUS.

4/83 SYSTEM 100.0 0.0 720 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 2 FGD SYSTEM REMAINED DOWN WHILE FINAL INSTALLATION WORK ON JEFFREY 3 WAS COMPLETED.

5/83 SYSTEM 100.0 0.0 744 0

6/83 SYSTEM 100.0 0.0 720 0

7/83 SYSTEM 100.0 0.0 744 0

8/83 SYSTEM 100.0 0.0 744 0

9/83 SYSTEM 100.0 0.0 720 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ALTHOUGH THE FGD SYSTEM WAS AVAILABLE THROUGHOUT THE PERIOD BETWEEN MAY AND SEPTEMBER, THE SYSTEM WAS NOT REQUIRED TO OPERATE.

THE NEXT UNIT OUTAGE IS SCHEDULED FOR NOVEMBER. DURING THIS OUTAGE, THE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

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

UTILITY PLANS TO DO SOME PATCH WORK ON THE ABSORBER OUTLET DUCTING.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

JEFFREY 2 WAS OUT OF SERVICE DURING THE FOURTH QUARTER OF 1983, HOWEVER THE FGD SYSTEM WAS CONSIDERED 100% AVAILABLE.

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

OVERALL FGD SYSTEM AVAILABILITY FOR THE FIRST THREE QUARTERS OF 1984 WAS ESTIMATED AT OVER 85%. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY STATED THAT THE FGD WAS AVAILABLE BUT IS CURRENTLY BEING BYPASSED. THE UNIT IS ABLE TO MEET COMPLIANCE WITHOUT IT. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

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

10/85	SYSTEM						744		
11/85	SYSTEM						720		
12/85	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS AVAILABLE BUT SAW LITTLE OPERATION DURING 1985. THE UTILITY USED COMPLIANCE COAL INSTEAD FOR THE MAJORITY OF THE YEAR.

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

THE UTILITY REPORTED THAT THE FGD SYSTEM DID NOT OPERATE ALL OF 1986 BECAUSE THE BOILER BURNED COMPLIANCE COAL.

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		

KANSAS POWER & LIGHT: JEFFREY 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT 2 FGD SYSTEM IS SCHEDULED TO UNDERGO A MAJOR MODIFICATION IN 1988. THE SYSTEM WILL BE CONFIGURED TO MATCH THE FGD SYSTEM ON UNIT 3. IN ORDER TO DO THIS, 2 OF THE 6 MODULES WILL BE REMOVED FROM SERVICE. THE PLANNED MODIFICATIONS ALSO INCLUDE THE RELINING OF THE ABSORBER MODULES.

THE UTILITY REPORTED THAT JEFFREY UNITS 1,2 AND 3 BURN COMPLIANCE COAL MORE THAN 99 PERCENT OF THE TIME. WHILE BURNING COMPLIANCE COAL, THE FGD SYSTEM IS NOT NEEDED TO MEET SO2 COMPLIANCE AND IS USUALLY SHUTDOWN. HOWEVER, IN ORDER TO HANDLE THE OCCASIONAL SHIPMENT OF HIGH SULFUR COAL, THE FGD SYSTEM ON AT LEAST ONE OF THE 3 UNITS MUST REMAIN FUNCTIONAL.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	JEFFREY	
UNIT NUMBER	3	
CITY	WAMEGO	
STATE	KANSAS	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2720	
GROSS UNIT GENERATING CAPACITY - MW	720	
NET UNIT GENERATING CAPACITY W/FGD - MW	680	
NET UNIT GENERATING CAPACITY WO/FGD - MW	692	
EQUIVALENT SCRUBBED CAPACITY - MW	533	
** 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	1312.35	(2781000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	135.6	(276 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.9	(26.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	18899.	(8125 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****	
AVERAGE ASH CONTENT - %	5.80	
RANGE ASH CONTENT - %	*****	
AVERAGE MOISTURE CONTENT - %	30.00	
RANGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	0.32	
RANGE SULFUR CONTENT - %	*****	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	*****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
SUPPLIER	C.E. WALTHER	
INLET FLUE GAS CAPACITY - CU.M/S	664.0	(1407000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.0	(320 F)
PRESSURE DROP - KPA	0.3	(1. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	98.6	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 3 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00	
ENERGY CONSUMPTION - %	1.7	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/1983	
INITIAL START-UP	5/1983	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** ABSORBER		
NUMBER	4	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	907.	(14400 GPM)
L/G RATIO - L/CU.M	5.3	(39.7 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
INLET GAS FLOW - CU. M/S	171.30	(363000 ACFM)
INLET GAS TEMPERATURE - C	135.6	(276 F)
SO2 REMOVAL EFFICIENCY - %	60.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRECOLLECTOR	
NUMBER PER SYSTEM	6	
NUMBER OF SPARES PER SYSTEM	1	
NUMBER PER MODULE	1	
GENERIC TYPE	BULK SEPARATION	
SPECIFIC TYPE	BAFFLE SLATS	
TRADE NAME/COMMON TYPE	BULK ENTRAINMENT SEPARATOR	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	NR	
** REHEATER		
NUMBER	1	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	25.0	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
OUTLET FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
NUMBER	4	
NUMBER OF SPARES	1	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	135.6	(276 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	SHUT-OFF	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	

KANSAS POWER & LIGHT: JEFFREY 3 (CONT.)

CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
FUNCTION	SHUT-OFF
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
FUNCTION	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	ABSORBER 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	ABSORBER OUTLET TO REHEAT ZONE
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	COAL TAR EPOXY
** DUCTWORK	
LOCATION	REHEAT ZONE TO STACK
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	CHEMICALLY-BONDED MORTAR
** 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
NUMBER	3
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	10.9 (12 TPH)
PRODUCT QUALITY - % SOLIDS	60.0
** TANKS	
SERVICE	NUMBER
-----	-----
SLUDGE STORAGE	****
SLUDGE TRANSFER	****
MIST ELIMINATOR WASH	****
ABSORBER RECYCLE	4
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	6
ABSORBER BLEED	****

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 3 (CONT.)

SLUDGE	****
POND RETURN	****
ADDITIVE FEED	4
ADDITIVE TRANSFER	3
** SOLIDS CONCENTRATING/DEWATERING DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	AIR SPARGERS IN REACTION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	230 ACRES/80 FT
SITE SERVICE LIFE - YRS	30
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
CONSUMPTION	12130LB/HR
POINT OF ADDITION	BALL MILL

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

5/83	SYSTEM							744		
6/83	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE JEFFREY 3 FGD SYSTEM COMMENCED OPERATION IN MAY AND IS CURRENTLY IN TH
STARTUP PHASE OF OPERATION.

THE JEFFREY 3 FGD SYSTEM IS SIMILIAR TO UNITS 1 AND 2 EXCEPT THAT THE
OUTLET FROM THE ABSORBERS FEED INTO A COMMON BYPASS DUCT (FOR CONTINUOUS
REHEAT) WHICH THEN EXITS INTO THE STACK. UNITS 1 AND 2 HAVE MIXING
CHAMBER SECTIONS WHICH IN THE PAST HAVE CAUSED CORROSION PROBLEMS.

7/83	SYSTEM							744		
8/83	SYSTEM							744		
9/83	SYSTEM							720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 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 SINCE START UP, AT LEAST THREE OF THE FOUR AB-SORBER SPRAY TOWERS HAVE OPERATED FULL TIME.

A UNIT OUTAGE FOR UNIT 3 BEGAN ON SEPTEMBER 17 AND WAS SCHEDULED TO LAST TWO WEEKS. HOWEVER, DUE TO SOME UNEXPECTED TURBINE PROBLEMS, THE UNIT OUTAGE MAY NOW LAST THREE WEEKS.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

JEFFREY 3 WAS DOWN DURING PART OF DECEMBER DUE TO PROBLEMS BROUGHT ABOUT BY THE EXTREME COLD WEATHER CONDITIONS.

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

OVERALL FGD SYSTEM AVAILABILITY FOR THE FIRST THREE QUARTERS OF 1984 WAS ESTIMATED AT OVER 85%. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

10/84	SYSTEM	744
11/84	SYSTEM	744
12/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 3 (CONT.)

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

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 THE SPRING OF 1985 WITHOUT ANY MAJOR PROBLEMS OR OUTAGES. HOWEVER, DURING THE REMAINDER OF THE YEAR THE FGD SYSTEM SAW INTERMITTENT USAGE WHILE THE UNIT OPERATED ON LOW SULFUR COMPLIANCE COAL.

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

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986. SCHEDULED MINOR BOILER OUTAGES WERE HELD IN THE SPRING AND FALL.

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			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: JEFFREY 3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. 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 THE YEAR 1987.

THE UTILITY REPORTED THAT JEFFREY UNITS 1,2 AND 3 BURN COMPLIANCE COAL MORE THAN 99 PERCENT OF THE TIME. WHILE BURNING COMPLIANCE COAL, THE FGD SYSTEM IS NOT NEEDED TO MEET SO2 COMPLIANCE AND IS USUALLY SHUTDOWN. HOWEVER, IN ORDER TO HANDLE THE OCCASIONAL SHIPMENT OF HIGH SULFUR COAL, THE FGD SYSTEM ON AT LEAST ONE OF THE 3 UNITS MUST REMAIN FUNCTIONAL.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT	
PLANT NAME	LAWRENCE	
UNIT NUMBER	4	
CITY	LAWRENCE	
STATE	KANSAS	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	129.	(0.300 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	576	
GROSS UNIT GENERATING CAPACITY - MW	119	
NET UNIT GENERATING CAPACITY W/FGD - MW	107	
NET UNIT GENERATING CAPACITY WO/FGD - MW	109	
EQUIVALENT SCRUBBED CAPACITY - MW	119	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	190.18	(403000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.8	(280 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	2.4	(8.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	23260.	(10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****	
AVERAGE ASH CONTENT - %	9.80	
RANGE ASH CONTENT - %	9.8-16	
AVERAGE MOISTURE CONTENT - %	11.80	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.55	
RANGE SULFUR CONTENT - %	0.55-0.90	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	2	
INITIAL START-UP DATE	1/1976	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
TRADE NAME/COMMON NAME	ROD SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	3.0 X 23.0	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	NORYL-CLAD FRP RODS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	226.8	(3600 GPM)
L/G RATIO - LITER/CU.M	2.4	(17.9 GAL/1000ACF)
PRESSURE DROP - KPA	2.2	(9.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	15.2	(50.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	95.1	(201500 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

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	COMBUSTION ENGINEERING	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	RETROFIT	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.90	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	73.00	
ENERGY CONSUMPTION - %	1.7	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/1977	
INITIAL START-UP	1/1977	
CONTRACT AWARDED	12/1968	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
NUMBER	0	
** ABSORBER		
NUMBER	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	334.	(5300 GPM)
L/G RATIO - L/CU.M	4.1	(30.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.6	(2.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	1.8	(6.0 FT/S)
INLET GAS FLOW - CU. M/S	82.35	(174500 ACFM)
INLET GAS TEMPERATURE - C	51.1	(124 F)
SO2 REMOVAL EFFICIENCY - %	73.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
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	0.09	(0.3 FT)
DISTANCE BETWEEN STAGES - CM	30.48	(12.0 IN)
DISTANCE BETWEEN VANES - CM	8.9	(3.50 IN)
VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	1.8	(6.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	POND RECYCLE	
WASH FREQUENCY	ONCE/DAY	
WASH RATE - L/S	12.6	(200 GAL/MIN)

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

** REHEATER	
NUMBER	2
NUMBER PER MODULE	1
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	HOT WATER
TRADE NAME/COMMON TYPE	FIN TUBE
PERCENT GAS BYPASSED - AVG	0.0
TEMPERATURE INCREASE - C	13.9 (25 F)
INLET FLUE GAS FLOW RATE - CU. M/S	171.30 (363000 ACFM)
INLET FLUE GAS TEMPERATURE - C	51.7 (125 F)
OUTLET FLUE GAS TEMPERATURE - C	65.6 (150 F)
NUMBER OF HEAT EXCHANGER BANKS	2
NUMBER OF TUBES PER BUNDLE	66
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
** FANS	
NUMBER	2
DESIGN	CENTRIFUGAL
SUPPLIER	BUFFALO FORGE
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	80.22 (170000 ACFM)
FLUE GAS TEMPERATURE - C	62.8 (145 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
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	
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	
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	SCRUBBER 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	SCRUBBER OUTLET
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	BYPASS
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA'
LINER GENERIC MATERIAL TYPE	NONE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

LINER SPECIFIC MATERIAL TYPE	N/A
** 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	60.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	2
SCRUBBER RECYCLE	2
WASTE SLURRY BLEED	2
REAGENT PREP PRODUCT	1
MILL SUMP/PRODUCT	****
RECLAIMED WATER	****
** PUMPS	
SERVICE	NUMBER
-----	-----
ADDITIVE FEED	6
MIST ELIMINATOR WASH	****
VENTURI RECIRCULATION	2
ABSORBER RECIRCULATION	2
MILL SLURRY	****
ADDITIVE TRANSFER	****
ADDITIVE STORAGE	****
EFFLUENT BLEED	****
THICKENER UNDERFLOW	2
MAKEUP WATER RECIRCULATION	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
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
FEED STREAM SOURCE	COLLECTION TANK
FEED STREAM CHARACTERISTICS	8-10% SOLIDS
OUTLET STREAM CHARACTERISTICS	30-35% SOLIDS
OUTLET STREAM DISPOSITION	TO POND
OVERFLOW STREAM DISPOSITION	RECLAIMED WATER TANK
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	REACTION TANK
PROPRIETARY PROCESS	N/A
INLET QUALITY - %	10.0
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	OVERFLOW FROM INTERIM SLUDGE POND
SITE TREATMENT	NONE
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SO ₂ CONCENTRATION
PHYSICAL VARIABLES	PERCENT SOLIDS, SLURRY FLOW
CONTROL LEVELS	PH 6.5
MONITOR LOCATION	PH PROBES IN REACTION TANKS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	93% CaCO ₃ , 7% MgCO ₃
CONSUMPTION	1.5 TPH
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	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR

0/69 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH THE FGD SYSTEM ON BOILER NO. 4 INCLUDED BUILDUP AND PLUGGING OF THE INLET DUCT WHERE HOT GASES ENTER THE SCRUBBERS, EROSION OF SCRUBBER WALLS, CORROSION OF SCRUBBERS INTERNALS, BUILDUP ON ID FAN ROTORS, AND PLUGGING OF DRAIN LINES, MARBLE BEDS, AND MIST ELIMINATORS. LOW SO₂ REMOVAL WAS CAUSED BY OVERBURNING OF THE LIMESTONE AND DROPOUT OF THE LIM WITH THE ASH IN THE BOTTOM OF THE SCRUBBER.

THE SCRUBBERS WERE MODIFIED IN 1969 BY RAISING THE MIST ELIMINATOR AND ADDING SOOT BLOWERS IN THE INLET DUCT AND REHEATER TO REDUCE PLUGGING. NEW SPRAY NOZZLES WERE ALSO INSTALLED. REHEATER PLUGGING WAS ELIMINATED BY REPLACING COPPER REHEAT COILS WITH A CARBON STEEL UNIT HAVING WIDELY SPACED FINS.

0/70 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

MAJOR MODIFICATIONS IN 1970 WERE SANDBLASTING AND COATING OF THE INTERIOR OF THE SCRUBBERS, REPLACEMENT OF ALL INTERNAL STEEL PIPES WITH PLASTIC AN FIBERGLASS, AND REPLACEMENT OF STAINLESS STEEL MIST ELIMINATORS WITH FIBERGLASS. SINCE MIST ELIMINATOR PLUGGING WAS NOT COMPLETELY STOPPED, THE UNIT WAS WASHED MANUALLY EVERY NIGHT TO MAINTAIN THE REQUIRED MODULE SERVICE.

0/72 SYSTEM

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODIFICATIONS IN THE SUMMER OF 1972 ON THE TWO FGD MODULES INCLUDED ENLARGEMENT OF THE CRYSTALLIZATION TANK, AND INSTALLATION OF NEW PLASTIC SPRAY NOZZLES, NEW SLURRY PUMPS AND STRAINERS, AND NEW MULTIPLE MIXERS IN THE TANK. PROBLEMS THAT REMAINED INCLUDED CORROSION, INEFFICIENT DAMPERS, EXPANSION JOINT FAILURE, MIST ELIMINATOR FOULING, RAPID EROSION OF THE SLURRY PUMP, AND VALVE FAILURE.

0/73 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE FGD SYSTEM SINCE THE FALL OF 1973 HAS BEEN THE MOST SUCCESSFUL TO DATE.

0/74 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

IN 1974 THIS UNIT WAS AVAILABLE FOR OPERATION 343 DAYS. 50% OF THE FUEL CONSUMED WAS COAL, 2% FUEL OIL, AND 48% NATURAL GAS.

0/75 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

DURING 1975 THIS UNIT WAS AVAILABLE FOR OPERATION 333 DAYS. 64% OF THE FUEL CONSUMED WAS COAL, 33% FUEL OIL, AND 33% NATURAL GAS.

THE UTILITY COMPLETED NEGOTIATIONS FOR A LOW-SULFUR COAL SUPPLY FROM SOUTHEAST WYOMING (MEDICINE BOW) IN 1974. THE HIGH-SULFUR KANSAS COAL WAS COMPLETELY PHASED OUT BY LATE SPRING OF 1975. THIS IMPROVED SCRUBBER OPERATIONS BECAUSE OF REDUCED SULFUR REMOVAL REQUIREMENTS AND THE ALKALINE SPECIES IN THE NEW COAL REDUCED THE AMOUNT OF NECESSARY LIMESTONE ADDITION.

6/75 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

STATION LOAD IS REDUCED TO 50% EVERY NIGHT. THEREFORE, ONE OF THE MODULES CAN BE TAKEN OFF-LINE NIGHTLY FOR CLEANING OR REPAIR. WYOMING COAL (0.5% SULFUR) IS NOW BEING BURNED IN THE BOILER FURNACE. SOME NATURAL GAS HAS BEEN BURNED SINCE JUNE 20, 1975.

7/75 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

EACH MODULE HAS BEEN SHUT DOWN ONCE PER WEEK FOR INSPECTION AND CLEAN-UP.

8/75 SYSTEM

744

9/75 SYSTEM

720

10/75 SYSTEM

744

11/75 SYSTEM

720

12/75 SYSTEM

744

1/76 SYSTEM

744

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
** PROBLEMS/SOLUTIONS/COMMENTS							
THE UTILITY IS REPLACING THE Limestone INJECTION FGD SYSTEM WITH A ROD-DECK VENTURI/SPRAY TOWER FGD SYSTEM. THE NEW SYSTEM WILL BE BROUGHT ON LINE IN EARLY JANUARY 1977.							
2/76	SYSTEM						696
3/76	SYSTEM						744
4/76	SYSTEM						720
5/76	SYSTEM						744
6/76	SYSTEM						720
7/76	SYSTEM						744
8/76	SYSTEM						744
9/76	SYSTEM						720
** PROBLEMS/SOLUTIONS/COMMENTS							
A SCHEDULED UNIT OUTAGE BEGAN IN MID-SEPTEMBER FOR A TURBINE OVERHAUL. THE UNIT IS SCHEDULED TO COME BACK ON LINE IN EARLY JANUARY.							
10/76	SYSTEM						744
11/76	SYSTEM						720
12/76	SYSTEM						744
1/77	SYSTEM						744
** PROBLEMS/SOLUTIONS/COMMENTS							
THE NEW LIMESTONE FGD SYSTEM BECAME COMMERCIALY OPERABLE IN EARLY JANUARY 1977. THE UTILITY REPORTED THAT BOTH PARTICULATE AND SO2 REMOVAL IN THE ROD-DECK VENTURI/SPRAY TOWER SCRUBBING UNIT ARE QUITE SATISFACTORY							
2/77	SYSTEM						672
3/77	SYSTEM						744
** PROBLEMS/SOLUTIONS/COMMENTS							
MINOR PROBLEMS HAVE BEEN RELATED TO MAINTAINING DESIRED SOLIDS LEVEL IN THE MAKE-UP TANK. MODIFICATION PLANS INCLUDE CESSATION OF SLURRY DILUTION, WHICH CURRENTLY PRECEDES THE INTRODUCTION OF THE FRESH LIMESTONE SLURRY INTO THE RECIRCULATION LOOP. THE UTILITY PLANS TO PUMP THE 35% SOLIDS SLURRY DIRECTLY FROM THE SLURRY TANK INTO THE RECIRCULATION LOOP.							
CURRENTLY SEVERAL DIFFERENT MAKES OF SLURRY PUMPS ARE BEING USED. ALL ARE FUNCTIONING WELL SO FAR. THE PUMPS HAVE NOT BEEN IN SERVICE LONG ENOUGH FOR COMPARISONS TO BE DRAWN.							
4/77	SYSTEM						720

-----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 REQUIRED FOR SERVICE DURING THE REPORT PERIOD BECAUSE
 NATURAL GAS WAS FIRED IN THE BOILER.

5/77 SYSTEM 744

6/77 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR CRACKS HAVE BEEN A PROBLEM.

A COMPRESSOR BREAKDOWN IN THE RECYCLE TANK AIR AGITATION SYSTEM AND THE
 RECYCLE TANK STRAINER SCREEN WASH HAVE BEEN PROBLEM AREAS. THE WASH
 SYSTEM HAS BEEN TWISTING OFF UNDER WATER PRESSURE.

SOOT BLOWER PROBLEMS WERE ENCOUNTERED.

THE DENVER SLURRY PUMPS ARE EXPERIENCING SOME ON-GOING PROBLEMS, WHILE
 THE ALLEN-SHERMAN-HOFF PUMPS ARE OPERATING SATISFACTORILY.

7/77 SYSTEM 744

8/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER BURNED NATURAL GAS THROUGHOUT AUGUST.

THE MIST ELIMINATOR CRACKS HAVE BEEN REPAIRED.

THE RECYCLE TANK STRAINER PROBLEMS PERSISTED AND THE AIR AGITATION SYSTEM
 COMPRESSOR WAS MALFUNCTIONING RESULTING IN SOLIDS SETTLING IN THE RECYCLE
 TANK.

THE DENVER SLURRY PUMPS ARE FUNCTIONING ADEQUATELY AT PRESENT. THE PUMP
 GLAND PACKINGS ARE BEING REDESIGNED.

9/77 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE NO. 4 BOILER HAS BEEN FIRING 100% NATURAL GAS FOR ALL BUT 8 TO 10
 DAYS SINCE THE BEGINNING OF APRIL 1977. AS OF SEPTEMBER 15 THE UNIT
 BEGAN BURNING COAL AGAIN.

10/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM LOAD WAS CUT BACK TO 50% IN OCTOBER BECAUSE A NEW COOLING
 TOWER IS BEING CONSTRUCTED.

11/77 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

ON NOVEMBER 15 A MAJOR FGD SYSTEM OVERHAUL TOOK PLACE WHILE THE TURBINE
 WAS DOWN FOR INSPECTION AND THE NEW COOLING TOWER WAS BEING CONNECTED.

12/77 SYSTEM 744

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT CAME BACK ON LINE DECEMBER 20 AT FULL CAPACITY. THE TURBINES WERE BALANCED DURING DECEMBER.

1/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM OPERATED WITHOUT ANY PROBLEMS OTHER THAN SOME FREEZING OF THE PIPELINES.

THICKENER DISCHARGE LINE FREEZING CAUSED CLARIFIER PLUGGING.

2/78 SYSTEM

672

** PROBLEMS/SOLUTIONS/COMMENTS

THE THICKENER UNDERFLOW LINE IS STILL FROZEN AND TWO 3 INCH DIAMETER FIRE HOSES ARE BEING USED TO PUMP THE UNDERFLOW SOLIDS TO THE POND.

3/78 SYSTEM

744

4/78	A	100.0	100.0	100.0			
	B	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	720	720	720

5/78	A	100.0	100.0	100.0			
	B	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	744	744	744

6/78	A	100.0	100.0	100.0			
	B	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	720	720	720

7/78	A	100.0	100.0	100.0			
	B	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM BOTH OPERATED THROUGHOUT JUNE AND JULY WITHOUT ANY FORCED OUTAGES.

8/78	A	100.0	100.0	100.0			
	B	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	744	744	744

9/78	A	100.0	100.0	63.0			
	B	100.0	100.0	63.0			
	SYSTEM	100.0	100.0	63.0	720	456	456

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM RAN WITH NO FORCED OUTAGES DURING AUGUST AND SEPTEMBER.

THE UNIT WAS DOWN THE LAST WEEK AND A HALF IN SEPTEMBER FOR A SCHEDULED FALL TURBINE/BOILER OUTAGE. ROUTINE MAINTENANCE INCLUDED BOILER AND TURBINE CLEANING AND REPAIR.

10/78 SYSTEM

744 576

11/78 SYSTEM

720 720

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

12/78 SYSTEM

744 744

** PROBLEMS/SOLUTIONS/COMMENTS

AN EPA SPONSORED CONTINUOUS MONITORING TEST BEGAN AT THIS UNIT AT THE BEGINNING OF DECEMBER AND WILL CONTINUE THROUGH THE END OF JANUARY. THE TEST INVOLVES 24 HOUR MONITORING OF SO2, OPACITY AND NOX.

1/79 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

AN ID FAN WAS FORCED OUT OF SERVICE ON JANUARY 5 FORCING THE UNIT TO OPERATE AT 50% CAPACITY. THE FAN IS EXPECTED TO BE REPLACED BY JANUARY 12.

2/79	A	96.0	96.0	96.0
	B	71.0	71.0	71.0
	SYSTEM	84.0	84.0	84.0

672 672 564

** PROBLEMS/SOLUTIONS/COMMENTS

ONE MODULE WAS FORCED OUT OF SERVICE FOR TWO DAYS WHEN ITS TANK AGITATOR FAILED.

ONE MODULE WAS FORCED OUT OF SERVICE FOR AN EIGHT DAY PERIOD DUE TO A FAN MOTOR MALFUNCTION

3/79 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 4 EXPERIENCED A MOTOR FAILURE ON AN ID FAN DURING THE FEBRUARY-MARCH PERIOD.

4/79 SYSTEM

720

5/79 SYSTEM

744

6/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM RAN WELL. THE ONLY FGD SYSTEM RELATE OUTAGES WERE DUE TO A MIXER FAILURE AND GENERAL MAINTENANCE.

7/79 SYSTEM

744

8/79 SYSTEM

744

9/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE THIRD QUARTER AN OUTAGE WAS CAUSED BY MIXER MOTOR AND OTHER MIXER RELATED PROBLEMS. DURING THE OUTAGE MAINTENANCE WAS DONE ON THE BOILER AND SCRUBBERS AND REPAIR WORK WAS DONE ON THE MIXERS.

10/79 SYSTEM

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 4 (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 OPERATED AT HALF LOAD DURING THE LAST WEEK OF SEPTEMBER AND
 WAS SHUT DOWN COMPLETELY IN EARLY OCTOBER FOR THE ANNUAL FALL OUTAGE.

11/79 SYSTEM 720

12/79 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR APPROXIMATELY 10 DAYS OF SCHEDULED OUTAGE FOR FALL
 MAINTENANCE.

SOME AGITATOR SHAFT FAILURES OCCURRED IN THE REACTION TANK CAUSING
 MAINTENANCE ATTENTION.

1/80 SYSTEM 100.0 100.0 100.0 744 744 744

2/80 SYSTEM 100.0 100.0 100.0 696 696 696

3/80 SYSTEM 100.0 100.0 100.0 744 744 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WERE REPORTED FOR THE LAWRENCE 4 SCRUBBER DURING
 THE FIRST QUARTER 1980.

4/80 SYSTEM 100.0 100.0 100.0 80.0 720 576 576

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE FOR SIX DAYS IN APRIL FOR A SCHEDULED INSPECTION.
 DURING THE BOILER OUTAGE GENERAL MAINTENANCE WAS PERFORMED ON THE FGD
 SYSTEM.

5/80 SYSTEM 100.0 100.0 100.0 100.0 744 744 744

6/80 SYSTEM 100.0 100.0 100.0 100.0 720 720 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED 100% OF THE TIME IN
 MAY AND JUNE.

7/80 SYSTEM 96.8 96.8 96.8 96.8 744 744 720 54.8

** PROBLEMS/SOLUTIONS/COMMENTS

A STORAGE TANK ERODED COMPLETELY THROUGH CAUSING A TWO DAY OUTAGE IN
 JULY.

8/80 SYSTEM 100.0 100.0 100.0 100.0 744 744 744 50.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM OR THE BOILER DURING
 AUGUST.

9/80 SYSTEM 96.9 100.0 100.0 40.3 720 290 290 16.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 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 BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 17 DAYS FOR A BOILER INSPECTION.

ECONOMIZER WELD REPAIRS CAUSED THE SYSTEM TO REMAIN OUT OF SERVICE FOR 22 HOURS.

10/80	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/80	SYSTEM	100.0	100.0	100.0	89.7	720	646	646

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER THE BOILER WAS OUT OF SERVICE APPROXIMATELY 74 HOURS DUE TO TUBE LEAKS. THE FGD SYSTEM WAS AVAILABLE 100% DURING THIS TIME.

12/80	SYSTEM	100.0	100.0	100.0	98.1	744	730	730

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER 14 HOURS OF OUTAGE TIME WAS DUE TO TRANSFORMER PROBLEMS. THE FGD SYSTEM WAS AVAILABLE THE ENTIRE MONTH.

1/81	SYSTEM					744		

2/81	SYSTEM					672		

3/81	SYSTEM					744		

** PROBLEMS/SOLUTIONS/COMMENTS

LAWRENCE 4 WAS ON COLD STANDBY MUCH OF THE JANUARY-MARCH PERIOD AND THEREFORE DID NOT SEE MUCH OPERATION. UTILITY REPORTED THERE WERE NO FGD SYSTEM RELATED OUTAGES DURING THE QUARTER.

4/81	SYSTEM					720		

5/81	SYSTEM					744		

6/81	SYSTEM					720		

7/81	SYSTEM					744		

8/81	SYSTEM					744		

9/81	SYSTEM					720		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF SEPTEMBER, LAWRENCE 4 WAS ON COLD STANDBY FROM THE THIRD TO THE TWENTY FIRST. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THIS UNIT DURING THE SECOND AND THIRD QUARTERS OF 1981.

10/81	SYSTEM					744		

11/81	SYSTEM					720		

12/81	SYSTEM					744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 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 UTILITY REPORTED THAT BOILER OPERATIONS WERE NOT CURTAILED OR REDUCED AS A RESULT OF THE FGD SYSTEM DURING THE ENTIRE FOURTH QUARTER 1981.

1/82	SYSTEM	744
2/82	SYSTEM	672
3/82	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982. SOMETIME DURING THE FIRST AND/OR SECOND QUARTER 1982, THE UNIT WILL BE SHUTDOWN FOR A SCHEDULED 2 WEEK SPRING OUTAGE.

4/82	SYSTEM	720
5/82	SYSTEM	744
6/82	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

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

** PROBLEMS/SOLUTIONS/COMMENTS

OVER THE PAST YEAR THE LAWRENCE 4 AND 5 FGD SYSTEMS HAVE OPERATED WITH NO MAJOR PROBLEMS. THERE HAVE BEEN SOME CHRONIC MINOR PROBLEMS WITH SPRAY HEADER PLUGGING. THERE MAY BE SOME MODIFICATIONS PERFORMED AT SOME POINT IN THE FUTURE TO MINIMIZE THE PROBLEM.

THE DOWNSTREAM DUCTWORK IN BOTH THE LAWRENCE 4 AND 5 FGD SYSTEMS HAS BEEN EXPERIENCING CORROSION THAT WILL REQUIRE SOME DEGREE OF REPLACEMENT. THE CORROSION IS NOT RELATED TO CHLORIDES. A TIME TABLE FOR THE REPAIR WORK WAS NOT REPORTED BY THE UTILITY.

4/83	SYSTEM	720
5/83	SYSTEM	744
6/83	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/83	SYSTEM							744			
8/83	SYSTEM							744			
9/83	SYSTEM							720			
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED FORCED OUTAGES WERE ENCOUNTERED DURING THE PERIOD OF APRIL THROUGH SEPTEMBER.											
THE NEXT UNIT OUTAGE IS SCHEDULED TO BEGIN ON OCTOBER 23 AND LAST FROM TWO TO THREE WEEKS. DURING THE OUTAGE, THE UTILITY PLANS TO DO SOME TEMPORARY PATCH WORK ON THE ABSORBER OUTLET DUCTING. THE UTILITY STATED THAT THIS DUCTWORK WILL EVENTUALLY NEED SOME MAJOR REPLACEMENT WORK (PLANNED FOR SOMETIME IN 1984).											
10/83	SYSTEM							744			
11/83	SYSTEM							720			
12/83	SYSTEM							744			
** PROBLEMS/SOLUTIONS/COMMENTS											
LAWRENCE 4 WAS ON LINE LESS THAN 600 HOURS DURING THE FOURTH QUARTER OF 1983 DUE TO LOW POWER DEMAND.											
1/84	SYSTEM							744			
2/84	SYSTEM							696			
3/84	SYSTEM							744			
** PROBLEMS/SOLUTIONS/COMMENTS											
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE FIRST QUARTER OF 1984.											
4/84	SYSTEM							720			
5/84	SYSTEM							744			
6/84	SYSTEM							720			
** PROBLEMS/SOLUTIONS/COMMENTS											
A MAJOR OUTAGE OCCURRED DURING MAY AND JUNE TO REPLACE CORRODING OUTLET DUCTWORK IN THE REHEAT SECTION. CARBON STEEL DUCTS WERE REPLACED WITH FIBERGLASS.											
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%.											
10/84	SYSTEM							744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

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

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			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE YEAR 1985 THE BOILER AND FGD SYSTEM SAW LIMITED USAGE, OPERATING FOR ONLY APPROXIMATELY 1500 HOURS. DURING THIS TIME, NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED. IN 1986 THE UNIT IS EXPECTED TO OPERATE FOR APPROXIMATELY 6000 HOURS.

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 1987

KANSAS POWER & LIGHT: LAWRENCE 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986.
SCHEDULED MINOR BOILER OUTAGES WERE HELD IN THE SPRING AND FALL.

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

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KANSAS POWER & LIGHT
PLANT NAME	LAWRENCE
UNIT NUMBER	5
CITY	LAWRENCE
STATE	KANSAS
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	215. (0.500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	576
GROSS UNIT GENERATING CAPACITY - MW	355
NET UNIT GENERATING CAPACITY W/FGD - MW	330
NET UNIT GENERATING CAPACITY WO/FGD - MW	340
EQUIVALENT SCRUBBED CAPACITY - MW	355
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	CYCLING
DESIGN BOILER FLUE GAS FLOW - CU.M/S	599.78 (1271000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9 (300 F)
STACK HEIGHT - M	107. (350 FT)
STACK SHELL	CARBON STEEL
STACK TOP DIAMETER - M	4.9 (16.0 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	23260. (10000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	9.80
RANGE ASH CONTENT - %	9.8-16.0
AVERAGE MOISTURE CONTENT - %	11.80
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	0.55
RANGE SULFUR CONTENT - %	0.55-0.90
AVERAGE CHLORIDE CONTENT - %	0.03
RANGE CHLORIDE CONTENT - %	*****
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	0
TYPE	NONE
** PARTICLE SCRUBBER	
NUMBER	2
NUMBER OF SPARES	0
INITIAL START-UP DATE	4/1978
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS
TRADE NAME/COMMON NAME	ROD SCRUBBER
SUPPLIER	COMBUSTION ENGINEERING
DIMENSIONS - FT	5.0 X 37.0
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
LINER GENERIC MATERIAL	NONE
LINER SPECIFIC MATERIAL	N/A
GAS CONTACTING DEVICE TYPE	TYPE 316L STAINLESS STEEL RODS
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	655.2 (10400 GPM)
L/G RATIO - LITER/CU.M	2.2 (16.4 GAL/1000ACF)
PH CONTROL ADDITIVE	LIMESTONE SLURRY
PRESSURE DROP - KPA	2.2 (9.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	15.2 (50.0 FT/S)

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

INLET GAS FLOW RATE - CU.M/S	299.7	(635000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 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	COMBUSTION ENGINEERING
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	98.90
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	52.00
ENERGY CONSUMPTION - %	2.8
CURRENT STATUS	1
COMMERCIAL START-UP	4/1978
INITIAL START-UP	4/1978
CONTRACT AWARDED	9/1969

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %

** QUENCHER/PRESATURATOR

NUMBER

0

** ABSORBER

NUMBER

2

NUMBER OF SPARES

0

GENERIC TYPE

SPRAY TOWER

SPECIFIC TYPE

OPEN COUNTERCURRENT SPRAY

TRADE NAME/COMMON TYPE

N/A

SUPPLIER

COMBUSTION ENGINEERING

SHELL GENERIC MATERIAL

STAINLESS STEEL

SHELL SPECIFIC MATERIAL

AUSTENITIC

SHELL MATERIAL TRADE NAME/COMMON TYPE

TYPE 316L

LINER GENERIC MATERIAL

NONE

LINER SPECIFIC MATERIAL

N/A

LINER MATERIAL TRADE NAME/COMMON TYPE

N/A

GAS CONTACTING DEVICE TYPE

N/A

NUMBER OF CONTACTING ZONES

1

LIQUID RECIRCULATION RATE - LITER/S

655. (10400 GPM)

L/G RATIO - L/CU.M

2.6 (19.1 GAL/1000 ACF)

GAS-SIDE PRESSURE DROP - KPA

0.2 (0.8 IN-H2O)

SUPERFICIAL GAS VELOCITY - M/SEC

1.8 (6.0 FT/S)

INLET GAS FLOW - CU. M/S

256.71 (544000 ACFM)

INLET GAS TEMPERATURE - C

52.2 (126 F)

SO2 REMOVAL EFFICIENCY - %

70.0

** 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

CONFIGURATION

HORIZONTAL

NUMBER OF STAGES

2

NUMBER OF PASSES PER STAGE

2

FREEBOARD DISTANCE - M

0.09 (0.3 FT)

DISTANCE BETWEEN STAGES - CM

30.48 (12.0 IN)

DISTANCE BETWEEN VANES - CM

8.9 (3.50 IN)

VANE ANGLES - DEGREES

90

PRESSURE DROP - KPA

0.2 (1.0 IN-H2O)

SUPERFICIAL GAS VELOCITY - M/S

1.8 (6.0 FT/S)

CONSTRUCTION MATERIAL GENERIC TYPE

ORGANIC

CONSTRUCTION MATERIAL SPECIFIC TYPE

FIBER-REINFORCED POLYESTER

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

WASH WATER SOURCE	POND RECYCLE
WASH FREQUENCY	ONCE/DAY
WASH RATE - L/S	12.6 (200 GAL/MIN)
** REHEATER	
NUMBER	2
NUMBER PER MODULE	1
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	HOT WATER
TRADE NAME/COMMON TYPE	FIN TUBE
TEMPERATURE INCREASE - C	13.9 (25 F)
INLET FLUE GAS FLOW RATE - CU. M/S	551.18 (1168000 ACFM)
INLET FLUE GAS TEMPERATURE - C	51.7 (125 F)
OUTLET FLUE GAS TEMPERATURE - C	65.6 (150 F)
NUMBER OF BUNDLES PER BANK	2
NUMBER OF TUBES PER BUNDLE	66
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
** FANS	
NUMBER	2
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	283.14 (600000 ACFM)
FLUE GAS TEMPERATURE - C	65.6 (150 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
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	
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	
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	SCRUBBER 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	SCRUBBER OUTLET
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	BYPASS
SHELL GENERIC MATERIAL TYPE	CARBON STEEL

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	HIGH STRENGTH LOW ALLOY 'HSLA'
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	21.8 (24 TPH)
PRODUCT QUALITY - % SOLIDS	60.0
** TANKS	
SERVICE	NUMBER
-----	-----
VENTURI & ABSORBER RECYCLE	1
ADDITIVE STORAGE	1
ADDITIVE DILUTION	****
MILL SUMP	****
MILL PRODUCT	****
RECLAIMED WATER	****
** PUMPS	
SERVICE	NUMBER
-----	-----
REACTION/RECYCLE TANK BLEED	****
VENTURI RECIRCULATION	2
MIST ELIMINATOR WASH	****
MILL SLURRY	2
ADDITIVE DILUTION	2
ABSORBER RECIRCULATION	2
ADDITIVE TRANSFER	****
ADDITIVE STORAGE	****
ADDITIVE FEED	6
RECLAIMED WATER	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	REACTION TANK
PROPRIETARY PROCESS	N/A
INLET QUALITY - %	10.0
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	OVERFLOW FROM INTERIM SLUDGE POND
SITE TREATMENT	NONE

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, SO2 CONCENTRATION
PHYSICAL VARIABLES	PERCENT SOLIDS, SLURRY FLOW, PRESSURE CHANGE ACR
CONTROL LEVELS	PH 6.5
MONITOR LOCATION	PH PROBES IN REACTION TANKS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	93% CaCO ₃ , 7% MgCO ₃
SOURCE/SUPPLIER	LAWRENCE, KANSAS
CONSUMPTION	4 TPH
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 SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR

0/74 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

THE LAWRENCE 5 BOILER WAS ORIGINALLY EQUIPPED WITH A LIMESTONE INJECTION FGD SYSTEM MODELED AFTER THE FGD SYSTEM RETROFITTED ONTO THE LAWRENCE 4 BOILER. CONSTRUCTION OF THE LAWRENCE 5 BOILER AND SCRUBBING SYSTEM BEGAN IN MARCH 1968 AND PROCEEDED SIMULTANEOUSLY WITH THE RETROFIT WORK ON LAWRENCE 4. INITIAL OPERATION OF THE LAWRENCE 5 BOILER AND SCRUBBING SYSTEM OCCURRED IN MARCH 1977. COMMERCIAL OPERATIONS WERE ACHIEVED IN NOVEMBER 1971 WITH THE COMPLETION OF THE SHAKEDOWN PHASE OF OPERATIONS.

THE LIMESTONE INJECTION FGD SYSTEM INCLUDED FACILITIES FOR PULVERIZING LIMESTONE AND THEN INJECTING IT INTO THE BOILER FURNACE CHAMBER FOR CALCINATION. THE FLUE GAS TRANSPORTS THE CALCINED LIMESTONE AND FLYASH TO THE SCRUBBER MODULES, EACH CONSISTING OF A SINGLE MARBLE BED EQUIPPED WITH OVERFLOW POTS FOR DRAINAGE OF RECIRCULATING SLURRY, FOR PARTICLE AND SULFUR DIOXIDE REMOVAL. THE CLEANED GASES THEN PASSED THROUGH A SET OF MIST ELIMINATORS, REHEATERS, AND INDUCED DRAFT FANS BEFORE BEING DISCHARGED THROUGH THE STACKS TO THE ATMOSPHERE.

ALTHOUGH THE CONFIGURATION OF THIS ORIGINAL SYSTEM WAS FAIRLY SIMPLE, MANY OPERATING PROBLEMS AND DESIGN INADEQUACIES WERE ENCOUNTERED. IN THE INJECTION PROCESS IT WAS DIFFICULT TO ACHIEVE SATISFACTORY CONTROL OF THE LIMESTONE CALCINATION AS WELL AS THE AMOUNT OF LIME/LIMESTONE CARRIED BY THE FLUE GAS INTO THE TAIL-END SCRUBBERS. THIS PROBLEM WAS FURTHER COMPLICATED WHEN THE BOILER WAS FIRED WITH A VARIABLE COMBINATION OF COAL, NATURAL GAS AND OIL.

THE FGD SYSTEM WAS MODIFIED A NUMBER OF TIMES THROUGHOUT ITS LIFE AND WAS LATER ABANDONED FOR A NEW SECOND-GENERATION SCRUBBER DESIGN DEVELOPED BY THE SYSTEM SUPPLIER. THE LIMESTONE INJECTION SYSTEM OPERATED UNTIL MARCH 20, 1978 WHEN IT WAS SHUTDOWN TO TIE THE NEW ROD DECK-VENTURI/SPRAY TOWER SCRUBBING SYSTEM INTO THE FLUE GAS PATH.

8/74 SYSTEM

744

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

ONE MODULE WAS ISOLATED TO PERFORM FLOW DISTRIBUTION TESTS THROUGH THE MARBLE BED IN AUGUST.

THE MIST ELIMINATOR WASH SYSTEM IS NOT EFFECTIVE. THE MIST ELIMINATORS HAVE HAD TO BE CLEANED MANUALLY.

THE BOILER IS CURRENTLY BEING FIRED WITH GAS AND OIL.

9/74	SYSTEM						720
10/74	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED ON GAS AND OIL UNTIL OCTOBER 12 WHEN COAL WAS BURNED AGAIN.

POOR GAS DISTRIBUTION THROUGH THE MARBLE BEDS AND AMONG THE EIGHT MODULES IS STILL A PROBLEM AREA. THE SYSTEM SUPPLIER HAS COMPLETED THE GAS DISTRIBUTION TEST AND IS CURRENTLY MODIFYING THE GAS FLOW PATTERN THROUGH THE MODULES.

11/74	SYSTEM						720

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE NEARLY 100% OF NOVEMBER. GAS DISTRIBUTION PROBLEMS ARE CONTINUING.

12/74	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE OCTOBER 12 THE UNIT HAS OPERATED ON A BLEND OF KANSAS AND WYOMING COAL. THE FGD SYSTEM HAS BEEN AVAILABLE APPROXIMATELY 97% OF THE OCTOBER-DECEMBER PERIOD. SO2 REMOVAL EFFICIENCY HAS BEEN APPROXIMATELY 75%.

MODIFICATIONS TO IMPROVE GAS DISTRIBUTION WITHIN AND AMONG THE MODULES HAVE NOT COMPLETELY SOLVED THE PROBLEM.

PUMP RUBBER LINING FAILURES OCCURRED DURING DECEMBER. SCRAPS OF RUBBER WERE DISCOVERED AT THE DISCHARGE PIPE OF THE SLURRY RECYCLE PUMPS.

1/75	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BURNED A MIXTURE OF 70% WYOMING AND 30% KANSAS COAL DURING JANUARY.

2/75	SYSTEM						672

3/75	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BURNED WYOMING COAL HAVING 0.5% SULFUR DURING MARCH.

4/75	SYSTEM						720

5/75	SYSTEM						744

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
6/75	SYSTEM						720
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE FGD SYSTEM SHUTDOWN FOR MOST OF JUNE FOR A MAJOR REBUILD OF THE SPRAY SYSTEMS IN ALL EIGHT MODULES. THE BOILER WAS FIRED WITH OIL AND THE FGD SYSTEM WAS BYPASSED.						
7/75	SYSTEM				0.0		744 744 0
8/75	SYSTEM				0.0		744 744 0
	** PROBLEMS/SOLUTIONS/COMMENTS						
	OIL AND GAS WERE FIRED IN JULY AND AUGUST, RESULTING IN NO FGD OPERATION.						
9/75	SYSTEM						720
10/75	SYSTEM						744
	** PROBLEMS/SOLUTIONS/COMMENTS						
	DURING THE SEPTEMBER-OCTOBER PERIOD THE BOILER WAS SHUT DOWN FOR A SHORT TIME TO PERFORM A BOILER INSPECTION AND TO MAKE SOME TURBINE REPAIRS. DURING PART OF THE PERIOD GAS AND OIL WERE BURNED IN THE BOILER FURNACE.						
	SLURRY RECYCLE TANK SCREENS WERE REPLACED DURING THE SEPTEMBER-OCTOBER PERIOD.						
11/75	SYSTEM						720
	** PROBLEMS/SOLUTIONS/COMMENTS						
	PROJECTIONS BY THE UTILITY FOR THIS UNIT CALL FOR 330 DAYS OF OPERATION ON 1976 WITH FUEL CONSUMPTION BEING 60% COAL, 25% FUEL OIL, AND 15% NATURAL GAS.						
	LIKE UNIT 4 THIS UNIT MAY BE CONVERTED TO A ROD-DECK VENTURI AND SPRAY TOWER SCRUBBING SYSTEM.						
12/75	SYSTEM						744
1/76	SYSTEM						744
2/76	SYSTEM						696
	** PROBLEMS/SOLUTIONS/COMMENTS						
	THE UTILITY HAS DECIDED TO INSTALL A NEW ROD DECK-VENTURI/SPRAY TOWER FGD SYSTEM AT LAWRENCE 5.						
3/76	SYSTEM						744
4/76	SYSTEM						720
5/76	SYSTEM						744
6/76	SYSTEM						720
7/76	SYSTEM						744
8/76	SYSTEM						744
9/76	SYSTEM						720

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

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

10/76 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE INSTALLATION OF THE NEW ROD AND SPRAY TOWER SCRUBBING SYSTEM IS NOW IN PROGRESS. THE SYSTEM WILL CONSIST OF TWO SCRUBBING TRAINS EACH HANDLING 50% OF THE FLUE GAS CAPACITY. FOUNDATION AND STRUCTURAL STEEL ERECTION HAS BEEN COMPLETED, AND SOME OF THE BREECHING HAS BEEN INSTALLED. THE UNIT WILL OPERATE IN A FULLY AUTOMATIC MODE.

THE BOILER HAS BEEN OPERATING NO. 2 FUEL OIL IN ADDITION TO LOW SULFUR WYOMING COAL WHILE THE NEW SCRUBBING FACILITIES ARE BEING INSTALLED. THE ORIGINAL LIMESTONE INJECTION AND TAIL-END SCRUBBING SYSTEM IS STILL AVAILABLE FOR SERVICE AND IS OPERATED WHEN THE UNIT FIRES COAL. THE SYSTEM TREATS FLUE GAS RESULTING FROM THE BURNING OF LOW SULFUR (0.5%) WYOMING COAL.

THE UTILITY REPORTED THAT C-E HAS ENCOUNTERED SOME PROBLEMS WORKING OUT AND FINE TUNING SOME OF THE INSTRUMENTATION LOGIC CIRCUITS.

11/76 SYSTEM

720

12/76 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

KP&L REPORTED THAT CONSTRUCTION OF THE NEW SCRUBBING SYSTEM IS STILL IN PROGRESS. THE ERECTION OF THE STRUCTURAL STEEL AND BREECHING IS CONTINUING. THE MODULES ARE NOW BEING ERECTED AT THE PLANT SITE, PARALLEL TO THE EXISTING MARBLE-BED SYSTEM.

1/77 SYSTEM

744

2/77 SYSTEM

672

3/77 SYSTEM

744

4/77 SYSTEM

720

5/77 SYSTEM

744

6/77 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE EXISTING MARBLE BED SCRUBBERS HAS BEEN QUITE SATISFACTOR AND NEARLY PROBLEM FREE. THE CONNECTING DUCTWORK IS CURRENTLY BEING INSTALLED AS CONSTRUCTION CONTINUES ON THE NEW FGD SYSTEM. THE TWO PARALLEL SCRUBBING MODULES EACH DESIGNED TO HANDLE 200 MW OF GENERATING CAPACITY ARE INSTALLED, AS ARE THE REHEATER TUBE BUNDLES. THE EXISTING MARBLE BED SCRUBBERS WILL BE REMOVED WHEN THE NEW SCRUBBING SYSTEM IS READY FOR SCRUBBING OPERATION.

7/77 SYSTEM

744

8/77 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

SOME OF THE NEW DUCTWORK IS IN PLACE. THE NEW SCRUBBER MODULES ARE IN PLACE AS ARE THE REHEATER TUBES. THE NO. 1 AND 8 MARBLE BED MODULES WILL SOON BE REMOVED BECAUSE THE SPACE IS NEEDED FOR FURTHER CONSTRUCTION

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

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

OPERATIONS OF THE EXISTING FGD SYSTEM THROUGHOUT AUGUST HAVE BEEN GOOD.

9/77 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE CONSTRUCTION ON THE NEW SCRUBBER PLANT IS CONTINUING ACCORDING TO SCHEDULE AND IS EXPECTED TO BE COMPLETE BY APRIL 1978.

10/77 SYSTEM 744

11/77 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM OPERATED ACCEPTABLY THROUGHOUT OCTOBER AND NOVEMBER.

12/77 SYSTEM 744

1/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE CONSTRUCTION OF THE ROD-DECK SCRUBBERS IS NOW COMPLETE. THE INLET DUCTWORK IS BEING INSTALLED, AND THE OUTLET DUCTWORK WILL BE INSTALLED ALONG WITH ADDITIONAL CONTROLS DURING THE SCHEDULED OUTAGE IN APRIL 1978.

THE EXISTING FGD SYSTEM OPERATED WITHOUT SERIOUS PROBLEMS THROUGHOUT DECEMBER AND JANUARY. ONLY SIX MODULES ARE LEFT ON THE EXISTING SYSTEM. TWO WERE REMOVED TO MAKE ROOM FOR THE NEW SYSTEM.

2/78 SYSTEM 672

3/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE ORIGINAL FGD SYSTEM WAS PULLED OFF LINE ON MARCH 20 SO THAT THE NEW SCRUBBER-ABSORBER SYSTEM COULD BE TIED INTO THE GAS PATH. THIS NEW SYSTEM CONSISTS OF TWO MODULES EACH WITH A ROD SECTION FOR PARTICULATE REMOVAL AND A SPRAY TOWER FOR SO2 REMOVAL. THE CAPACITY IS 210 MW EACH MODULE. INITIAL OPERATION SHOULD BEGIN BY THE FIRST OF MAY.

4/78 SYSTEM 720

5/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE NEW UNIT WENT IN SERVICE ON APRIL 14 AND HAS OPERATED WITH NO OUTAGES SINCE START-UP.

6/78 SYSTEM 100.0 100.0 100.0 720

7/78 SYSTEM 100.0 100.0 100.0 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OPERATED ALL BUT TWO DAYS OF THE JUNE-JULY PERIOD, WHEN A BOILER DRAIN LINE LEAK CAUSED AN OUTAGE.

THE FGD SYSTEM OPERATED THE ENTIRE TIME THE BOILER WAS ON-LINE, WITH NO REPORTED PROBLEMS.

8/78 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE SYSTEM OPERATED WITH NO FORCED OUTAGES DURING THE AUGUST-SEPTEMBER PERIOD. THE UNIT WAS TAKEN OUT OF SERVICE AT THE END OF SEPTEMBER FOR A SCHEDULED TURBINE/BOILER INSPECTION. ROUTINE MAINTENANCE IS BEING PERFORMED ON THE BOILER AND TURBINE.									
10/78	SYSTEM						744		
11/78	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE FGD SYSTEM OPERATED THROUGHOUT OCTOBER AND NOVEMBER WITH ONLY ONE OUTAGE IN OCTOBER FOR AN ANNUAL ONE-WEEK BOILER/TURBINE INSPECTION.									
12/78	SYSTEM				95.5		744	642	
1/79	SYSTEM						744		
2/79	SYSTEM						672		
** PROBLEMS/SOLUTIONS/COMMENTS									
A 30 HOUR OUTAGE WAS REQUIRED IN FEBRUARY TO REPAIR A RUPTURED PIPE IN TH FGD SYSTEM.									
3/79	SYSTEM						744		
4/79	SYSTEM						720		
5/79	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS BROUGHT DOWN TO 50% CAPACITY FOR A SCHEDULED THREE WEEK OUTAGE IN MAY TO REBUILD AN AIR PREHEATER FAN MOTOR.									
6/79	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT THE SYSTEM OPERATED WELL THROUGH JUNE. THE ONLY FGD SYSTEM RELATED OUTAGES WERE DUE TO RECYCLE TANK AGITATOR FAILURE AND GENERAL MAINTENANCE.									
7/79	SYSTEM						744		
8/79	SYSTEM						744		
9/79	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT OPERATED NORMALLY THROUGHOUT THE THIRD QUARTER OF 1979. THE UNIT WILL BE SHUT DOWN FOR AN ANNUAL FALL OUTAGE ON OCTOBER 15. DURING THE OUTAGE SOME BOILER WORK WILL BE DONE. THE SCRUBBER WILL BE CLEANED AN MAINTENANCE WORK WILL BE PERFORMED ON THE RECYCLE TANK AGITATORS. THE OUTAGE IS TO LAST TWO WEEKS.									
10/79	SYSTEM						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720		
12/79	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS DOWN FOR APPROXIMATELY 10 DAYS OF SCHEDULED OUTAGE FOR FALL MAINTENANCE DURING THE SECOND QUARTER OF 1979.										
SOME AGITATOR SHAFT FAILURES OCCURRED IN THE REACTION TANK CAUSING MAINTENANCE ATTENTION DURING THE PERIOD.										
1/80	SYSTEM	100.0	100.0		100.0			744	744	744
2/80	SYSTEM		100.0		51.7			696	360	360
3/80	SYSTEM		100.0		54.8			744	408	408
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM OPERATED WITHOUT ANY MAJOR PROBLEMS DURING THE FIRST QUARTER OF 1980. THE BOILER WAS DOWN FROM MID-FEBRUARY TO MID-MARCH FOR TURBINE REPAIRS, DURING WHICH TIME GENERAL SCRUBBER MAINTENANCE WAS PERFORMED.										
4/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720
5/80	SYSTEM	100.0	100.0	100.0	80.6			744	600	600
6/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER WAS DOWN FOR SIX DAYS DURING MAY FOR A SCHEDULED INSPECTION. DURING THIS TIME GENERAL MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM. OTHER THAN THIS TIME, THE FGD SYSTEM OPERATED 100% OF THE TIME DURING THE APRIL-JUNE PERIOD.										
7/80	SYSTEM	100.0	100.0	100.0	96.1			744	715	715 54.0
** PROBLEMS/SOLUTIONS/COMMENTS										
A 29 HOUR OUTAGE OCCURRED AS A RESULT OF A REHEATER TUBE LEAK IN THE BOILER. NO FGD SYSTEM-RELATED PROBLEMS OCCURRED DURING JULY.										
8/80	SYSTEM	100.0	100.0	100.0	81.5			744	606	606 43.3
** PROBLEMS/SOLUTIONS/COMMENTS										
THE OUTAGE TIME IN AUGUST WAS DUE TO NECESSARY REPAIR OF A BOILER AIR PREHEATER TUBE.										
9/80	SYSTEM	100.0	100.0	100.0	95.7			720	689	689 38.7
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER WAS OUT OF SERVICE FOR APPROXIMATELY 31 HOURS FOR A SCHEDULED INSPECTION.										
10/80	SYSTEM	100.0	100.0	100.0	65.2			744	485	485

KANSAS POWER & LIGHT: LAWRENCE 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 OCTOBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

THE BOILER WAS OUT OF SERVICE 259 HOURS DUE TO A SCHEDULED INSPECTION.

11/80	SYSTEM	100.0	100.0	100.0	100.0	720	720	720
12/80	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER AND DECEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED.

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

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT NO FGD-RELATED OUTAGES OCCURRED THROUGHOUT THE FIRST QUARTER OF 1981.

THE UNIT WAS SHUT DOWN FOR 17-HOURS IN MARCH DUE TO A SUPERHEATER FAILURE.

4/81	SYSTEM					720		
5/81	SYSTEM					744		
6/81	SYSTEM					720		
7/81	SYSTEM					744		
8/81	SYSTEM					744		
9/81	SYSTEM					720		

** PROBLEMS/SOLUTIONS/COMMENTS

LAWRENCE 5 WAS REPORTED TO BE AVAILABLE 100% OF THE TIME DURING THE THIRD QUARTER 1981. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR EITHER THE SECOND OR THIRD QUARTERS.

10/81	SYSTEM					744		
11/81	SYSTEM					720		
12/81	SYSTEM					744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT BOILER OPERATIONS WERE NOT CURTAILED OR REDUCED AS A RESULT OF THE FGD SYSTEM DURING THE FOURTH QUARTER 1981.

1/82	SYSTEM					744		
2/82	SYSTEM					672		
3/82	SYSTEM					744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982. SOMETIME DURING THE FIRST AND/OR SECOND QUARTER 1982, THE UNIT WILL BE SHUTDOWN FOR A SCHEDULED 2 WEEK SPRING OUTAGE.

4/82	SYSTEM						720		
5/82	SYSTEM						744		
6/82	SYSTEM						720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

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		

** PROBLEMS/SOLUTIONS/COMMENTS

OVER THE PAST YEAR THE LAWRENCE 4 AND 5 FGD SYSTEMS HAVE OPERATED WITH NO MAJOR PROBLEMS. THERE HAVE BEEN SOME CHRONIC MINOR PROBLEMS WITH SPRAY HEADER PLUGGING. THERE MAY BE SOME MODIFICATIONS PERFORMED AT SOME POINT IN THE FUTURE TO MINIMIZE THE PROBLEM.

THE DOWNSTREAM DUCTWORK IN BOTH THE LAWRENCE 4 AND 5 FGD SYSTEMS HAS BEEN EXPERIENCING CORROSION THAT WILL REQUIRE SOME DEGREE OF REPLACEMENT. THE CORROSION IS NOT RELATED TO CHLORIDES. A TIME TABLE FOR THE REPAIR WORK WAS NOT REPORTED BY THE UTILITY.

4/83	SYSTEM						720		
5/83	SYSTEM						744		
6/83	SYSTEM						720		
7/83	SYSTEM						744		
8/83	SYSTEM						744		
9/83	SYSTEM						720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 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 UTILITY REPORTED THAT NO MAJOR FGD-RELATED FORCED OUTAGES WERE ENCOUNTERED DURING THE PERIOD OF APRIL THROUGH SEPTEMBER.

THE NEXT UNIT OUTAGE IS SCHEDULED TO BEGIN THE FIRST WEEK OF OCTOBER AND LAST FROM TWO TO THREE WEEKS. DURING THE OUTAGE, THE UTILITY PLANS TO DO SOME TEMPORARY PATCH WORK ON THE ABSORBER OUTLET DUCTING. THIS TEMPORARY PATCH WORK IS HOPED BY THE UTILITY TO LAST THROUGH 1984.

10/83	SYSTEM	744
11/83	SYSTEM	720
12/83	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1983. FGD SYSTEM AVAILABILITY WAS 100%.

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%. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED.

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

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

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 MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE YEAR 1985. THE UNIT IS EXPECTED TO BE BASE LOADED NEXT YEAR WITH A PROJECTED USAGE OF APPROXIMATELY 7500 HOURS.

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

THE UTILITY ANNOUNCED PLANS TO BECOME THE FIRST AMERICAN UTILITY TO INSTALL EQUIPMENT DESIGNED TO SUBSTANTIALLY DECREASE NOX EMISSIONS. AS PART OF A TWO YEAR DEMONSTRATION PROJECT, 40 NEW LOW NOX BURNERS WILL BE INSTALLED ON UNIT 5. THE UTILITY EXPECTS TO REDUCE NOX EMISSIONS BY 60%. COMBUSTION ENGINEERING IS THE CONTRACTOR FOR THE MODIFICATION. INSTALLATION OF THE NEW BURNERS IS EXPECTED TO BEGIN IN APRIL 1987, THE NEXT SCHEDULED MAJOR TURBINE/BOILER OUTAGE. OVER HALF OF THE \$4 MILLION TEST PROJECT IS FUNDED BY THE ELECTRIC POWER RESEARCH INSTITUTE AND THE KANSAS ELECTRIC UTILITY RESEARCH PROGRAM. THE REMAINDER OF THE FUNDING, APPROXIMATELY \$1.5 MILLION, IS BEING FUNDED BY THE UTILITY.

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986.

1/87	SYSTEM									744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KANSAS POWER & LIGHT: LAWRENCE 5 (CONT.)

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

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	KENTUCKY UTILITIES	
PLANT NAME	GREEN RIVER	
UNIT NUMBER	1-3	
CITY	CENTRAL CITY	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	62.	(0.145 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	387.	(0.900 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	264	
GROSS UNIT GENERATING CAPACITY - MW	60	
NET UNIT GENERATING CAPACITY W/FGD - MW	59	
NET UNIT GENERATING CAPACITY WO/FGD - MW	62	
EQUIVALENT SCRUBBED CAPACITY - MW	60	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	169.88	(360000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	404.4	(760 F)
STACK HEIGHT - M	50.	(165 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26168.	(11250 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10900-11600
AVERAGE ASH CONTENT - %	9.85	
RANGE ASH CONTENT - %	8.85-10.85	
AVERAGE MOISTURE CONTENT - %	11.00	
RANGE MOISTURE CONTENT - %	10.0-12.0	
AVERAGE SULFUR CONTENT - %	2.23	
RANGE SULFUR CONTENT - %	2.0-2.7	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	3	
NUMBER OF SPARES	0	
TYPE	CYCLONE 'MULTIPLE! 280/COLLECTOR	
SUPPLIER	WESTERN PREC. DIVISION, JOY	
INLET FLUE GAS CAPACITY - CU.M/S	49.5	(105000 ACFM)
INLET FLUE GAS TEMPERATURE - C	176.7	(350 F)
PRESSURE DROP - KPA	0.5	(2. IN-H2O)
PARTICLE REMOVAL EFFICIENCY -%	80.0	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	1	
NUMBER OF SPARES	0	
INITIAL START-UP DATE	9/1975	
GENERIC TYPE	VENTURI	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	AMERICAN AIR FILTER	
SHELL GENERIC MATERIAL	CARBON STEEL; STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED MORTAR	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

LIQUID RECIRCULATION RATE - LITER/S	129.2	(2050 GPM)
L/G RATIO - LITER/CU.M	0.8	(5.7 GAL/1000ACF)
PRESSURE DROP - KPA	1.7	(7.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	169.9	(360000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICIENCY - %	98.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	AMERICAN AIR FILTER
A-E FIRM	SARGENT & LUNDY
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	98.00
ENERGY CONSUMPTION - %	5.0
CURRENT STATUS	1
COMMERCIAL START-UP	6/1976
INITIAL START-UP	9/1975
CONTRACT AWARDED	6/1973

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	3.80	
DESIGN COAL HEAT CONTENT - J/G	25818.6	(11100 BTU/LB)
DESIGN COAL ASH CONTENT - %	14.00	
DESIGN CHLORIDE CONTENT - %	*****	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	48.0	

** QUENCHER/PRESATURATOR

NUMBER	0

** ABSORBER

NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ENTRAINED PACKING	
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	20.0 X 20.0 X 3.0	
SHELL GENERIC MATERIAL	CARBON STEEL; STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110; AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A; TYPE 316	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED MORTAR	
LINER MATERIAL TRADE NAME/COMMON TYPE	NR	
GAS CONTACTING DEVICE TYPE	PLASTIC/RUBBER MOBILE BALLS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	614.	(9750 GPM)
L/G RATIO - L/CU.M	3.6	(27.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7	(3.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	142.99	(303000 ACFM)
INLET GAS TEMPERATURE - C	46.7	(116 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
PARTICLE REMOVAL EFFICIENCY - %	98.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	1
GENERIC TYPE	CENTRIFUGAL
SPECIFIC TYPE	RADIAL VANE
TRADE NAME/COMMON TYPE	RADIAL BAFFLE
MANUFACTURER	AMERICAN AIR FILTER
CONFIGURATION	HORIZONTAL

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	1	
FREEBOARD DISTANCE - M	4.11	(13.5 FT)
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)
PRESSURE DROP - KPA	0.6	(2.3 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	8.4	(27.5 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	2.8	(45 GAL/MIN)
** REHEATER		
NUMBER	1	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	INDIRECT HOT AIR	
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER	
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	22.2	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	142.99	(303000 ACFM)
INLET FLUE GAS TEMPERATURE - C	46.7	(116 F)
OUTLET FLUE GAS TEMPERATURE - C	68.9	(156 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
** FANS		
NUMBER	1	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	169.88	(360000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	10	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
MODULATION	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DAMPERS		
NUMBER	3	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE/SEAL AIR	
MODULATION	OPEN/CLOSED	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	INLET	
CONFIGURATION	RECTANGULAR	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

** DUCTWORK	
LOCATION	OUTLET
CONFIGURATION	CIRCULAR
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	RETROFIT DUCT TO FGD BOOSTER FAN
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
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	BATCH
DEVICE TYPE	AGITATED TANK
NUMBER	1
NUMBER OF SPARES	0
PRODUCT QUALITY - % SOLIDS	20.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	1
REAGENT PREP PRODUCT	3
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER/ABSORBER RECIRCULATION	3
SLURRY TRANSFER	2
POND RETURN	2
BLEED STREAM	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 'NATURALLY OCCURRING!
SITE DIMENSIONS	9 ACRES/25 FT
SITE CAPACITY - CU.M	203629 (166.5 ACRE-FT)
SITE SERVICE LIFE - YRS	12
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	REACTION TANK 'PH!
CHEMICAL PARAMETERS	SO2, PH
PHYSICAL VARIABLES	GAS FLOW, PRESSURE DROP, PERCENT SOLIDS

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

CONTROL LEVELS	PH 5.5-6.0; SOLIDS 10%
MONITOR TYPE	UNIFLO
MONITOR LOCATION	PH-REACTANT TANK; DENSITY METERS-RECYCLE LINE
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	4.7 (75 GPM)
SOURCE OF MAKEUP WATER	RIVER WATER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME
CONSUMPTION	2 TPH
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
SCRUBBER - %	0.0
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
SLAKER - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	33.0
** FGD SPARE COMPONENT INDICES	
SCRUBBER	0.0
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
SLAKER	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	1.0

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

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

9/75 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM BECAME OPERATIONAL SEPTEMBER 13, 1975 ON A HALF-LOAD BASIS
BECAUSE OF A TURBINE OVERHAUL. LOGGING OF OPERATING DATA BEGAN DECEMBER
1975.

10/75 SYSTEM

744

11/75 SYSTEM

720

12/75 SYSTEM 74.0 65.0 78.0 35.0 744 398 257

1/76 SYSTEM 42.0 11.0 14.0 9.0 744 572 64

** PROBLEMS/SOLUTIONS/COMMENTS

A MAJOR PROBLEM WAS FAILURE OF THE RECYCLE PUMPS.
THAWING AND REPAIR OF NUMEROUS FROZEN LINES WAS REQUIRED.
SHUTDOWN OF SUMP PUMPS WAS NECESSARY.
A MAJOR PROBLEM AREA WAS THE FEED TANK AGITATOR.

2/76 SYSTEM 70.0 42.0 42.0 30.0 696 499 211

-----PERFORMANCE DATA-----
 PERIOD 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 TANK AGITATORS, SLAKE TANKS AND MIX-HOLD TANKS CONTRIBUTING TO OUTAGE TIME.

REPAIRS AND CLEANOUT OF REACTANT PUMPS CONTRIBUTED TO OUTAGE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/76	SYSTEM	97.0	85.0	95.0	52.0		744	458	386	

** PROBLEMS/SOLUTIONS/COMMENTS

ALL RUBBER-LINED IMPELLERS WERE REPLACED IN THE PUMPS.

4/76	SYSTEM	90.0	100.0	100.0	77.0		720	552	552	
5/76	SYSTEM	81.0	100.0	100.0	61.0		744	456	456	
6/76	SYSTEM	100.0	99.0	99.0	82.0		720	597	589	
7/76	SYSTEM	90.0	98.0	99.0	77.0		744	584	574	
8/76	SYSTEM	97.0	97.0	97.0	97.0		744	744	722	

** PROBLEMS/SOLUTIONS/COMMENTS

VIBRATION IN THE SCRUBBER BOOSTER ID FAN NECESSITATED A 22 HOUR SYSTEM SHUTDOWN FOR REPAIR DURING AUGUST.

9/76	SYSTEM	86.0	100.0	100.0	79.0		720	571	571	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR FAN PROBLEMS OCCURRED BUT NO FORCED OUTAGE TIME WAS REQUIRED.

HALF-LOAD OPERATIONS WERE CONDUCTED THROUGHOUT THE PERIOD BECAUSE OF BEARING PROBLEMS WITH ONE OF THE TWO TURBINE GENERATING UNITS.

10/76	SYSTEM	100.0	100.0	100.0	94.0		744	699	699	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR FAN PROBLEMS OCCURRED BUT NO FORCED OUTAGE TIME WAS REQUIRED.

HALF-LOAD OPERATIONS WERE CONDUCTED THROUGHOUT THE PERIOD BECAUSE OF BEARING PROBLEMS WITH ONE OF THE TWO TURBINE GENERATING UNITS.

11/76	SYSTEM	100.0	100.0	98.0	98.0		720	704	704	
12/76	SYSTEM	73.0	97.0	87.0	70.0		744	536	517	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER AND DECEMBER, 1976 SOME FLUE GAS WAS BY-PASSED AROUND THE SYSTEM WHILE THE UTILITY CONDUCTED A CHECKOUT OF THE SCRUBBER INTERNALS AND REPLACED SOME OF THE PACKING SPHERES IN THE MOBILE BED.

1/77	SYSTEM	94.0	94.0	94.0	94.0		744	744	698	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JANUARY NO PROBLEMS OCCURRED.

2/77	SYSTEM	36.0	91.0	91.0	36.0		672	266	243	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

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

3/77 SYSTEM 0.0 0.0 0.0 744 0 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF FEBRUARY IT WAS FOUND THAT THE CARBOLINE STACK LINER WAS BADLY DETERIORATED. SCRUBBER AND BOILER OPERATIONS WERE TERMINATED UNTIL THE STACK LINING WAS REPAIRED. THE STACK WAS REPAIRED FIRST BY WELDING A BACKUP METAL PLATE TO THE PORTIONS OF THE STACK WHERE PITTING OCCURRED. THE ENTIRE STACK WAS THEN LINED WITH A REFRACTORY COATING CALLED PRECRETE G-8 BY AAF. THE REPAIRS WERE COMPLETED MARCH 7.

THE BOILER IS NOT OPERATED WITHOUT THE SCRUBBER BECAUSE THERE IS NO ESP FOR PARTICULATE CONTROL.

4/77 SYSTEM 40.0 98.0 98.0 23.0 720 167 164

5/77 SYSTEM 99.0 98.0 98.0 69.0 744 527 513

6/77 SYSTEM 100.0 100.0 100.0 5.0 720 34 34

** PROBLEMS/SOLUTIONS/COMMENTS

WORK ON THE SCRUBBER MODULE INCLUDED REPAIRS TO THE UNDERBED DAMPER SYSTEM AND LEAKING IN THE VENTURI.

LIME SLAKING OPERATIONS WAS REPAIRED.

7/77 SYSTEM 100.0 0.0 0.0 744 0 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

A STRIKE BY PLANT OPERATING PERSONNEL RESULTED IN BOILER AND FGD SYSTEM SHUTDOWN WHICH CONTINUED THROUGH THE END OF OCTOBER.

8/77 SYSTEM 100.0 0.0 0.0 744 0 0 0.0

9/77 SYSTEM 100.0 0.0 0.0 720 0 0 0.0

10/77 SYSTEM 100.0 0.0 0.0 744 0 0 0.0

11/77 SYSTEM 86.0 91.0 91.0 41.0 720 332 301

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH LEAKS IN RECYCLE PUMP IMPELLER COATINGS AND PUMP FAILURES. TWO PUMPS WERE DOWN AND BEING BYPASSED.

SUMP PUMP FAILURES WERE NOTED.

LEAKS IN THE PACKING WERE NOTED.

12/77 SYSTEM 50.0 63.0 91.0 50.0 744 596 375

** PROBLEMS/SOLUTIONS/COMMENTS

NUMEROUS FREEZE UPS WERE ENCOUNTERED DURING DECEMBER CAUSING FGD SYSTEM OUTAGE TIME.

1/78 SYSTEM 31.0 32.0 32.0 23.0 744 537 170

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (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 UNIT WENT DOWN AFTER APPROXIMATELY 170 HOURS OF OPERATION IN JANUARY.
 THIS WAS CAUSED BY THE FREEZING OF THE SLURRY LINE TO THE POND.

2/78	SYSTEM	97.0	0.0	0.0	0.0	672	672	0
3/78	SYSTEM	97.0	0.0	0.0	0.0	744	669	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM COULD HAVE BEEN CONSIDERED AVAILABLE THROUGHOUT MOST OF THE
 WINTER PERIOD BUT BECAUSE EMERGENCY CONDITIONS THE UTILITY CHOSE TO
 CONCENTRATE THEIR MAINTENANCE CREWS ON POWER GENERATION RATHER THAN FGD
 OPERATION. UNDER NORMAL CONDITIONS THE RELATIVELY MINOR FGD SYSTEM
 PROBLEMS WOULD HAVE BEEN SOLVED MORE QUICKLY.

DURING THE FREEZE UPS NUMEROUS GASKETS WERE TORN THROUGHOUT THE SYSTEM.
 THE SYSTEM WAS SHUT DOWN COMPLETELY FOR REPAIR WORK DURING FEBRUARY
 AND MARCH.

4/78	SYSTEM	41.0	99.0	99.0	41.0	720	296	295
5/78	SYSTEM	64.0	100.0	98.0	64.0	744	474	474

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCREENS ON THE SUCTION SIDE OF THE PUMPS THAT PUMP THE SLURRY FROM THE
 PREP ROOM TO THE NOZZLES EXPERIENCED PLUGGING PROBLEMS. THE SCREENS GET
 PLUGGED WITH LARGE GRIT IN THE SLURRY AND ARE SUCKED OUT OF POSITION BY
 THE PUMPS. THE UTILITY REPORTED THAT THIS TENDS TO BE A RECURRING
 PROBLEM.

6/78	SYSTEM	73.0	100.0	100.0	73.0	720	525	524
7/78	SYSTEM	13.0	96.0	100.0	13.0	744	103	99

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER AND FGD SYSTEM OUTAGES DURING JUNE AND JULY WERE FOR ROUTINE
 MAINTENANCE.

8/78	SYSTEM	61.0	99.0	99.0	28.0	744	207	205

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FROM AUGUST 1 THROUGH AUGUST 12 AS A RESULT OF BLEED
 PUMP PROBLEMS.

9/78	SYSTEM	76.0	98.0	100.0	41.0	720	303	298

** PROBLEMS/SOLUTIONS/COMMENTS

BECAUSE OF PLUGGING PROBLEMS THE FGD SYSTEM WAS OPERATED AT APPROXIMATELY
 ONE THIRD OF TOTAL CAPACITY THE LAST TWO WEEKS OF SEPTEMBER.

10/78	SYSTEM	30.0	94.0	96.0	30.0	744	236	222

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED RECYCLE TANK SCREEN PLUGGING.

THE FGD SYSTEM EXPERIENCED VIBRATING FAN PROBLEMS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS HOURS	FGD HOURS	CAP. FACTOR	
11/78	SYSTEM	24.0	100.0	74.0	24.0		720	175	175	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS DOWN THE LAST TWO WEEKS OF NOVEMBER DUE TO LOW LOAD DEMAND.										
12/78	SYSTEM	0.0			0.0		744	0	0	0.0
1/79	SYSTEM	0.0	0.0	0.0	0.0		744	1	0	
2/79	SYSTEM	0.0			0.0		672	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM WAS UNAVAILABLE IN DECEMBER, JANUARY AND FEBRUARY AS A RESULT OF FREEZING WEATHER WHICH CAUSED FROZEN PIPES, ETC.										
3/79	SYSTEM	11.2	100.0	100.0	11.2		744	83	83	
4/79	SYSTEM	18.2	100.0	100.0	18.2		720	131	131	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE LOW OPERATIONAL HOURS FOR MARCH AND APRIL WERE DUE TO RECYCLE PUMP PROBLEMS.										
5/79	SYSTEM	100.0			0.0		744	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER WAS TAKEN DOWN IN MAY FOR REPAIRS THAT ARE PROJECTED TO LAST THROUGH THE END OF SEPTEMBER. DURING THIS OUTAGE AN INDIRECT STEAM REHEAT SYSTEM WILL BE INSTALLED TO BOOST THE TEMPERATURE OF THE EXITING FLUE GAS. THIS WAS FOUND TO BE NECESSARY DUE TO EXCESSIVE MOISTURE IN THE AREA.										
6/79	SYSTEM	100.0			0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT REMAINED OUT OF SERVICE DURING JUNE FOR BOILER REPAIRS. IT IS NOT EXPECTED TO RETURN TO SERVICE UNTIL OCTOBER OR NOVEMBER.										
7/79	SYSTEM	100.0			0.0		744	0	0	0.0
8/79	SYSTEM	100.0			0.0		744	0	0	0.0
9/79	SYSTEM	100.0			0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER REMAINED OUT OF SERVICE DURING JULY, AUGUST AND SEPTEMBER. THE BOILER TEMPERATURE VALVES AND PIPING BETWEEN THE PRIMARY AND SECONDARY SUPERHEATERS MUST STILL BE REPLACED. THE BOILER IS NOT EXPECTED TO RETURN ON LINE UNTIL THE FIRST OF THE YEAR OR POSSIBLY AS LATE AS MARCH.										
THE NEW INDIRECT REHEAT SYSTEM IS IN PLACE AND READY FOR OPERATION AS SOON AS THE BOILER RETURNS TO SERVICE.										
10/79	SYSTEM	100.0			0.0		744	0	0	0.0
11/79	SYSTEM	100.0			0.0		720	0	0	0.0
12/79	SYSTEM	100.0			0.0		744	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

WORK IS CONTINUING ON THE REPAIRS OF THE OLD BOILER. THE UNIT MAY BE SHUT DOWN INTO MARCH 1980. THE FGD SYSTEM WAS AVAILABLE THROUGHOUT THE PERIOD BUT WAS NOT OPERATED.

1/80	SYSTEM	100.0			0.0		744	0	0	0.0
2/80	SYSTEM	100.0			0.0		696	0	0	0.0
3/80	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM	100.0			0.0		720	0	0	0.0
5/80	SYSTEM	100.0			0.0		744	0	0	0.0
6/80	SYSTEM	100.0			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM REMAINED OFF LINE DURING THE SECOND QUARTER OF 1980 AS A RESULT OF THE ON-GOING BOILER REPAIRS. COMPLETION OF THE BOILER REPAIRS HAS BEEN DELAYED BY THE UNAVAILABILITY OF SOME NEEDED PARTS.

7/80	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REPAIRS HAVE BEEN COMPLETED; HOWEVER, THE BOILER DID NOT OPERATE DUE TO REPAIR WORK BEING DONE ON THE TURBINE.

8/80	SYSTEM	100.0			0.0		744	0	0	0.0
9/80	SYSTEM	100.0			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

TURBINE REPAIRS CONTINUED THROUGH AUGUST AND SEPTEMBER. THE FGD SYSTEM WAS AVAILABLE FOR OPERATION.

10/80	SYSTEM	100.0			0.0		744	0	0	0.0
11/80	SYSTEM	100.0			0.0		720	0	0	0.0
12/80	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER THE TURBINE REPAIRS CONTINUED. AN ATTEMPT TO RESTART THE BOILER IN MID-DECEMBER RESULTED IN A BLOWN GENERATOR CAUSED BY FAULTY INSULATORS. THE UTILITY IS PRESENTLY WAITING ON NEW INSULATORS.

DURING THE PERIOD THE BOILER CONTROL VALVES HAD TO BE REPLACED.

THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME DURING THE FOURTH QUARTER.

1/81	SYSTEM	100.0			0.0		744	0	0	0.0
2/81	SYSTEM	100.0			0.0		672	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
3/81	SYSTEM	100.0			0.0	744	0 0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS							
DURING MARCH AN ATTEMPT TO RUN A FULL LOAD COMPLIANCE TEST FAILED DUE TO BLOWN INSULATORS. THE UTILITY IS PRESENTLY WAITING ON NEW INSULATORS.							
THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME DURING THE FIRST QUARTER.							
4/81	SYSTEM	100.0			0.0	720	0 0 0.0
5/81	SYSTEM	100.0			0.0	744	0 0 0.0
6/81	SYSTEM	100.0			0.0	720	0 0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS							
THE FGD SYSTEM DID NOT OPERATE DURING THE SECOND QUARTER 1981. THE UTILITY IS WAITING FOR NEW GENERATOR TERMINAL LEADS. THE FGD SYSTEM WAS AVAILABLE, HOWEVER, FOR OPERATION.							
7/81	SYSTEM	100.0			0.0	744	0 0 0.0
8/81	SYSTEM	100.0			0.0	744	0 0 0.0
9/81	SYSTEM	100.0			0.0	720	0 0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS							
THE GREEN RIVER UNITS 1-3 REMAINED OFF LINE DURING THE SECOND QUARTER 1981. THE FGD SYSTEM WAS AVAILABLE FOR OPERATION BUT WAS NOT NEEDED.							
10/81	SYSTEM	100.0			0.0	744	0 0
11/81	SYSTEM	100.0			0.0	720	0 0
12/81	SYSTEM	100.0			0.0	744	0 0
** PROBLEMS/SOLUTIONS/COMMENTS							
THE BOILER WAS DOWN THROUGHOUT THE FOURTH QUARTER. THE UTILITY HAS INTENDED TO OPERATE THE BOILER FOR A SHORT TIME HOWEVER, THE FGD SYSTEM LIQUID CIRCUITS FROZE DUE TO THE WEATHER. BY THE TIME THE SYSTEM WAS THAWED THE UTILITY NO LONGER REQUIRED THE POWER.							
1/82	SYSTEM	100.0			0.0	744	0 0 0.0
2/82	SYSTEM	100.0			0.0	672	0 0 0.0
3/82	SYSTEM	100.0			0.0	744	0 0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS							
DURING THE FIRST QUARTER THE SYSTEM WAS AVAILABLE FOR OPERATION; HOWEVER, DUE TO A LACK OF POWER DEMAND THE SYSTEM DID NOT OPERATE.							
4/82	SYSTEM	100.0			0.0	720	0 0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS							
THE SYSTEM DID NOT OPERATE DURING APRIL DUE TO A LACK OF POWER DEMAND.							
5/82	SYSTEM	100.0			5.0	744	39 39

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (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 MAY THE SYSTEM OPERATED APPROXIMATELY 39 HOURS IN PREPARATION FOR TESTS SCHEDULED FOR JUNE.

6/82	SYSTEM	100.0			14.7	720	106	106	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SYSTEM OPERATED APPROXIMATELY 106 HOURS IN WHICH TIME COMPLIANCE TESTS WERE PERFORMED.

7/82	SYSTEM	100.0	100.0	100.0	8.5	744	63	63	6.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM OPERATED ONLY 63 HOURS DURING JULY DUE TO LOW POWER DEMAND.

8/82	SYSTEM	100.0			0.0	744	0	0	0.0

9/82	SYSTEM	100.0			0.0	720	0	0	0.0

10/82	SYSTEM	100.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM DID NOT OPERATE DURING AUGUST, SEPTEMBER, OR OCTOBER DUE TO LOW POWER DEMAND.

11/82	SYSTEM	100.0	100.0	100.0	1.5	720	11	11	0.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM OPERATED ONLY 11 HOURS DURING NOVEMBER DUE TO LOW POWER DEMAND.

12/82	SYSTEM	100.0			0.0	744	0	0	0.0

1/83	SYSTEM	100.0			0.0	744	0	0	0.0

2/83	SYSTEM	100.0			0.0	672	0	0	0.0

3/83	SYSTEM	100.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM DID NOT OPERATE DURING THE PERIOD OF DECEMBER 1982 THROUGH MARCH 1983 DUE TO LOW POWER DEMAND.

4/83	SYSTEM	100.0			0.0	720	0	0	0.0

5/83	SYSTEM	100.0			0.0	744	0	0	0.0

6/83	SYSTEM	100.0			0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE SYSTEM DID NOT OPERATE DURING THE SECOND QUARTER DUE TO LOW POWER DEMAND.

7/83	SYSTEM	100.0	100.0	100.0	34.4	744	256	256	11.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (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 JULY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/83	SYSTEM	97.8	100.0	100.0	87.2		744	649	649	29.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS BROUGHT DOWN DURING AUGUST DUE TO LACK OF POWER DEMAND AND REPAIRS WERE MADE ON A LEAKING FLOODED ELBOW PRECEDING THE MOBILE BED CONTACTOR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/83	SYSTEM	98.6	100.0	97.1	46.0		720	331	331	12.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN DURING PART OF SEPTEMBER DUE TO THE CONTINUED PROBLEM WITH THE LEAKING FLOODED ELBOW.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/83	SYSTEM	100.0			0.0		744	0	0	0.0

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/83	SYSTEM	100.0	100.0	100.0	7.4		720	53	53	2.1

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/83	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN DURING MOST OF THE FOURTH QUARTER DUE TO LOW POWER DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/84	SYSTEM	0.0			0.0		744	0	0	0.0

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/84	SYSTEM	0.0			0.0		696	0	0	0.0

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/84	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNITS WERE OFF LINE DURING THE FIRST QUARTER OF 1984 DUE TO LOW POWER DEMAND. IN ADDITION, BECAUSE OF SEVERE WEATHER CONDITIONS AND THE INTERMITTENT MODE OF OPERATION OF THE UNITS, THE FGD SYSTEM WAS NOT AVAILABLE UNTIL MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/84	SYSTEM	100.0	100.0	100.0	6.7		720		720	3.7

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/84	SYSTEM	100.0	100.0	100.0	6.7		744		744	3.7

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/84	SYSTEM	100.0	100.0	100.0	6.7		720		720	3.7

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/84	SYSTEM	100.0	100.0	100.0	3.5		744		26	1.2

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/84	SYSTEM	100.0	100.0	100.0	3.5		744		26	1.2

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/84	SYSTEM	100.0	100.0	100.0	3.5		720		25	1.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT OPERATED A TOTAL OF 223 HOURS DURING THE MONTHS OF APRIL THROUGH SEPTEMBER, 1984. THE AVERAGE BOILER CAPACITY FACTOR FOR THIS PERIOD WAS 2.4%. NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/84	SYSTEM	100.0			0.0		744	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/84	SYSTEM	100.0			0.0		720	0	0	0.0
12/84	SYSTEM	100.0			0.0		744	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE UNITS WERE OFF LINE DURING THE FOURTH QUARTER OF 1984 DUE TO LOW POWER DEMAND.										
1/85	SYSTEM	100.0			0.0		744	0	0	0.0
2/85	SYSTEM	100.0			0.0		672	0	0	0.0
3/85	SYSTEM	83.9		0.0	0.0		744	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE FGD SYSTEM HAD BEEN PREPARED FOR WINTER STANDBY. THE UNIT REMAINED AT RESERVE SHUTDOWN FOR POSSIBLE OPERATION FROM JANUARY THROUGH LATE MARCH. THE UNIT WAS CALLED TO SERVICE ON THE 27TH OF MARCH BUT WAS UNABLE TO OPERATE BECAUSE OF FGD SYSTEM PROBLEMS. MAINTENANCE WORK WAS PERFORMED ON ISOLATION DAMPERS POND PUMPS, AND A MIX- HOLD TANK AGITATOR.										
4/85	SYSTEM	0.0			0.0		720	0	0	0.0
5/85	SYSTEM	0.0			0.0		744	0	0	0.0
6/85	SYSTEM	0.0			0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE APRIL-JUNE PERIOD ALL KNOWN PROBLEMS THAT HAD PREVENTED FGD SYSTEM OPERATION DURING THE PREVIOUS QUARTER WERE CORRECTED EXCEPT FOR THE RE-INSTALLATION OF THE 1500 HP MAIN FAN MOTOR.										
7/85	SYSTEM	73.4	100.0	100.0	2.5		744	55	19	3.8
8/85	SYSTEM	73.4	100.0	100.0	2.5		744	55	19	3.8
9/85	SYSTEM	73.4	100.0	100.0	2.5		720	55	18	3.8
** PROBLEMS/SOLUTIONS/COMMENTS										
THE MAIN FAN MOTOR WAS RETURNED TO THE PLANT ON JULY 1ST AFTER REWINDING AND OTHER REPAIR WORK WAS COMPLETED. RE-INSTALLATION WAS COMPLETED DURING THE QUARTER.										
10/85	SYSTEM	87.2	100.0	100.0	11.3		744	250	84	5.0
11/85	SYSTEM	87.2	100.0	100.0	11.3		720	250	81	0.5
12/85	SYSTEM	87.2	100.0	100.0	11.3		744	250	84	0.5
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT THE FGD SYSTEM WAS ON STANDBY IN A "WINTERIZED" STATUS. THE POWER PLANT REMAINED ON RESERVE SHUTDOWN THROUGHOUT THE QUARTER.										
1/86	SYSTEM				0.0		744	0		0.0
2/86	SYSTEM				0.0		672	0		0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

KENTUCKY UTILITIES: GREEN RIVER 1-3 (CONT.)

-----PERFORMANCE DATA-----						
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.
						PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
3/86	SYSTEM				0.0	744 0 0.0
4/86	SYSTEM				0.0	720 0 0.0
5/86	SYSTEM				0.0	744 0 0.0
6/86	SYSTEM				0.0	720 0 0.0
7/86	SYSTEM				0.0	744 0 0.0
8/86	SYSTEM				0.0	744 0 0.0
9/86	SYSTEM				0.0	720 0 0.0
10/86	SYSTEM				0.0	744 0 0.0
11/86	SYSTEM				0.0	720 0 0.0
12/86	SYSTEM				0.0	744 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT DID NOT OPERATE ALL OF 1986 DUE TO LACK IN POWER DEMAND. BEING CLASSIFIED AS A PEAKING UNIT, THE UNIT WILL MOST LIKELY ONLY BE NEEDED DURING SUMMER MONTHS DURING PEAK LOADS.

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 DID NOT OPERATE ALL OF 1987. THE UNIT IS STILL WINTERIZED AND WOULD TAKE APPROXIMATELY 1 MONTH TO STARTUP.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LAKELAND UTILITIES	
PLANT NAME	MCINTOSH	
UNIT NUMBER	3	
CITY	LAKELAND	
STATE	FLORIDA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	19.	(0.044 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	570	
GROSS UNIT GENERATING CAPACITY - MW	364	
NET UNIT GENERATING CAPACITY W/FGD - MW	350	
NET UNIT GENERATING CAPACITY WO/FGD - MW	357	
EQUIVALENT SCRUBBED CAPACITY - MW	364	
** 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	143.3	(290 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11200-13500
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	7.0-17.0	
AVERAGE MOISTURE CONTENT - %	6.00	
RANGE MOISTURE CONTENT - %	4.2-9.5	
AVERAGE SULFUR CONTENT - %	2.56	
RANGE SULFUR CONTENT - %	1.3-3.6	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	0.01-0.14	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	BABCOCK & WILCOX	
INLET FLUE GAS CAPACITY - CU.M/S	251.9	(533800 ACFM)
INLET FLUE GAS TEMPERATURE - C	138.9	(282 F)
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	

LAKELAND UTILITIES: MCINTOSH 3 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	BABCOCK & WILCOX
A-E FIRM	C.T. MAIN
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	1.9
CURRENT STATUS	1
COMMERCIAL START-UP	9/1982
INITIAL START-UP	7/1982
CONTRACT AWARDED	3/1978

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	1858.0	(20000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	24.0	

** QUENCHER/PRESATURATOR

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	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
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	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	2520.	(40000 GPM)
L/G RATIO - L/CU.M	10.7	(80.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.9	(7.5 IN-H2O)
INLET GAS FLOW - CU. M/S	584.64	(1238898 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	85.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
DISTANCE BETWEEN VANES - CM	114.3	(45.00 IN)
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	VINYL ESTER	
WASH FREQUENCY	CONTINUOUS	
WASH RATE - L/S	14.4	(229 GAL/MIN)

** REHEATER

NUMBER	1
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE

LAKELAND UTILITIES: MCINTOSH 3 (CONT.)

TEMPERATURE INCREASE - C	22.2	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	73.55	(155858 ACFM)
INLET FLUE GAS TEMPERATURE - C	193.9	(381 F)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	TLT-BABCOCK	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
PRESSURE DROP - KPA	6.4	(20.9 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	4	
SUPPLIER	TLT-BABCOCK	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
PRESSURE DROP - KPA	10.1	(33.1 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
LOCATION	ID FAN DISCHARGE TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	ORGANIC	
LINER SPECIFIC MATERIAL TYPE	INERT FLAKE-FILLED VINYL ESTER	
** DUCTWORK		
LOCATION	2 BYPASS STREAMS	
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	WET BALL MILL	
DEVICE	COMPARTMENTED	
DEVICE TYPE	NR	
NUMBER	1	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6	(15 TPH)
** TANKS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECYCLE	2	
QUENCHER	2	
THICKENER OVERFLOW	1	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LAKELAND UTILITIES: MCINTOSH 3 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	8
QUENCHER RECIRCULATION	4
CLARIFIED RECIRCULATION WATER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
NUMBER OF SPARES	0
CAPACITY	1080 TON/DAY
FEED STREAM CHARACTERISTICS	30% SOLIDS
OUTLET STREAM CHARACTERISTICS	55% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	140.0 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
FEED STREAM CHARACTERISTICS	15% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	28.8 (31.7 TPH)
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - %	55.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
SITE DIMENSIONS	125 ACRES X 40 FT
SITE CAPACITY - CU.M	6115000 (5000.0 ACRE-FT)
SITE SERVICE LIFE - YRS	30
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH, DENSITY, GAS FLOW, SO2
CONTROL LEVELS	PH 5.5-6.0
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	20.3 (322 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	303
MAKEUP WATER ADDITION - LITERS/S	14.4 (228 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	CACO3
CONSUMPTION	96000 TONS/YR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LAKELAND UTILITIES: MCINTOSH 3 (CONT.)

** 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

7/82 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL FGD OPERATIONS BEGAN AT THIS FACILITY DURING JULY. THE SYSTEM IS CURRENTLY UNDERGOING SHAKEDOWN/DEBUGGING OPERATIONS.

8/82 SYSTEM 744

9/82 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE MCINTOSH 3 UNIT (BOILER AND FGD SYSTEM) COMMENCED COMMERCIAL OPERATION ON SEPTEMBER 1, 1982.

10/82 SYSTEM 744

11/82 SYSTEM 720

12/82 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1982.

1/83 SYSTEM 744

2/83 SYSTEM 672

3/83 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT IT WAS PLEASED WITH THE OPERATION OF THE UNIT AND FGD SYSTEM. THE FGD SYSTEM AVAILABILITY IS REPORTED TO BE GREATER THAN 95%.

NOTE: IN ADDITION TO HAVING THE CAPABILITY OF BURNING APPROXIMATELY 140 TONS/HR OF BITUMINOUS COAL WITH ASH CONTENTS RANGING FROM 7 TO 17 %, THE BOILER IS ALSO DESIGNED TO BURN REFUSE DERIVED FUEL (RDF). THE UNIT IS CURRENTLY BURNING 300 TONS/DAY OF RDF COLLECTED FROM THE NEARBY CITY OF LAKELAND, FLORIDA. THE RDF IS CONSUMED NORMALLY WITHIN ONE 8 HOUR SHIFT. THE REPORTED HEAT CONTENT OF THE RDF IS APPROXIMATELY 5000 BTU/LB COMPARED TO THE AVERAGE 11500 BTU/LB FOR THE COAL. THE RDF PLANT AND BOILER HAVE THE CAPACITY OF BURNING AN ADDITIONAL 8 TO 12 HOURS OF RDF (300 TO 450 TONS). THE UTILITY CURRENTLY RECEIVES \$6/TON FOR RDF DISPOSAL.

4/83 SYSTEM 720

5/83 SYSTEM 744

6/83 SYSTEM 720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LAKELAND UTILITIES: MCINTOSH 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL THROUGH JUNE 1983.

7/83	SYSTEM	100.0	89.7	100.0	87.3		744	724	640	83.0
8/83	SYSTEM	100.0	89.7	100.0	87.3		744	724	640	83.0
9/83	SYSTEM	100.0	89.7	100.0	87.3		720	701	629	83.0

** PROBLEMS/SOLUTIONS/COMMENTS

10/83	NORTH	56.5	100.0	100.0	56.5					
	SOUTH	46.4	82.0	100.0	46.4					
	SYSTEM	51.5	91.0	100.0	51.5		744	421	383	69.4
11/83	NORTH	56.5	100.0	100.0	56.5					
	SOUTH	46.4	82.1	100.0	46.4					
	SYSTEM	51.4	91.0	100.0	51.4		720	407	370	69.4
12/83	NORTH	56.5	100.0	100.0	56.5					
	SOUTH	46.4	82.0	100.0	46.4					
	SYSTEM	51.5	91.0	100.0	51.5		744	421	383	69.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/84	NORTH	100.0	100.0	100.0	100.0					
	SOUTH	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	87.3
2/84	SYSTEM	100.0	100.0	100.0	44.8		696	264	696	25.8
3/84	NORTH	19.4	100.0	100.0	19.4					
	SOUTH	19.4	100.0	100.0	19.4					
	SYSTEM	19.4	100.0	100.0	19.4		744	144	144	8.5
4/84	SYSTEM	100.0	100.0	100.0	98.4		720	696	720	78.0
5/84	SYSTEM	100.0	100.0	100.0	100.0		744	696	744	75.6
6/84	SYSTEM	100.0	100.0	100.0	100.0		720	672	720	74.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST TWO QUARTERS OF 1984.

7/84	SYSTEM	100.0	100.0	100.0	99.6		744	598	741	76.0
8/84	SYSTEM	100.0	100.0	100.0	100.0		744	689	744	78.4
9/84	SYSTEM	100.0	100.0	100.0	99.7		720	710	718	82.1
10/84	SYSTEM	100.0	100.0	100.0	99.6		744	294	741	32.8
11/84	SYSTEM	100.0	100.0	100.0	100.0		720	672	720	73.4
12/84	SYSTEM	100.0	99.6	100.0	99.6		744	744	741	82.5

LAKELAND UTILITIES: MCINTOSH 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 THE MONTHS OF JULY THROUGH DECEMBER 1984.

1/85	SYSTEM	744
2/85	SYSTEM	672
3/85	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1985. HOWEVER, THE PLANT WAS DOWN FOR APPROXIMATELY 3 WEEKS IN APRIL FOR A SCHEDULED TURBINE/BOILER OUTAGE. DURING THIS OUTAGE PERIOD, BABCOCK & WILCOX INSTALLED TEST PANELS IN THE MIST ELIMINATOR. B&W IS CURRENTLY TESTING A NEW MIST ELIMINATOR MATERIAL WHICH MAY LAST LONGER.

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 MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF APRIL THROUGH DECEMBER, 1985. HOWEVER, THE PLANT WAS DOWN FOR 2 WEEKS IN OCTOBER FOR A SCHEDULED TURBINE/BOILER OUTAGE.

DURING 1985, ABSORBER REACTION TANK AGITATOR OPERATION WAS MODIFIED TO IMPROVE MIXING. CHEMINEER REPLACED THE AGITATOR IMPELLERS AND INSTRUCTED THE UTILITY TO RUN BOTH AGITATORS IN EACH REACTION TANK. THE UTILITY HAD IN THE PAST KEPT ONE AGITATOR AS A SPARE.

DURING THE MONTH OF DECEMBER, AT THE SUGGESTION OF BLACK & VEATCH, THE UTILITY REPORTED CONVERTING FROM DOUBLE MODULE OPERATION TO SINGLE MODULE OPERATION. INSTEAD OF RUNNING BOTH ABSORBERS SIMULTANEOUSLY, THEY NOW CYCLE THE MODULES, KEEPING ONE ALWAYS AS A SPARE. THE USE OF A LOWER SULFUR COAL PERMITTED THIS MODE OF OPERATION.

1/86	SYSTEM	774
2/86	SYSTEM	672
3/86	SYSTEM	774
4/86	SYSTEM	720
5/86	SYSTEM	774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LAKELAND UTILITIES: MCINTOSH 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
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 INSTALLED NEW NOZZLES AND VARIED THE MIST ELIMINATOR WASH CYCLE TO REDUCE MIST ELIMINATOR PLUGGING.									
THERE IS VISIBLE CORROSION OF UNLINED CARBON STEEL BYPASS, QUENCH SUMP, AND REHEAT DUCTWORK.									
THE INLET, OUTLET, BYPASS, AND REHEAT LOUVRE DAMPERS STICK AND ARE HARD TO SEAL.									
THE UTILITY REPORTED THAT THE UNIT OPERATED APPROXIMATELY A TOTAL OF 4 MONTHS DURING THE YEAR 1986 DUE TO NUMEROUS BOILER-RELATED PROBLEMS. THE PROBLEMS INCLUDED TURBINE REPAIRS, TRANSFORMER FAILURES AND TURBINE CONDENSER COOLING WATER PIPELINE FAILURES. NO FGD-RELATED PROBLEMS RESULTED IN BOILER DOWNTIME IN 1986. HOWEVER, WERE NOTED.									
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 OF JANUARY THROUGH MARCH 1987.									
4/87	SYSTEM							720	
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE IN APRIL FOR 3 WEEKS FOR A SCHEDULED MAINTENANCE OUTAGE.									
5/87	SYSTEM							744	
6/87	SYSTEM							720	
7/87	SYSTEM							744	
8/87	SYSTEM							744	
9/87	SYSTEM							720	
10/87	SYSTEM							744	

LAKELAND UTILITIES: MCINTOSH 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 UNIT OR FGD-RELATED OUTAGES WERE
 ENCOUNTERED DURING THE PERIOD MAY THROUGH OCTOBER.

11/87 SYSTEM 720

12/87 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED SEVERE CORROSION PROBLEMS WITH THE
 UNLINED 316L STAINLESS STEEL ABSORBERS. THE UTILITY IS CURRENTLY
 INVESTIGATING A VARIETY OF CONSTRUCTION MATERIALS FOR POSSIBLE USE IN
 RELINING THE VESSELS. THE UTILITY ALSO REPORTED CONTINUED MIST ELIMINATOR
 SCALE PROBLEMS. THE WASH WATER SUPPLY, THE WASH SYSTEM EQUIPMENT, AND THE
 DESIGN AND CHEMICAL ADDITIVES ARE BEING INVESTIGATED FOR POSSIBLE
 SOLUTIONS FOR THIS PROBLEM.

A FIVE-DAY SCHEDULED FGD MAINTENANCE OUTAGE OCCURRED DURING THE
 MONTH OF NOVEMBER. THIS OUTAGE WAS PRIMARILY SCHEDULED SO THAT THE MIST
 ELIMINATORS COULD BE CLEANED. NO OTHER FGD-RELATED OUTAGES WERE
 ENCOUNTERED DURING THE REMAINDER OF THE YEAR.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOS ANGELES DEPT OF WTR & PWR	
PLANT NAME	INTERMOUNTAIN	
UNIT NUMBER	1	
CITY	DELTA	
STATE	UTAH	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	9.	{ 0.020 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	64.	{ 0.150 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	236.	{ 0.550 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1600	
GROSS UNIT GENERATING CAPACITY - MW	841	
NET UNIT GENERATING CAPACITY W/FGD - MW	800	
NET UNIT GENERATING CAPACITY WO/FGD - MW	822	
EQUIVALENT SCRUBBED CAPACITY - MW	841	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	****	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1264.69	(2680000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.8	(280 F)
STACK HEIGHT - M	216.	(710 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	9.1	{ 30.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23725.	(10200 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****	
AVERAGE ASH CONTENT - %	10.10	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.79	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** FABRIC FILTER

NUMBER	1
TYPE	REVERSE AIR
SUPPLIER	GE ENVIRONMENTAL SERVICES
NUMBER OF COMPARTMENTS	48
NUMBER OF SPARE COMPARTMENTS	3
PARTICLE REMOVAL EFFICIENCY - %	99.5

** ESP

NUMBER	0
TYPE	N/A
SUPPLIER	N/A

** 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOS ANGELES DEPT OF WTR & PWR: INTERMOUNTAIN 1 (CONT.)

PROCESS TYPE	LIMESTONE	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.75	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	2.6	
CURRENT STATUS	1	
COMMERCIAL START-UP	6/1986	
INITIAL START-UP	2/1986	
CONTRACT AWARDED	10/1981	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** ABSORBER		
NUMBER	6	
NUMBER OF SPARES	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY	
TRADE NAME/COMMON TYPE	HORIZONTAL SPRAY CHAMBER	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NR	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NR	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BUTYL	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	5	
L/G RATIO - L/CU.M	8.0	(60.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	1264.69	(2680000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
PARTICLE REMOVAL EFFICIENCY - %	50.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA	
GENERIC TYPE	NA	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** REHEATER		
NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	NR	
PERCENT GAS BYPASSED - AVG	0.0	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** FANS		
DESIGN	NR	
FUNCTION	NA	
APPLICATION	NR	
SERVICE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
** DAMPERS		
FUNCTION	NA	
GENERIC TYPE	NA	
SPECIFIC TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	

LOS ANGELES DEPT OF WTR & PWR: INTERMOUNTAIN 1 (CONT.)

CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NA
SHELL SPECIFIC MATERIAL TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NA
DEVICE TYPE	NA
** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	3
FEED STREAM CHARACTERISTICS	10% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	3
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	NA
PROPRIETARY PROCESS	NA
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NA
SITE DIMENSIONS	300 ACRES
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
SOURCE OF MAKEUP WATER	COOLING TOWER

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

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

2/86 SYSTEM

672

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATIONS OF THE INTERMOUNTAIN 1
FGD SYSTEM COMMENCED IN FEBRUARY 1986.

3/86 SYSTEM

774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOS ANGELES DEPT OF WTR & PWR: INTERMOUNTAIN 1 (CONT.)

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

4/86	SYSTEM							720
5/86	SYSTEM							774
6/86	SYSTEM							720

** PROBLEMS/SOLUTIONS/COMMENTS

STARTUP AND DEBUGGING OPERATIONS WERE CONDUCTED FOR APPROXIMATELY 5 MONTHS WITH THE PLANT BEING DECLARED COMMERCIAL IN JUNE 1986.

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 UNIT OUTAGES RELATED TO FGD PROBLEMS WERE ENCOUNTERED DURING THE YEAR 1986. COMPLIANCE TESTING ON THE UNIT IS SCHEDULED FOR MAY 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 NO MAJOR FGD-RELATED UNIT OUTAGES WERE ENCOUNTERED DURING 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOS ANGELES DEPT OF WTR & PWR	
PLANT NAME	INTERMOUNTAIN	
UNIT NUMBER	2	
CITY	DELTA	
STATE	UTAH	
REGULATORY CLASSIFICATION	A	
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	3000	
GROSS UNIT GENERATING CAPACITY - MW	841	
NET UNIT GENERATING CAPACITY W/FGD - MW	800	
NET UNIT GENERATING CAPACITY WO/FGD - MW	822	
EQUIVALENT SCRUBBED CAPACITY - MW	841	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	****	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1264.69	(2680000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	137.8	(280 F)
STACK HEIGHT - M	216.	(710 FT)
STACK SHELL	NA	
STACK TOP DIAMETER - M	9.1	(30.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	23725.	(10200 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****	
AVERAGE ASH CONTENT - %	10.10	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	15.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.79	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** FABRIC FILTER		
SUPPLIER	GE ENVIRONMENTAL SERVICES	
** ESP		
NUMBER	4	
TYPE	HOT SIDE	
PARTICLE REMOVAL EFFICENCY - %	99.5	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIMESTONE	
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.75	

LOS ANGELES DEPT OF WTR & PWR: INTERMOUNTAIN 2 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	2.6	
CURRENT STATUS	1	
COMMERCIAL START-UP	7/1987	
INITIAL START-UP	3/1987	
CONTRACT AWARDED	10/1981	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** ABSORBER		
NUMBER	5	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN CROSSCURRENT SPRAY	
TRADE NAME/COMMON TYPE	HORIZONTAL SPRAY CHAMBER	
SHELL GENERIC MATERIAL	NA	
SHELL SPECIFIC MATERIAL	NA	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA	
LINER GENERIC MATERIAL	NA	
LINER SPECIFIC MATERIAL	NA	
LINER MATERIAL TRADE NAME/COMMON TYPE	NA	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	5	
INLET GAS FLOW - CU. M/S	1264.69	(2680000 ACFM)
INLET GAS TEMPERATURE - C	137.8	(280 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
PARTICLE REMOVAL EFFICIENCY - %	50.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA	
GENERIC TYPE	NA	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** REHEATER		
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** FANS		
DESIGN	NR	
FUNCTION	NA	
APPLICATION	NR	
SERVICE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
** DAMPERS		
FUNCTION	NA	
GENERIC TYPE	NA	
SPECIFIC TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
LINER GENERIC MATERIAL TYPE	NA	
LINER SPECIFIC MATERIAL TYPE	NA	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NA	
SHELL SPECIFIC MATERIAL TYPE	NA	
LINER GENERIC MATERIAL TYPE	NA	
LINER SPECIFIC MATERIAL TYPE	NA	

LOS ANGELES DEPT OF WTR & PWR: INTERMOUNTAIN 2 (CONT.)

** REAGENT PREPARATION EQUIPMENT

FUNCTION	SLAKER
DEVICE	DETENTION
DEVICE TYPE	N/A

** PUMPS

SERVICE	NUMBER
-----	-----
NA	****

** SOLIDS CONCENTRATING/DEWATERING
DEVICE

NA

*** SALEABLE BYPRODUCTS

NATURE	NONE
DISPOSITION	N/A

*** SLUDGE

** TREATMENT

METHOD	FIXATION
DEVICE	NA
PROPRIETARY PROCESS	NA

** DISPOSAL

NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TREATMENT	NA

** WATER BALANCE

WATER LOOP TYPE	CLOSED
SOURCE OF MAKEUP WATER	COOLING TOWER

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

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

1/87	SYSTEM						744			

2/87	SYSTEM						672			

3/87	SYSTEM						744			

4/87	SYSTEM						720			

5/87	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATIONS OF THE INTERMOUNTAIN 2 FGD SYSTEM BEGAN IN MARCH OF 1987 WITH COMMERCIAL OPERATION DECLARED IN MAY 1987.

6/87	SYSTEM						720			

7/87	SYSTEM						744			

8/87	SYSTEM						744			

9/87	SYSTEM						720			

10/87	SYSTEM						744			

LOS ANGELES DEPT OF WTR & PWR: INTERMOUNTAIN 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
11/87	SYSTEM								720		
12/87	SYSTEM								744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM OR UNIT SINCE COMMERCIAL OPERATION BEGAN AND THAT THE FGD SYSTEM WAS ACHIEVING HIGH PERFORMANCE AVAILABILITIES.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	4	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(0.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992	
GROSS UNIT GENERATING CAPACITY - MW	170	
NET UNIT GENERATING CAPACITY W/FGD - MW	155	
NET UNIT GENERATING CAPACITY WO/FGD - MW	158	
EQUIVALENT SCRUBBED CAPACITY - MW	170	
*** 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	346.37	(734000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	160.0	(320 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26284.	(11300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10400-11900
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	10.0-20.0	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.8	
AVERAGE SULFUR CONTENT - %	3.87	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	RESEARCH-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	172.2	(365000 ACFM)
INLET FLUE GAS TEMPERATURE - C	160.0	(320 F)
PRESSURE DROP - KPA	0.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.0	
** PARTICLE SCRUBBER		
NUMBER	0	
GENERIC TYPE	NONE	
SPECIFIC TYPE	N/A	
TRADE NAME/COMMON NAME	N/A	
SHELL GENERIC MATERIAL	N/A	
SHELL SPECIFIC MATERIAL	N/A	
LINER GENERIC MATERIAL	N/A	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	N/A	
*** FGD SYSTEM		

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	AMERICAN AIR FILTER
A-E FIRM	FLUOR - PIONEER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	1.8
CURRENT STATUS	1
COMMERCIAL START-UP	8/1977
INITIAL START-UP	8/1976
CONTRACT AWARDED	4/1974

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	25586.0	(11000 BTU/LB)
DESIGN COAL ASH CONTENT - %	15.00	
DESIGN MOISTURE CONTENT - %	12.00	
DESIGN CHLORIDE CONTENT - %	0.07	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	304.0	

** QUENCHER/PRESATURATOR

NUMBER	2	
TYPE	WETTED WALL CONICAL FRUSTUM	
SUPPLIER	AMERICAN AIR FILTER	
INLET GAS FLOW - CU. M/S	172.24	(365000 ACFM)
INLET GAS TEMPERATURE - C	160.0	(320 F)
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	111.	(1760 GPM)
L/G RATIO - L/CU. M	0.6	(4.8 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ENTRAINED PACKING	
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	20.0 X 20.0 X 27.5	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	INORGANIC; ORGANIC	
LINER SPECIFIC MATERIAL	HYDRAULICALLY-BONDED MORTAR; INERT FLAKE-FILLED	
LINER MATERIAL TRADE NAME/COMMON TYPE	PRE-KRETE G-8; PLASITE	
GAS CONTACTING DEVICE TYPE	PLASTIC/RUBBER MOBILE BALLS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1110.	(17625 GPM)
L/G RATIO - L/CU.M	8.1	(60.5 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	137.56	(291500 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	87.0	

** 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
CONFIGURATION	HORIZONTAL

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	1.83	(6.0 FT)
DISTANCE BETWEEN VANES - CM	3.0	(1.20 IN)
PRESSURE DROP - KPA	0.3	(1.2 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	3.7	(12.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	EVERY 16 MIN.	
WASH RATE - L/S	5.0	(80 GAL/MIN)
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	AMERICAN STANDARD	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	173.19	(367000 ACFM)
FLUE GAS TEMPERATURE - C	162.8	(325 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	173.19	(367000 ACFM)
FLUE GAS TEMPERATURE - C	162.8	(325 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	20	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
MANUFACTURER	AMERICAN AIR FILTER	
MODULATION	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLotine	
SPECIFIC TYPE	TOP-ENTRY GUILLotine/SEAL AIR	
MANUFACTURER	AMERICAN AIR FILTER	
MODULATION	OPEN/CLOSED	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLotine	
SPECIFIC TYPE	TOP-ENTRY GUILLotine/SEAL AIR	
MANUFACTURER	AMERICAN AIR FILTER	
MODULATION	OPEN/CLOSED	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE/SEAL AIR
MANUFACTURER	AMERICAN AIR FILTER
MODULATION	OPEN/CLOSED
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** 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	INERT FLAKE-FILLED VINYL ESTER
** DUCTWORK	
LOCATION	OUTLET FROM REHEATER 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
** 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	GRINDING OF SOLIDS FOUND IN BARGE DELIVERED CARB
DEVICE	BALL MILL
DEVICE TYPE	TUBE MILL
NUMBER	1
NUMBER OF SPARES	0
PRODUCT QUALITY - % SOLIDS	25.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	2
LIME SLURRY HOLD TANK	1
RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	6
THICKENER UNDERFLOW	2
THICKENER OVERFLOW	2
LIME SLURRY FEED	2
BLEED	4
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	85.0 DIA X 14.0

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

SHELL GENERIC MATERIAL TYPE	CARBON STEEL
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	245 GPM, 25% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	185 GPM
OUTLET STREAM DISPOSITION	VACUUM FILTER
OVERFLOW STREAM DISPOSITION	LIME HOLD TANK & REACTION TANKS
*** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
CONFIGURATION	CIRCULAR
CAPACITY	500 GPM
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	N/A
BELT SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	5.7 (6.3 TPH)
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - %	60.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING
SITE SERVICE LIFE - YRS	10
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	RECYCLE LIQUOR
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	PH 6.1-6.2 AT OUTLET & 8.5 AT INLET TO ABSORBER
MONITOR LOCATION	REACTION TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN/CLOSED
RECEIVING WATER STREAM	OHIO RIVER
MAKEUP WATER ADDITION - LITERS/S	6.3 (100 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	BETZ POLYFLOC 1100
PRINCIPAL CONSTITUENT	CAOH ₂
SOURCE/SUPPLIER	AIRCO
CONSUMPTION	15000 LB/HR DRY CA'OH ₂ AT FULL LOAD
UTILIZATION - %	100.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

POINT OF ADDITION	RECYCLE TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	0.0
THICKENER - %	0.0
VACUUM FILTER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
BALL MILL	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	0.0
THICKENER	0.0
VACUUM FILTER	0.0

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR	
8/76	SYSTEM	92.3	90.0	91.0	89.5	87.00	99.00	744	740	666	65.0

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME DURING THE MONTH WAS DUE PRIMARILY TO EQUIPMENT INSPECTIONS, REPAIR/REPLACEMENT OF AUXILIARY MOTOR PARTS, AND DEPLETION OF ABSORBENT SUPPLY BECAUSE OF A LATE BARGE DELIVERY.

THE SCRUBBING SYSTEM HAS BEEN GENERALLY OPERATING AT APPROXIMATELY 50 TO 80% FLUE GAS CAPACITY.

SOME MINOR PROBLEMS HAVE BEEN ENCOUNTERED WITH AUXILIARY EQUIPMENT MOTORS

SOME MINOR PROBLEMS HAVE BEEN ENCOUNTERED WITH SPRAY NOZZLES IN THE MOBIL BED CONTACTOR. THE SPRAY NOZZLES ARE SPINNER-VANE COMPONENTS ORIGINALLY CONSTRUCTED OF PLASTIC. OPERATING TEMPERATURES AND PRESSURES HAVE CAUSED THE PLASTIC HOUSING TO EXPAND RESULTING IN THE VANES EXTRUDING OUT THE FRONT END, SUBSEQUENTLY CAUSING A BLOCKAGE OF THE SLURRY FEED. THE NOZZLES HAVE BEEN REPLACED WITH CERAMIC CONSTRUCTED COMPONENTS.

9/76	SYSTEM	91.5	90.0	90.5	90.0	88.00		720	720	648	62.0
10/76	SYSTEM	92.6	90.0	90.7	72.6	90.00		744	600	540	51.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OUT OF SERVICE ON OCTOBER 25, 1976 TO IMPLEMENT ADDITIONAL MODIFICATIONS TO THE SCRUBBING SYSTEM. MAJOR SYSTEM MODIFICATIONS INCLUDE INCREASING PUMP CAPACITY AND DECREASING PRESSURE DROP. THESE TWO PROBLEMS HAVE HINDERED OPERATION OF THE UNIT AT FULL LOAD CAPACITY.

11/76	SYSTEM	96.0	95.0	94.0	79.2	89.00		720	600	570	52.0
12/76	SYSTEM	92.0	90.0	93.0	72.3	85.00		744	598	538	53.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OPERATED ON CARBIDE LIME DURING THE NOVEMBER-DECEMBER PERIOD.

1/77	SYSTEM	42.0	37.7	40.0	33.7	86.00		744	666	251	32.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 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

DUE TO OHIO RIVER FREEZE UP BARGE DELIVERIES OF LIME CEASED CAUSING
 THE FGD SYSTEM TO BE TAKEN OFF LINE ON JANUARY 12.

2/77 SYSTEM 100.0 1.2 672 0 8 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY, THE SCRUBBER WAS ONLY OPERATED FOR TWO 4-HOUR PERIODS
 TO PREVENT TOTAL FREEZE-UP.

3/77 SYSTEM 91.0 82.9 76.0 48.1 744 432 358 51.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER CAME BACK ON-LINE ON MARCH 14, 1977.

DC POWER SUPPLY TO THE BYPASS DAMPER FAILED. THE SCRUBBER SYSTEM WAS
 BYPASSED WHILE REPAIRS WERE MADE.

4/77 SYSTEM 95.0 92.7 92.0 60.0 720 466 432 49.0

5/77 SYSTEM 0.0 744 0

6/77 SYSTEM 0.0 720 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS DOWN FOR MODIFICATIONS FROM APRIL 19 TO JULY 17,
 1977.

A CHEVRON TYPE MIST ELIMINATOR WAS INSTALLED DURING THE OUTAGE.

A NEW SPRAY HEADER WAS ADDED TO INCREASE THE L/G RATIO DURING THE OUTAGE.

DIRECT OIL-FIRED REHEAT WAS ADDED.

THE LINING IN THE SYSTEM FROM THE MIST ELIMINATOR TO THE STACK WAS RE-
 PLACED WITH PLASITE 4005 (THE ORIGINAL LINING WAS BUBBLING, BUT HAD NOT
 YET FAILED, FAILURE SEEMED IMMINENT WITHIN 4-5 MONTHS). THE NEW LINING
 WAS INSTALLED BY GENERAL COATINGS.

7/77 SYSTEM 95.0 90.0 90.0 43.5 744 360 324 36.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS PLACED BACK IN SERVICE ON JULY 17, 1977 AFTER SYSTEM
 MODIFICATIONS WERE COMPLETED.

8/77 SYSTEM 79.0 89.5 90.0 79.0 744 657 588 60.0

9/77 SYSTEM 98.9 99.1 99.0 72.8 720 529 524 59.0

** PROBLEMS/SOLUTIONS/COMMENTS

COMPLIANCE TESTING OCCURED DURING AUGUST AND SEPTEMBER 1977 BY EPA
 PERSONNEL AND WAS OFFICIALLY APPROVED TO HAVE ACHIEVED COMPLIANCE.

10/77 SYSTEM 98.1 97.8 99.0 89.0 744 677 662 51.0

11/77 SYSTEM 69.9 94.0 94.0 62.9 720 483 453 53.0

12/77 SYSTEM 85.0 85.0 100.0 81.7 744 715 608 48.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER, "AIRCO", THE LIME SUPPLIER, HAD 1200 FT OF THEIR FEED LINE FREEZE UP CAUSING LIME TO BECOME UNAVAILABLE FOR A SHORT TIME.

1/78	SYSTEM	66.4	66.6	87.0	66.4	744	742	494	50.0
2/78	SYSTEM	100.0			0.0	672	0	0	0.0
3/78	SYSTEM	100.0	33.5	35.0	33.5	744	744	249	52.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN THE ENTIRE MONTH OF FEBRUARY DUE TO A COAL SHORTAGE AND A LACK OF AVAILABLE LIME RESULTING FROM THE SEVERE WINTER WEATHER. THE UNIT CAME BACK ON LINE MARCH 21, 1978.

4/78	SYSTEM	100.0	100.0	100.0	42.1	720	303	303	51.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN PART OF APRIL FOR REPAIRS.

5/78	SYSTEM	31.0	32.7	35.0	15.5	744	352	115	42.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN AGAIN DURING PART OF MAY FOR REPAIRS.

DURING THE MAY BOILER OUTAGE A NUMBER OF MODIFICATIONS WERE MADE TO THE DAMPERS IN THE FGD SYSTEM.

6/78	SYSTEM	99.3	99.3	99.3	99.3	720	720	715	50.0
7/78	SYSTEM	98.8	98.7	98.7	91.1	744	687	678	44.0
8/78	SYSTEM	100.0	94.2	96.0	94.2	744	744	701	53.0
9/78	SYSTEM	100.0	100.0	100.0	19.2	720	138	138	31.0

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO FGD FORCED OUTAGES DURING THE AUGUST-SEPTEMBER PERIOD.

THE BOILER WENT DOWN IN SEPTEMBER AFTER 138 HOURS OF OPERATION FOR TUBE REPAIRS.

10/78	SYSTEM	100.0			0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER REMAINED OFF LINE DURING OCTOBER FOR CONTINUATION OF THE TUBE REPAIRS.

11/78	SYSTEM	100.0	97.2	98.0	58.3	720	432	420	36.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM CAME BACK ON LINE DURING THE SECOND WEEK OF NOVEMBER WITH NO OPERATIONAL PROBLEMS REPORTED FOR THE FGD SYSTEM.

12/78	SYSTEM	100.0			0.0	744	0	0	0.0

LOUISVILLE GAS & ELECTRIC: CANE RUN 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 DECEMBER A TURBINE BECAME UNOPERATIONAL. THE UNIT IS EXPECTED
 TO BE OFF LINE UNTIL APRIL.

1/79	SYSTEM	100.0			0.0	744	0	0	0.0
2/79	SYSTEM	100.0			0.0	672	0	0	0.0
3/79	SYSTEM	100.0			0.0	744	0	0	0.0
4/79	SYSTEM	100.0			0.0	720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT DID NOT OPERATE DURING THESE MONTHS BECAUSE THE BOILER WAS STILL
 DOWN FOR TURBINE REPAIR AND TUBE LEAK REPAIRS.

5/79	SYSTEM	100.0			0.0	744	0	0	0.0
6/79	SYSTEM	100.0	46.2	46.2	17.1	720	266	123	34.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED DOWN DURING MAY FOR CONTINUED TURBINE AND BOILER TUBE
 REPAIRS. THE UNIT WAS PLACED BACK IN SERVICE IN JUNE.

7/79	SYSTEM	98.0	98.7	97.0	93.0	744	701	692	62.0
8/79	SYSTEM	92.0	89.2	89.0	89.2	744	744	664	61.0
9/79	SYSTEM		0.0		0.0	720	168	0	36.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY MAJOR PROBLEMS OCCURRED DURING SEPTEMBER. TUBE FAILURES WERE
 ENCOUNTERED CAUSING THE BOILER OUTAGE AND MECHANICAL FAILURE WITH THE
 DAMPER GATES CAUSED THE SCRUBBER TO BE OFF LINE DURING THE MONTH.

10/79	SYSTEM	72.0	30.1	70.0	12.0	744	296	89	39.0
11/79	SYSTEM	96.0	93.9	94.0	58.1	720	445	418	42.0
12/79	SYSTEM	91.0	38.5	38.0	20.2	744	390	150	40.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER 1979 THERE WERE NO MAJOR PROBLEMS. THE LOW
 SCRUBBER HOURS WERE A RESULT OF NECESSARY MAINTENANCE.

1/80	SYSTEM	100.0	100.0	99.0	95.6	744	711	711	53.0
2/80	SYSTEM	100.0	99.8	99.0	66.7	696	465	464	41.0
3/80	SYSTEM	82.0	80.5	80.0	74.3	744	687	553	55.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED FOR THE FIRST QUARTER OF 1980
 WITH EITHER THE BOILER OR THE FGD SYSTEM.

4/80	SYSTEM	99.0	98.8	98.8	79.9	720	582	575	48.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 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 APRIL SPRAY PUMP PROBLEMS CAUSED SEVEN HOURS OF OUTAGE TIME.

5/80	SYSTEM	96.8	100.0	100.0	7.0	744	52	52	10.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS NOT NEEDED MOST OF MAY, THIS ACCOUNTS FOR THE LOW UTILIZATION OF THE FGD SYSTEM.

ONE DAY OF OUTAGE TIME IN MAY WAS CAUSED BY A LEAK IN A SPRAY PUMP SEAL.

6/80	SYSTEM	0.0	0.0		0.0	720	350	0	32.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING PART OF JUNE THE BOILER WAS ON RESERVE, IN WHICH TIME THE SCRUBBER DUCTWORK AND LININGS WERE REPAIRED.

REPAIRS WERE MADE TO MODULE LININGS AND DUCTWORK. DUCTWORK REPAIRS/ REPLACEMENTS WERE MADE WITH 316 SS.

ALSO DURING THE DOWN TIME THE EXPANSION JOINT LOCATED AT THE DISCHARGE OF THE BOOSTER PUMP WAS REPLACED.

7/80	A	85.7	92.8	92.8	85.7				
	B	85.7	92.8	92.8	85.7				
	SYSTEM	85.7	92.8	92.8	85.7	744	687	638	58.0

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WERE ENCOUNTERED WITH THE OIL REHEAT SYSTEM DURING JULY.

SPRAY PUMP AND VALVE FAILURES ENCOUNTERED DURING THE MONTH ACCOUNTED FOR SOME OF THE FGD SYSTEM DOWN TIME.

8/80	SYSTEM	100.0	99.3	99.3	76.9	744	576	572	50.0

9/80	SYSTEM	100.0	100.0	100.0	35.7	720	257	257	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR OUTAGES OCCURRED DURING AUGUST AND SEPTEMBER.

10/80	SYSTEM	100.0	100.0	100.0	82.1	744	611	611	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/80	SYSTEM	71.8	52.8	52.8	35.2	720	572	254	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER DUCTWORK FAILURE CAUSED SOME OUTAGE TIME.

ALSO DURING THE MONTH PROBLEMS WERE ENCOUNTERED WHEN THE MIST ELIMINATORS FAILED.

12/80	SYSTEM	100.0	100.0	100.0	76.8	744	572	572	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 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 DECEMBER THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS OCCURRED

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
1/81	SYSTEM	81.0	81.0	81.0	81.0		744	744	604	35.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE FGD SYSTEM WAS OUT OF SERVICE APPROXIMATELY 140 HOURS DUE TO A LACK OF AVAILABLE TIME.

2/81	SYSTEM	0.0	0.0	0.0	0.0		672	268	0	35.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE FGD SYSTEM WAS NOT AVAILABLE DUE TO MIST ELIMINATOR AND DUCTWORK PROBLEMS.

3/81	SYSTEM	100.0	100.0	100.0	39.0		744	290	290	35.0	

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/81	SYSTEM	100.0			0.0		720	0	0	0.0	

5/81	SYSTEM	100.0			0.0		744	0	0	0.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTHS OF APRIL AND MAY THE UNIT DID NOT OPERATE. HOWEVER, THE FGD SYSTEM WAS AVAILABLE 100%.

6/81	SYSTEM	84.2	80.4	80.4	63.6		720	570	458	50.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JUNE THE PUMP PIT WAS SUBMERGED IN SLURRY.

7/81	SYSTEM	72.6	100.0	100.0	72.6		744	540	540	50.0	

8/81	SYSTEM	39.9	65.9	65.9	39.9		744	451	297	50.0	

9/81	SYSTEM	60.8	100.0	100.0	60.8		720	438	438	50.0	

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER MODULE PLUGGING ACCOUNTED FOR THE MAJORITY OF THE FGD SYSTEM OUTAGE TIME DURING THE THREE MONTH PERIOD.

10/81	SYSTEM	65.4	93.3	93.3	65.4		744	522	487	40.0	

11/81	SYSTEM	99.3	99.6	99.6	99.3		720	718	715	40.0	

12/81	SYSTEM	65.4	100.0	100.0	65.4		744	487	487	40.0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1981.

1/82	SYSTEM	11.0	4.0	4.0	3.0		744	557	22	54.0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
LOUISVILLE GAS & ELECTRIC: CANE RUN 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 JANUARY, LOW SYSTEM DEPENDABILITY PARAMETERS WERE DUE TO COLD WEATHER FREEZING THE MOBILE BALLS AND PLUGGING THE MOBILE BED CONTACTOR.

2/82	SYSTEM	0.0	0.0	0.0	0.0	672	0	0	50.0
3/82	SYSTEM	100.0	100.0	100.0	52.8	744	393	393	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

FROM JANUARY 24 TO MARCH 8 THE UNIT AND MODULES WERE DOWN FOR GENERAL REPAIRS.

4/82	SYSTEM	97.1	96.4	96.4	70.6	720	527	506	50.0
5/82	SYSTEM	92.3	91.2	91.2	79.2	744	649	592	50.0
6/82	SYSTEM	94.6	93.8	93.8	81.7	720	627	588	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

7/82	SYSTEM	74.7	81.5	81.5	74.7	744	682	556	50.0
8/82	SYSTEM	57.4	83.6	83.6	57.4	744	511	427	50.0
9/82	SYSTEM	71.0	94.6	94.6	71.0	720	540	511	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

REPAIRS ON THE ABSORBER MOBILE BED CONTACTORS RESULTED IN OUTAGE TIME DURING THE PERIOD OF JULY, AUGUST AND SEPTEMBER, 1982.

DUCTWORK REPAIRS ALSO ACCOUNTED FOR OUTAGE TIME DURING THE MONTHS OF JULY, AUGUST AND SEPTEMBER 1982.

10/82	SYSTEM	61.6	98.7	98.7	61.6	744	464	458	50.0
11/82	SYSTEM	75.6	99.8	99.8	75.6	720	545	544	50.0
12/82	SYSTEM	84.9	100.0	100.0	84.9	744	632	632	50.0
1/83	SYSTEM	72.3	99.1	99.1	72.3	744	543	538	50.0
2/83	SYSTEM	48.1	99.4	99.4	48.1	672	325	323	50.0
3/83	SYSTEM	57.5	95.5	95.5	57.5	744	448	428	50.0
4/83	SYSTEM	19.7	100.0	100.0	19.7	720	142	142	50.0
5/83	SYSTEM	16.1	97.6	97.6	16.1	744	123	120	50.0
6/83	SYSTEM	74.0	100.0	100.0	74.0	720	533	533	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF APRIL THROUGH JUNE 1983.

7/83	SYSTEM	100.0			0.0	744	0	0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

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

8/83	SYSTEM	100.0			0.0		744	0	0	
9/83	SYSTEM	100.0	91.7	91.7	3.1		720	24	22	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1983.

10/83	SYSTEM	100.0	99.3	99.3	55.1		744	413	410	
11/83	SYSTEM	100.0	99.4	99.4	50.1		720	363	361	
12/83	SYSTEM	39.9	36.5	36.5	18.5		744	364	133	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM						744			
11/84	SYSTEM						720			
12/84	SYSTEM						744			

** 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			
6/85	SYSTEM						720			
7/85	SYSTEM						744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER FGD HOURS HOURS	CAP. FACTOR
8/85	SYSTEM							744		
9/85	SYSTEM							720		
10/85	SYSTEM							744		
11/85	SYSTEM							720		
12/85	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM WAS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS.

THE CANE RUN 4 LIME FGD SYSTEM WILL BE THE LAST OF THE SEVEN SYSTEMS TO UNDERGO MODIFICATIONS. DESIGN AND ENGINEERING WORK IS REPORTED TO BE 30-40% COMPLETE. MODIFICATIONS INCLUDE NEW DUCTWORK, NEW SLURRY PREPARATION AND HANDLING SYSTEM, CONVERSION OF AAF MOBILE BED ABSORBERS TO SPRAY TOWER DESIGN, THE ELIMINATION OF REHEAT, ADDITION OF WET FLUE (EXISTING STACK WILL BE USED), AND REPLACEMENT (WHERE POSSIBLE) OF LOUVRE DAMPERS WITH GUILLOTINE DAMPERS. THE MODIFICATIONS ARE SCHEDULED TO COMMENCE IN SEPTEMBER 1987 AND LAST APPROXIMATELY 12 TO 14 MONTHS. THE UNIT/FGD WAS OPERATIONAL IN 1985 AND IS SCHEDULED TO CONTINUE TO OPERATE UNTIL THE SCHEDULED OUTAGE PERIOD.

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

CANE RUN UNIT 4 OPERATED VERY LITTLE DURING 1986. FOR THIS REASON, FGD OPERABILITY WAS REPORTED TO BE 95.5%. THIS IS THE LAST REMAINING UNIT TO UNDERGO MODIFICATION. THE WORK IS SCHEDULED TO COMMENCE IN SEPTEMBER 1987 AND LAST APPROXIMATELY 12 TO 14 MONTHS.

1/87	SYSTEM							744		
2/87	SYSTEM							672		

UTILITY FGD SURVEY: JANUARY ~ DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 4 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
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	9999 999.9

** PROBLEMS/SOLUTIONS/COMMENTS

CANE RUN 4 WAS SHUT DOWN IN SEPTEMBER OF 1987 FOR MAJOR MODIFICATIONS.
THE UNIT WILL COME BACK ON LINE IN JUNE OF 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	5	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(0.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992	
GROSS UNIT GENERATING CAPACITY - MW	181	
NET UNIT GENERATING CAPACITY W/FGD - MW	167	
NET UNIT GENERATING CAPACITY WO/FGD - MW	170	
EQUIVALENT SCRUBBED CAPACITY - MW	181	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	RILEY STOKER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	CYCLING	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	349.21	(740000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	76.	(250 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	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10400-11900
AVERAGE ASH CONTENT - %	13.90	
RANGE ASH CONTENT - %	10.0-20.0	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.8	
AVERAGE SULFUR CONTENT - %	3.80	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** ESP

NUMBER	2	
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	148.9	(300 F)
PRESSURE DROP - KPA	0.0	(0. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.0	

** 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	FLUOR - PIONEER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	1.7
CURRENT STATUS	1
COMMERCIAL START-UP	7/1978
INITIAL START-UP	12/1977
CONTRACT AWARDED	4/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	25586.0	(11000 BTU/LB)
DESIGN COAL ASH CONTENT - %	15.00	
DESIGN MOISTURE CONTENT - %	12.00	
DESIGN CHLORIDE CONTENT - %	0.07	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	304.0	

** QUENCHER/PRESATURATOR

NUMBER	0

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	32.0 X 22.5	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	STAINLESS STEEL	
LINER SPECIFIC MATERIAL	AUSTENITIC	
LINER MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	3	
LIQUID RECIRCULATION RATE - LITER/S	1103.	(17500 GPM)
L/G RATIO - L/CU.M	9.0	(67.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	123.17	(261000 ACFM)
INLET GAS TEMPERATURE - C	52.2	(126 F)
SO2 REMOVAL EFFICIENCY - %	85.0	
PARTICLE REMOVAL EFFICIENCY - %	76.0	

** 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	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	3	
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.1	(7.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	RIVER	
WASH FREQUENCY	ONCE PER SHIFT	

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

WASH RATE - L/S	5.0	(80 GAL/MIN)
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	165.16	(350000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
FUNCTION	BOOSTER	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS TEMPERATURE - C	68.3	(155 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
MANUFACTURER	COMBUSTION ENGINEERING	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL/STAINLESS STEEL 'BLADES!	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
MANUFACTURER	COMBUSTION ENGINEERING	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL/STAINLESS STEEL 'BLADES!	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	2	
FUNCTION	SHUT-OFF	
GENERIC TYPE	LOUVER	
MANUFACTURER	COMBUSTION ENGINEERING	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL/STAINLESS STEEL 'BLADES!	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	INLET TO ABSORBER & OUTLET FROM REHEATER	
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 FROM ABSORBER 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	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	WET BALL MILL	
DEVICE TYPE	TUBE MILL	
NUMBER	1	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

NUMBER OF SPARES	0
PRODUCT QUALITY - % SOLIDS	25.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	2
REAGENT PREP PRODUCT	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	2
LIME FEED	2
THICKENER UNDERFLOW	2
WATER RECYCLE	2
MIST ELIMINATOR WASH	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	110.0 DIA
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	7% SOLIDS
OUTLET STREAM CHARACTERISTICS	250 GPM, 25% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	250 GPM
OUTLET STREAM DISPOSITION	VACUUM FILTER
OVERFLOW STREAM DISPOSITION	RECYCLE TANK AND THEN REACTION TANK
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
CONFIGURATION	CIRCULAR
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	NR
BELT SPECIFIC MATERIAL TYPE	NR
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	25% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	14.3 (15.7 TPH)
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC!
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

SITE SERVICE LIFE - YRS	10
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	ABSORBER RECYCLE LINE
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	PH 9 AT OUTLET & PH 5.4-5.6 AT INLET TO RECYCLE
MONITOR LOCATION	REACTION TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN/CLOSED
RECEIVING WATER STREAM	OHIO RIVER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	CARBIDE LIME
PRINCIPAL CONSTITUENT	CAOH ₂
SOURCE/SUPPLIER	AIRCO
CONSUMPTION	137,000 TPY
UTILIZATION - %	95.0
POINT OF ADDITION	SLURRY FEED TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	0.0
THICKENER - %	0.0
VACUUM FILTER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
BALL MILL	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	0.0
THICKENER	0.0
VACUUM FILTER	0.0

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

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

12/77 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATION OF THE FGD SYSTEM, ON A TRIAL BASIS, BEGAN ON DECEMBER 29, 1977. INITIAL OPERATIONS WERE NOT CONTINUOUS AND THE SYSTEM WAS TAKEN OFF LINE FOR NECESSARY MODIFICATIONS.

1/78 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

MODIFICATIONS, ESPECIALLY TO CONTROLS THAT WERE NOT OPERATING PROPERLY, CONTINUED THROUGH JANUARY AND THE FGD SYSTEM REMAINED OFF LINE.

2/78 SYSTEM 672

3/78 SYSTEM 60.0 50.0 50.0 12.2 744 182 91 27.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
LOUISVILLE GAS & ELECTRIC: CANE RUN 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 PLANT REMAINED OFF LINE THROUGHOUT FEBRUARY AND RESTARTED ON MARCH 24.

VARIOUS INITIAL START-UP PROBLEMS WERE STILL BEING ENCOUNTERED CAUSING FGD SYSTEM OUTAGES.

4/78	SYSTEM	100.0	96.9	96.0	90.0	720	669	648	52.0
5/78	SYSTEM	91.0	84.3	84.0	48.9	744	432	364	36.0

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM MODIFICATIONS WERE MADE DURING THE APRIL-MAY PERIOD IN PREPARATION FOR PERFORMANCE TESTS. THE TESTS WERE PERFORMED; HOWEVER, THE TEST METHODS WERE NOT FOLLOWED ACCURATELY AND THE DATA WAS INCONCLUSIVE.

6/78	SYSTEM	86.8	86.1	36.0	81.9	720	685	590	51.0
7/78	SYSTEM	83.1	80.1	80.0	68.0	744	632	506	48.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE STEAM REHEAT COIL INSTALLATION HAS BEEN A CHRONIC PROBLEM AREA. WELDS HAVE BEEN FAILING EVER SINCE INITIAL OPERATIONS.

8/78	SYSTEM	76.0	85.9	85.0	62.4	744	540	464	42.0
9/78	SYSTEM	96.0	79.6	79.0	67.4	720	609	485	44.0

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS CONTINUED WITH THE REHEAT COILS.

10/78	SYSTEM	96.0	96.2	95.0	68.5	744	530	510	41.0
11/78	SYSTEM	95.0	93.7	94.0	32.9	720	253	237	40.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUTDOWN IN NOVEMBER FOR REPAIRS TO THE STEAM REHEATER COILS. THE OUTAGE LASTED ABOUT TWO WEEKS.

12/78	SYSTEM	52.7	46.2	46.0	40.6	744	654	302	47.0
1/79	SYSTEM	69.6	67.2	67.0	62.8	744	693	467	42.0
2/79	SYSTEM	77.0	70.6	70.0	50.1	672	477	337	42.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY FREEZING CAUSED PROBLEMS WITH LIME DELIVERY.

3/79	SYSTEM	77.0	71.8	71.0	57.5	744	596	428	41.0
4/79	SYSTEM	99.0	99.2	99.0	49.6	720	360	357	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

SOME PROBLEMS WERE EXPERIENCED WITH DAMPERS AND THERE WERE PUMP FAILURES.

5/79	SYSTEM	89.0	84.3	84.0	49.1	744	433	365	38.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 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

COMPLIANCE TESTING WAS AGAIN PERFORMED AT THIS UNIT ON MAY 15 AND 19 AND A SO2 REMOVAL EFFICIENCY OF 93% WAS DEMONSTRATED. THE UNIT WAS DECLARED COMMERCIAL UPON COMPLETION OF THE TESTS.

6/79	SYSTEM	81.0	77.0	77.0	58.2	720	544	419	40.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY PROBLEMS REPORTED BY THE UTILITY FOR THE MAY-JUNE PERIOD WERE SPRAY PUMP PACKING FAILURES AND WELDING FAILURES ON THE REHEATER.

7/79	SYSTEM	78.0	72.0	72.0	56.5	744	583	420	38.0
8/79	SYSTEM	90.0	88.1	88.0	72.6	744	613	540	46.0
9/79	SYSTEM	90.0	83.6	82.0	54.4	720	469	392	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE WELDING PROBLEMS WITH THE REHEATER WERE ENCOUNTERED IN JULY AND SEPTEMBER. THE FAILURES ARE CONTINUING AND ARE EXPECTED TO BE RESOLVED BY THIS WINTER.

10/79	SYSTEM	87.0	83.7	85.0	65.6	744	583	488	42.0
11/79	SYSTEM	97.0	95.2	95.0	46.4	720	351	334	41.0
12/79	SYSTEM	86.0	82.2	82.0	63.4	744	574	472	44.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER OF 1979 THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED. THE UNIT REQUIRED ONLY NORMAL MAINTENANCE.

1/80	SYSTEM	94.0	92.1	92.0	72.2	744	583	537	43.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY NO OPERATIONAL PROBLEMS WERE ENCOUNTERED.

2/80	SYSTEM	81.0	71.9	71.0	49.7	696	481	346	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

IN FEBRUARY THE UTILITY RAN OUT OF CARBIDE LIME CAUSING INTERRUPTION OF THE FGD SYSTEM OPERATION. THE UNAVAILABILITY OF LIME WAS CAUSED BY FREEZE UPS ENCOUNTERED BY AIRCO, THE LIME SUPPLIER.

3/80	SYSTEM	66.0	44.5	44.0	27.2	744	454	202	29.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM	0.0			0.0	720	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (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 FGD SYSTEM WAS OFF LINE THE ENTIRE MONTH OF APRIL TO INSTALL STAINLESS STEEL (316 SS) IN THE DUCTWORK AND IN THE MODULES.

5/80	SYSTEM	95.3	94.5	94.5	80.2	744	632	597	43.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY ONE DAY OF OUTAGE TIME WAS NECESSARY TO COMPLETE THE INSTALLATION OF THE STAINLESS STEEL IN THE DUCTWORK AND MODULES.

A PUMP SEAL ON THE RECIRCULATION PUMP FAILED CAUSING APPROXIMATELY 10 HOURS OF OUTAGE TIME.

6/80	SYSTEM	78.8	74.4	74.4	61.8	720	598	445	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SYSTEM HAD TO BE TAKEN OFF LINE FOR 153 HOURS DUE TO THE POOR WELDS ON THE TUBE BUNDLES IN THE REHEATER. THE TUBE BUNDLES HAVE BEEN A CONSTANT PROBLEM AND THE MANUFACTURER IS SCHEDULED TO REPLACE THEM IN THE FALL.

7/80	SYSTEM	78.7	87.6	87.6	78.7	744	669	586	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY THE REHEAT TUBE EXCHANGERS FAILED. TWO NEW EXCHANGERS ARE NOW ON SITE AND ARE SCHEDULED TO BE INSTALLED IN NOVEMBER OR DECEMBER 1980

A THREE DAY OUTAGE OCCURRED IN JULY DUE TO A LIMESTONE ROCK DISABLING THE THICKENER.

8/80	SYSTEM	49.6	58.4	58.4	49.6	744	632	369	50.0

9/80	SYSTEM	87.2	97.5	97.5	87.2	720	644	628	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE OUTAGE TIME DURING AUGUST AND SEPTEMBER WAS CAUSED BY A REHEAT TUBE BUNDLE FAILURE. THE BUNDLES ARE PRESENTLY BEING REPLACED IN BOTH MODULES.

10/80	SYSTEM	100.0	100.0	100.0	10.0	744	72	72	50.0

11/80	SYSTEM	100.0	100.0	100.0	25.0	720	177	177	50.0

12/80	SYSTEM	100.0	100.0	100.0	99.8	744	743	742	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1980.

1/81	SYSTEM	100.0	99.7	99.7	89.4	744	667	665	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

2/81	SYSTEM	82.0	77.0	77.0	59.0	672	512	394	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY SOME OUTAGE TIME WAS DUE TO FAN PROBLEMS.

ADDITIONAL PROBLEMS WERE ENCOUNTERED DUE TO REHEATER LEAKS.

3/81	SYSTEM	100.0	46.0	46.0	43.0		744	698	319 50.0

** PROBLEMS/SOLUTIONS/COMMENTS

OUTAGE TIME DURING MARCH WAS DUE TO STRIKING WORKERS AT THE PLANT.

4/81	SYSTEM	100.0	100.0	100.0	51.0		720	367	367 40.0

5/81	SYSTEM	100.0	95.9	95.9	92.3		744	716	687 45.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

6/81	SYSTEM	100.0			0.0		720	0	0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JUNE THE BOILER DID NOT OPERATE; HOWEVER, THE FGD SYSTEM WAS AVAILABLE 100%.

7/81	SYSTEM	45.6	100.0	100.0	45.6		744	339	339 50.0

8/81	SYSTEM	49.5	100.0	100.0	49.5		744	368	368 45.0

9/81	SYSTEM	75.0	100.0	100.0	75.0		720	540	540 45.0

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO MAJOR FGD RELATED PROBLEMS REPORTED FOR THE THIRD QUARTER 1981.

10/81	SYSTEM	93.4	100.0	100.0	57.7		744	429	429 40.0

11/81	SYSTEM	88.9	99.5	99.5	57.4		720	415	413 40.0

12/81	SYSTEM	98.6	99.4	99.4	98.6		744	738	734 40.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1981.

1/82	SYSTEM	100.0	70.4	70.4	59.1		744	625	440 39.0

2/82	SYSTEM	100.0	91.0	91.0	49.6		672	366	333 50.0

3/82	SYSTEM	100.0	83.3	83.3	57.5		744	514	428 35.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982.

4/82	SYSTEM	100.0	100.0	100.0	15.6		720	112	112 50.0

5/82	SYSTEM	100.0	100.0	100.0	80.4		744	598	598 50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/82	SYSTEM	96.2	96.0	96.0	89.0		720	668	641	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.										
7/82	SYSTEM	87.8	96.2	96.2	87.8		744	679	653	50.0
8/82	SYSTEM	86.3	100.0	100.0	86.3		744	642	642	50.0
9/82	SYSTEM	33.5	97.2	100.0	33.5		720	248	241	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JULY 1982 THROUGH SEPTEMBER 1982.										
10/82	SYSTEM	0.0			0.0		744	0	0	50.0
11/82	SYSTEM	0.0			0.0		720	0	0	50.0
12/82	SYSTEM	0.0			0.0		744	0	0	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
A UNIT OVERHAUL WAS PERFORMED DURING THE PERIOD OF OCTOBER THROUGH DECEMBER 1982 FORCING AN FGD SYSTEM OUTAGE.										
1/83	SYSTEM	61.3	100.0	100.0	61.3		744	456	456	50.0
2/83	SYSTEM	65.6	99.3	99.3	65.6		672	444	441	50.0
3/83	SYSTEM	59.5	98.7	98.7	59.5		744	449	443	50.0
4/83	SYSTEM	43.6	100.0	100.0	43.6		720	314	314	50.0
5/83	SYSTEM	89.4	99.4	99.4	89.4		744	669	665	50.0
6/83	SYSTEM	73.2	100.0	100.0	73.2		720	527	527	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF JANUARY THROUGH JUNE 1983.										
7/83	SYSTEM	69.1	100.0	100.0	69.1		744	514	514	50.0
8/83	SYSTEM	29.0	39.3	39.3	29.0		744	549	216	50.0
9/83	SYSTEM	83.6	97.6	97.6	55.4		720	409	399	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
LOW AVAILABILITY DURING THE THIRD QUARTER WAS DUE IN PART TO GENERAL REPAIRS RESULTING FROM CORROSION PROBLEMS.										
10/83	SYSTEM	10.9	100.0	100.0	2.0		744	15	15	
11/83	SYSTEM	67.6	91.2	91.0	53.2		720	420	383	
12/83	SYSTEM	44.0	45.1	45.1	25.5		744	421	190	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM										744
11/84	SYSTEM										720
12/84	SYSTEM										744

** 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
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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM IS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS. THE CANE RUN 5 LIME FGD SYSTEM IS SCHEDULED TO UNDERGO DESIGN MODIFICATIONS IN SEPTEMBER 1986 AND LAST UNTIL MARCH 1987. MODIFICATIONS INCLUDE DUCTWORK REPLACEMENT, REMOVAL OF DOWNSTREAM ABSORBER ID BOOSTER FANS, UPGRADING BOILER ID FAN CAPACITY, ADDITION OF WET FLUE (EXISTING STACK WILL BE USED), AND REPLACEMENT (WHERE POSSIBLE) OF LOUVRE DAMPERS WITH GUILLOTINE DAMPERS. THE UNIT/FGD WAS OPERATIONAL IN 1985 AND IS SCHEDULED TO CONTINUE TO OPERATE UNTIL THE SCHEDULED SEPTEMBER 1986 OUTAGE DATE.										
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	
** PROBLEMS/SOLUTIONS/COMMENTS										
CANE RUN UNIT 5 OPERATED VERY LITTLE DURING THE JANUARY THROUGH AUGUST 1986 PERIOD. FGD OPERABILITY WAS REPORTED TO BE 95.8%.										
9/86	SYSTEM								720	
10/86	SYSTEM								774	
11/86	SYSTEM								720	
12/86	SYSTEM								774	
** PROBLEMS/SOLUTIONS/COMMENTS										
FGD MODIFICATION WORK ON UNIT 5 COMMENCED IN SEPTEMBER 1986 AND IS SCHEDULED TO BE COMPLETED BY FEBRUARY 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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 5 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
7/87	SYSTEM							744	
8/87	SYSTEM							744	
9/87	SYSTEM							720	
10/87	SYSTEM							744	
11/87	SYSTEM							720	
12/87	SYSTEM							744	999.9

** PROBLEMS/SOLUTIONS/COMMENTS

CANE RUN 5 COMMENCED OPERATION IN MARCH OF 1987 AFTER A SCHEDULED OUTAGE FOR MODIFICATIONS. OPERABILITY FOR THE PERIOD MARCH THROUGH DECEMBER WAS 91.2%. THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS FOR THE YEAR 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	CANE RUN	
UNIT NUMBER	6	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	50.	(0.116 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	992	
GROSS UNIT GENERATING CAPACITY - MW	260	
NET UNIT GENERATING CAPACITY W/FGD - MW	239	
NET UNIT GENERATING CAPACITY WO/FGD - MW	242	
EQUIVALENT SCRUBBED CAPACITY - MW	260	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	502.57	(1065000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	158.	(518 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	4.9	(16.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	25586.	(11000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10400-11900
AVERAGE ASH CONTENT - %	17.06	
RANGE ASH CONTENT - %	15.5-24.5	
AVERAGE MOISTURE CONTENT - %	8.95	
RANGE MOISTURE CONTENT - %	8.0-10.8	
AVERAGE SULFUR CONTENT - %	4.80	
RANGE SULFUR CONTENT - %	3.5-6.3	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	0.03-0.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
TYPE	COLD SIDE	
INLET FLUE GAS CAPACITY - CU.M/S	251.8	(533500 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	DUAL ALKALI
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	FLUOR - PIONEER
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00
ENERGY CONSUMPTION - %	1.2
CURRENT STATUS	1
COMMERCIAL START-UP	4/1979
INITIAL START-UP	4/1979
CONTRACT AWARDED	10/1976

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	*****

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	2
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	THYSSEN/CEA
DIMENSIONS - FT	32.0 DIA X 45.0
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	ASTM A-283
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	STAINLESS STEEL
LINER SPECIFIC MATERIAL	AUSTENITIC
LINER MATERIAL TRADE NAME/COMMON TYPE	TYPE 317L
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS
NUMBER OF CONTACTING ZONES	2
LIQUID RECIRCULATION RATE - LITER/S	272. (4318 GPM)
L/G RATIO - L/CU.M	1.3 (10.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5 (9.9 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.7 (9.0 FT/S)
INLET GAS FLOW - CU. M/S	251.29 (532500 ACFM)
INLET GAS TEMPERATURE - C	148.9 (300 F)
SO2 REMOVAL EFFICIENCY - %	94.2

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4
FREEBOARD DISTANCE - M	1.52 (5.0 FT)
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7 (9.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPROPYLENE

** FANS

NUMBER	2
DESIGN	CENTRIFUGAL
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	251.52 (533000 ACFM)

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

FLUE GAS TEMPERATURE - C	148.9	(300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** 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 TO STACK	
SHELL GENERIC MATERIAL TYPE	CARBON STEEL	
SHELL SPECIFIC MATERIAL TYPE	AISI 1110	
** DUCTWORK		
LOCATION	BYPASS/TRANSITION DUCT	
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	NR	
DEVICE	NR	
DEVICE TYPE	NR	
** TANKS		
SERVICE	NUMBER	
-----	-----	
ABSORBER RECYCLE	2	
SECONDARY REACTION	2	
NR	****	
VACUUM FILTER FILTRATE	3	
THICKENER OVERFLOW	1	
REAGENT PREP PRODUCT	2	
** PUMPS		
SERVICE	NUMBER	
-----	-----	
REACTOR TRANSFER	2	
ABSORBER RECIRCULATION	4	
THICKENER HOLD TANK TRANSFER	2	
LIME SLURRY	2	
SODA ASH SOLUTION PUMP	2	
THICKENER UNDERFLOW	4	
VACUUM	3	
LIME SLURRY FEED	2	
VACUUM FPUMP	****	
FILTRATE SUMP	2	
SODA ASH	2	
SILENCER OVERFLOW SUMP	2	
** SOLIDS CONCENTRATING/DEWATERING		
DEVICE	VACUUM FILTER	
NUMBER	3	
NUMBER OF SPARES	1	
CAPACITY	3 TON/DAY	
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC	
BELT SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER	
FEED STREAM CHARACTERISTICS	25% SOLIDS	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

OUTLET STREAM CHARACTERISTICS	63% SOLIDS
*** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	125.0 DIA X 23.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
OUTLET STREAM CHARACTERISTICS	25% 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
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	NONE
** PROCESS CONTROL AND INSTRUMENTATION	
PHYSICAL VARIABLES	PH
MONITOR LOCATION	ABSORBER BLEED LIQUOR
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEED FORWARD
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	17.5 (278 GPM)
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	20.0
FAN - %	0.0
RECIRCULATION PUMP - %	100.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.3
FAN	0.0
RECIRCULATION PUMP	1.0

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

4/79	SYSTEM	67.0	49.9	49.0	32.9	92.00	720	475	237	37.0

** PROBLEMS/SOLUTIONS/COMMENTS

THIS UNIT STARTED OPERATING ON APRIL 4, 1979. COMPLIANCE TESTING IS SCHEDULED FOR THE WEEK OF JUNE 3.

5/79	SYSTEM	46.0	21.5	21.0	14.7	91.00	744	506	109	42.0
6/79	SYSTEM	27.0	12.3	12.0	10.3	93.00	720	601	74	47.0

LOUISVILLE GAS & ELECTRIC: CANE RUN 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

THE UTILITY REPORTED THAT THE SYSTEM IS STILL CONSIDERED IN START-UP AND THAT NO UNUSUAL PROCESS PROBLEMS HAVE BEEN ENCOUNTERED. HOWEVER THE SYSTEM IS NOW OUT OF SERVICE DUE TO THE COMPLETE FAILURE OF THE MIST ELIMINATORS. IT IS EXPECTED TO BE DOWN FOR A MONTH.

7/79	SYSTEM		0.0		0.0	744	529	0	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT DID NOT OPERATE IN JULY AS PROCEDURES CONTINUED TO REPLACE THE MIST ELIMINATORS.

8/79	SYSTEM	10.0	7.0	7.0	7.0	744	683	51	51.0

9/79	SYSTEM	70.0	60.0	60.0	44.0	720	531	317	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST AND SEPTEMBER THE UNIT DOWNTIME WAS DUE TO THE COMPLETE FAILURE OF FIVE PUMPS. THE PUMP PROBLEMS WERE THE LOSS OF THE IMPELLERS OFF OF THE SHAFTS.

10/79	SYSTEM	96.0	81.4	81.0	28.9	744	246	215	37.0

11/79	SYSTEM	96.0	97.7	97.0	63.5	720	468	457	41.0

12/79	SYSTEM	98.0	94.9	95.0	89.7	744	703	667	60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE FOURTH QUARTER OF 1979. THE UNIT REQUIRED ONLY NORMAL MAINTENANCE.

1/80	SYSTEM	86.0	49.0	49.0	13.8	744	210	103	32.0

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGE TIME IN JANUARY WAS CAUSED BY A THICKENER FAILURE. THE RAKE BECAME INOPERABLE BECAUSE OF HIGH SOLIDS AND THE THICKENER HAD TO BE CLEANED OUT.

2/80	SYSTEM	91.0	84.7	84.0	47.0	696	386	327	37.0

3/80	SYSTEM	72.0	70.0	70.0	64.5	744	686	480	51.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM	98.8	91.5	97.7	73.9	720	581	531	37.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER OUTAGES IN APRIL WERE A RESULT OF THE LOSS OF ONE OF THE BOILER FEED PUMPS AND BECAUSE THE LOAD WAS NOT NEEDED.

THE FGD OUTAGES WERE A RESULT OF HIGH BOOSTER FAN SUCTION TRIPS, REPAIRS TO THE IUCS SYSTEM, REPAIRS TO THE THICKENER UNDERFLOW LINE AND A PLANNED INSPECTION OF THE TRAYS. THE TRAY PLUGGING PROBLEM WAS SOLVED BY A SLIGHT PH ADJUSTMENT IN THE REACTORS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/80	SYSTEM	99.9	99.9	99.9	99.5		744	741	740	52.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING MAY THE PRESSURE RELIEF VALVE ON THE BOOSTER FAN MALFUNCTIONED FORCING THE FGD SYSTEM OUT OF SERVICE.										
6/80	SYSTEM	99.9	99.7	99.9	88.9		720	642	640	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
A SPRAY PUMP MALFUNCTION CAUSED THE SYSTEM TO SHUTDOWN. APPROXIMATELY ONE HOUR WAS NEEDED TO PUT THE SPARE INTO SERVICE.										
THE BOILER WAS OFF FOR REPAIRS TO THE CLINKER GRINDER AND TO REPAIR A BOILER TUBE LEAK.										
IMPROVEMENTS TO THE PH CONTROL CIRCUITRY HAVE LEAD TO IMPROVED CARBIDE LIME UTILIZATION.										
EXPERIMENTATION WITH A NEW FILTER CLOTH HAS SHOWN AN IMPROVEMENT IN SODA ASH CONSUMPTION.										
SULFUR DIOXIDE EMISSIONS AVERAGED LESS THAN 200 PPM FOR JUNE.										
7/80	SYSTEM	99.9	99.7	99.9	82.9		744	618	617	52.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE PERIOD FROM JULY 17 THROUGH JULY 28 AN ACCEPTANCE TEST WAS RUN. DURING THE TEST THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS OR OUTAGE TIME. THE AVERAGE SO2 REMOVAL EFFICIENCY DURING THE TEST WAS 93.9%.										
DURING NORMAL OPERATION IN JULY NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED.										
8/80	SYSTEM	99.3	94.6	94.6	84.5		744	665	628	50.0
9/80	SYSTEM	94.0	98.6	98.7	86.9		720	635	626	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE MONTHS OF AUGUST AND SEPTEMBER.										
10/80	SYSTEM	99.8	99.8	99.8	99.8		744	743	743	33.0
** PROBLEMS/SOLUTIONS/COMMENTS										
11/80	SYSTEM	85.1	96.8	96.8	55.1		720	409	397	33.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING OCTOBER AND NOVEMBER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.										
12/80	SYSTEM	60.0	6.0	6.0	1.9		744	240	14	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE THICKENER RACK SHAFT WAS SHEARED-OFF CAUSING THE SYSTE
 TO SHUTDOWN FOR APPROXIMATELY 226 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/81	SYSTEM	85.7	83.3	83.3	80.2		744	716	597	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY PROBLEMS WITH THE THICKENER RACK SHAFT CONTINUED TO CAUSE
 OUTAGE TIME.

2/81	SYSTEM	99.6	99.5	99.5	71.6		672	483	481	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/81	SYSTEM	99.6	34.2	34.2	28.0		744	607	208	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH OUTAGE TIME WAS DUE TO STRIKING WORKERS AT THE PLANT.

4/81	SYSTEM	95.0	98.5	100.0	82.6		720	604	595	45.0

5/81	SYSTEM	96.8	96.9	100.0	96.8		744	243	720	55.0

6/81	SYSTEM	88.9	100.0	100.0	26.5		720	191	191	45.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE SECOND QUARTER 1981.

7/81	SYSTEM	74.0	69.0	69.0	57.0		744	615	424	50.0

8/81	SYSTEM	80.0	73.0	77.0	68.0		744	693	506	50.0

9/81	SYSTEM	100.0	98.0	98.0	22.0		720	162	158	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

RUPTURE OF THE FRP THICKENER AND ABSORBER BLEED PIPE CAUSED PROBLEMS DURIN
 THE THIRD QUARTER 1981. THE UNIT IS EXPECTED TO BE REMOVED FROM SERVICE
 IN OCTOBER FOR A THREE MONTH TURBINE OVERHAUL.

10/81	SYSTEM	100.0			0.0		720	0	0	0.0

11/81	SYSTEM	100.0			0.0		720	0	0	0.0

12/81	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER THE BOILER WAS DOWN FOR A TURBINE OVERHAUL.

1/82	SYSTEM	100.0	83.5	83.5	21.9		744	195	163	17.0

2/82	SYSTEM	100.0	76.5	76.5	70.4		672	618	473	54.0

3/82	SYSTEM	100.0	93.8	93.8	68.7		744	545	511	44.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 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 UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982.

4/82	SYSTEM	100.0	99.6	100.0	68.2	720	493	491	50.0
5/82	SYSTEM	100.0	99.7	100.0	96.4	744	719	717	50.0
6/82	SYSTEM	98.6	98.3	100.0	82.6	720	605	595	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER 1982.

7/82	SYSTEM	15.2	17.1	17.1	15.2	744	661	113	50.0
8/82	SYSTEM	42.6	50.6	50.6	42.6	744	626	317	50.0
9/82	SYSTEM	60.6	86.5	86.5	60.6	720	504	436	50.0
10/82	SYSTEM	87.0	94.9	94.9	87.0	744	682	647	50.0
11/82	SYSTEM	68.6	99.8	99.8	68.6	720	495	494	50.0
12/82	SYSTEM	62.9	95.1	95.1	62.9	744	492	468	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A MIST ELIMINATOR COLLAPSED DURING THE PERIOD OF JULY THROUGH DECEMBER 1982.

1/83	SYSTEM	52.8	99.7	99.7	52.8	744	394	393	50.0
2/83	SYSTEM	0.0			0.0	672	0	0	50.0
3/83	SYSTEM	0.0			0.0	744	0	0	50.0
4/83	SYSTEM	3.3	12.0	12.0	3.3	720	200	24	50.0
5/83	SYSTEM	32.1	51.6	51.6	32.1	744	463	239	50.0
6/83	SYSTEM	38.3	52.6	52.6	38.3	720	525	276	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

A TURBINE OVERHAUL WAS PERFORMED DURING THE PERIOD OF JANUARY THROUGH JUNE 1983 ACCOUNTING FOR SOME OF THE OUTAGE TIME DURING THAT PERIOD.

THE FAILURE OF A BOOSTER FAN ACCOUNTED FOR OUTAGE TIME DURING THE PERIOD OF JANUARY THROUGH JUNE 1983.

7/83	SYSTEM	80.2	95.1	95.1	80.4	744	629	598	50.0
8/83	SYSTEM	39.5	43.6	43.6	39.5	744	675	294	50.0
9/83	SYSTEM	89.9	84.5	84.5	40.3	720	343	290	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

SLURRY PIPING REPAIRS WERE MADE DURING THE THIRD QUARTER OF 1983.

10/83	SYSTEM	60.8	93.2	93.2	40.3	744	322	300
11/83	SYSTEM	92.4	100.0	100.0	7.1	720	51	51
12/83	SYSTEM	64.5	50.2	50.2	16.5	744	245	123

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** 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
6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

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

10/85	SYSTEM						744			
11/85	SYSTEM						720			
12/85	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM IS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS.

THE CANE RUN 6 DUAL ALKALI FGD SYSTEM DESIGN MODIFICATIONS BEGAN IN AUGUST 1985 AND ARE TO BE COMPLETED BY MARCH 1, 1986. THE DESIGN MODIFICATIONS INCLUDED MODIFYING THE ABSORBER TRAYS TO ELIMINATE PLUGGING PROBLEMS, FRP PIPING REPLACED WITH RUBBER LINED CARBON STEEL, ADDITION OF WET STACK (EXISTING STACK WAS USED), REPLACEMENT (WHERE POSSIBLE) OF LOUVRE DAMPERS WITH GUILLotine DAMPERS, AND IMPROVEMENTS TO THE SLUDGE THICKENING AND DEWATERING PROCESS. THE COST OF CONVERTING THE DUAL ALKALI SYSTEM TO LIME OR LIMESTONE WAS PROHIBITIVE.

1/86	SYSTEM						774			
2/86	SYSTEM						672			
3/86	SYSTEM						774			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD MODIFICATION WORK WAS COMPLETED MARCH 1, 1986. THE UNIT AND FGD SYSTEM WAS DOWN FOR APPROXIMATELY 7 MONTHS TOTAL FOR THIS WORK.

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 PERIOD MARCH THROUGH DECEMBER, POST-MODIFICATION FGD OPERABILITY WAS REPORTED TO BE 97%. FGD SO2 REMOVAL EFFICIENCY IS NOW REPORTED TO BE GREATER THAN 90%. NO MAJOR FGD-RELATED OUTAGES WERE REPORTED.

1/87	SYSTEM						744			
2/87	SYSTEM						672			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: CANE RUN 6 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
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 9999 999.9

** PROBLEMS/SOLUTIONS/COMMENTS

CANE RUN 6 ACHIEVED AN OPERABILITY OF 96.9% FOR 1987. THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS FOR THE YEAR 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC
PLANT NAME	MILL CREEK
UNIT NUMBER	1
CITY	LOUISVILLE
STATE	KENTUCKY
REGULATORY CLASSIFICATION	E
PARTICULATE EMISSION LIMITATION - NG/J	43. (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	1084
GROSS UNIT GENERATING CAPACITY - MW	321
NET UNIT GENERATING CAPACITY W/FGD - MW	293
NET UNIT GENERATING CAPACITY WO/FGD - MW	297
EQUIVALENT SCRUBBED CAPACITY - MW	321
*** 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	660.66 (1400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	151.7 (305 F)
STACK HEIGHT - M	183. (600 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	5.8 (19.0 FT)
*** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26749. (11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10800-12100
AVERAGE ASH CONTENT - %	14.50
RANGE ASH CONTENT - %	10.0-18.0
AVERAGE MOISTURE CONTENT - %	9.00
RANGE MOISTURE CONTENT - %	8.0-10.0
AVERAGE SULFUR CONTENT - %	3.75
RANGE SULFUR CONTENT - %	3.5-4.5
AVERAGE CHLORIDE CONTENT - %	0.04
RANGE CHLORIDE CONTENT - %	.03-.06
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** FABRIC FILTER	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	2
NUMBER OF SPARES	0
TYPE	HOT SIDE
SUPPLIER	WESTERN PRECIPITATOR
INLET FLUE GAS CAPACITY - CU.M/S	330.3 (700000 ACFM)
INLET FLUE GAS TEMPERATURE - C	151.7 (305 F)
PRESSURE DROP - KPA	0.1 (1. IN-H2O)
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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	FLUOR - PIONEER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	1.2
CURRENT STATUS	1
COMMERCIAL START-UP	4/1981
INITIAL START-UP	12/1980
CONTRACT AWARDED	11/1977

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.50	
DESIGN COAL HEAT CONTENT - J/G	23260.0	(10000 BTU/LB)
DESIGN COAL ASH CONTENT - %	18.00	
DESIGN MOISTURE CONTENT - %	10.00	
DESIGN CHLORIDE CONTENT - %	0.06	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	120.0	

** QUENCHER/PRESATURATOR

NUMBER	0
TYPE	NONE

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	26.0 X 31.0	
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	3755.	(59600 GPM)
L/G RATIO - L/CU.M	11.9	(88.9 GAL/1000 ACF)
SUPERFICIAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	316.17	(670000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	86.6	

** REHEATER

NUMBER	2	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	FIN TUBE	
LOCATION	DOWNSTREAM OF ABSORBER	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	82.2	(180 F)
NUMBER OF HEAT EXCHANGER BANKS	2	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS TEMPERATURE - C	82.2 (180 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	316.17 (670000 ACFM)
FLUE GAS TEMPERATURE - C	148.9 (300 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	COMBUSTION ENGINEERING
MODULATION	OPEN/ CLOSED
SEAL AIR FLOW - CU. M/S	0.71 (1500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL 'BLADES & FRAMES!; STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	COMBUSTION ENGINEERING
MODULATION	OPEN/ CLOSED
SEAL AIR FLOW - CU. M/S	0.71 (1500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL 'BLADES & FRAMES!; STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	COMBUSTION ENGINEERING
MODULATION	OPEN/ CLOSED
SEAL AIR FLOW - CU. M/S	0.71 (1500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL 'BLADES & FRAMES!; STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

** DUCTWORK	
LOCATION	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** 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	TUBE MILL
NUMBER	1
NUMBER OF SPARES	0
PRODUCT QUALITY - % SOLIDS	25.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	1
REAGENT FEED	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	8
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	140 DIA X 15.0
CAPACITY	1050000 GAL
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	N/A
BELT SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	1120 GPM/10% SOLIDS
OUTLET STREAM CHARACTERISTICS	280 GPM/30% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	840 GPM
OUTLET STREAM DISPOSITION	VACUUM FILTER
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	5
NUMBER OF SPARES	1
CONFIGURATION	CIRCULAR
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	NR
BELT SPECIFIC MATERIAL TYPE	NR
FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	25% SOLIDS
OUTLET STREAM CHARACTERISTICS	45% SOLIDS
OUTLET STREAM DISPOSITION	PUG MILL

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

*** SALEABLE BYPRODUCTS
NATURE NONE
DISPOSITION N/A

*** SLUDGE

** TREATMENT
METHOD FIXATION
DEVICE PUG MILL
PROPRIETARY PROCESS CONVERSION SYSTEMS 'POZ-O-TEC!
INLET QUALITY - % 45.0

** DISPOSAL
NATURE FINAL
TYPE LANDFILL
LOCATION ON-SITE
SITE TRANSPORTATION METHOD TRUCK
SITE TREATMENT CLAY LINING
SITE SERVICE LIFE - YRS 10

** WATER BALANCE
WATER LOOP TYPE OPEN/CLOSED
MAKEUP WATER ADDITION - LITERS/S 125.0 (1984 GPM)

** CHEMICALS AND CONSUMPTION
FUNCTION ABSORBENT
NAME CARBIDE LIME
PRINCIPAL CONSTITUENT 90% CAOH2
SOURCE/SUPPLIER AIRCO
POINT OF ADDITION RECYCLE TANK

** FGD SPARE CAPACITY INDICES
ABSORBER - % 0.0
MIST ELIMINATOR - % 0.0
REHEATER - % 0.0
FAN - % 0.0
BALL MILL - % 0.0
EFFLUENT HOLD TANK - % 0.0
THICKENER - % 0.0
VACUUM FILTER - % 0.0

** FGD SPARE COMPONENT INDICES
ABSORBER 0.0
MIST ELIMINATOR 0.0
REHEATER 0.0
FAN 0.0
BALL MILL 0.0
EFFLUENT HOLD TANK 0.0
THICKENER 0.0
VACUUM FILTER 0.0

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

12/80 SYSTEM 45.2 98.5 98.5 44.5 90.00 744 336 331 60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS PRESENTLY IN THE STARTUP PHASE. OPERATIONS BEGAN ON
DECEMBER 17, 1980 AND NO MAJOR PROBLEMS WERE REPORTED.

1/81 SYSTEM 51.0 46.0 46.0 42.0 94.80 744 675 312 45.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL 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 JANUARY A BROKEN BLEED PUMP DISCHARGE LINES CAUSE APPROXIMATELY 363 HOURS OF OUTAGE TIME.

2/81	SYSTEM	51.5	51.5	51.5	51.5	672	346	346	50.0
3/81	SYSTEM	39.0	36.0	36.0	35.0	744	712	258	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY AND MARCH PROBLEMS WERE ENCOUNTERED DUE TO THE THICKENER PLUGGING.

ADDITIONAL OUTAGE TIME DURING MARCH WAS DUE TO STRIKING WORKERS AT THE PLANT.

4/81	SYSTEM	39.9	25.2	25.2	7.9	720	226	57	25.0
5/81	SYSTEM	46.9	60.7	60.7	21.8	744	267	162	35.0
6/81	SYSTEM	56.1	33.9	33.9	26.5	720	563	191	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER 1981 THE UTILITY REPORTED HAVING PROBLEMS WITH THE GLYCOL HEAT EXCHANGER.

7/81	SYSTEM	76.3	75.3	75.3	72.2	744	713	537	65.0
8/81	SYSTEM	99.2	99.2	99.2	98.7	744	740	734	65.0
9/81	SYSTEM	85.7	95.5	95.5	79.6	720	600	573	60.0

** PROBLEMS/SOLUTIONS/COMMENTS

ALL FGD SYSTEM DOWNTIME DURING THE THIRD QUARTER 1981 WAS ATTRIBUTED TO PROBLEMS WITH THE GLYCOL HEAT EXCHANGER ON THE REHEAT SYSTEM.

10/81	SYSTEM	39.6	41.0	41.0	39.6	720	719	295	50.0
11/81	SYSTEM	37.4	39.8	39.8	37.4	720	675	269	50.0
12/81	SYSTEM	26.1	29.1	29.1	26.1	744	666	194	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER PROBLEMS WERE ENCOUNTERED WITH THE GLYCOL HEAT EXCHANGER.

1/82	SYSTEM	4.7	6.2	6.2	4.7	744	570	36	50.0
2/82	SYSTEM	25.4	25.6	25.6	25.4	672	669	171	50.0
3/82	SYSTEM	41.3	54.9	54.9	41.3	744	560	307	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FROZEN LINES DURING THE FIRST QUARTER 1982 HINDERED THE FGD SYSTEM OPERATION.

AN ADDITIONAL PROBLEM EXPERIENCED DURING THE PERIOD WAS HEAT EXCHANGER FAILURE.

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/82	SYSTEM	96.4	63.9	63.9	6.4		720	72	46	50.0
5/82	SYSTEM	43.1	35.2	35.2	30.9		744	653	230	50.0
6/82	SYSTEM	77.9	42.2	42.2	16.2		720	277	117	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE SECOND QUARTER MAJOR PROBLEMS WERE EXPERIENCED WITH THE GLYCOL HEAT EXCHANGE.										
7/82	SYSTEM	33.5	61.5	61.5	23.4		744	283	174	50.0
8/82	SYSTEM	64.5	69.7	69.7	64.5		744	689	480	50.0
9/82	SYSTEM	75.3	75.3	75.3	75.3		720	720	542	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT PROBLEMS WITH THE GLYCOL REHEAT SYSTEM OCCURRED DURING THE MONTHS OF JULY, AUGUST AND SEPTEMBER, 1982.										
10/82	SYSTEM	47.3	49.4	49.4	47.3		744	712	352	50.0
11/82	SYSTEM	83.8	83.8	83.8	83.8		720	720	603	50.0
12/82	SYSTEM	21.2	38.6	38.6	21.2		744	409	158	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT REHEATER TUBE FAILURES CAUSED SOME OUTAGE TIME DURING THE PERIOD OF JULY THROUGH DECEMBER 1982.										
SPRAY PUMP PROBLEMS WERE ALSO REPORTED FOR THE PERIOD OF JULY THROUGH DECEMBER 1982.										
1/83	SYSTEM	40.9	43.7	43.7	40.9		744	695	304	50.0
2/83	SYSTEM	47.2	47.1	47.1	47.0		672	671	316	50.0
3/83	SYSTEM	77.2	85.6	85.6	76.5		744	665	569	50.0
4/83	SYSTEM	43.9	82.1	82.1	43.9		720	385	316	50.0
5/83	SYSTEM	9.7	19.3	19.3	9.7		744	374	72	50.0
6/83	SYSTEM	55.0	62.8	62.8	55.0		720	631	396	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT MIST ELIMINATOR REPAIRS ACCOUNTED FOR OUTAGE TIME DURING THE PERIOD OF JANUARY THROUGH JUNE 1983.										
7/83	SYSTEM	56.2	57.4	57.4	55.5		744	719	413	50.0
8/83	SYSTEM	48.0	48.4	48.4	48.0		744	737	357	50.0
9/83	SYSTEM	44.7	35.0	35.0	24.6		720	505	177	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL 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

STACK REHEAT FAILURES DURING THE PERIOD RESULTED IN A STACK PLUME REHEAT
 SYSTEM DESIGN.

10/83	SYSTEM	82.4	79.3	79.3	66.4	744	623	494
11/83	SYSTEM	73.3	68.4	68.4	56.8	720	598	409
12/83	SYSTEM	58.2	46.3	46.3	39.2	744	630	292

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

** 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
6/85	SYSTEM	720
7/85	SYSTEM	744
8/85	SYSTEM	744
9/85	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

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

10/85	SYSTEM						744
11/85	SYSTEM						720
12/85	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM IS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS.

THE MILL CREEK 1 LIME/LIMESTONE FGD SYSTEM UNDERWENT ONLY MINOR DESIGN CHANGES WHICH TOOK PLACE DURING THE MONTHS OF JANUARY THROUGH MARCH OF 1985. ALL WORK IS COMPLETED EXCEPT FOR THE UPGRADING OF THE PROCESS CONTROL SYSTEM. MODIFICATIONS INCLUDE THE EVENTUAL CONVERSION TO LIMESTONE, COVERING THE REACTION TANKS, BLEED SYSTEM CHANGES, AND THE INSTALLATION OF NEW GUILLOTINE ISOLATION DAMPERS. THE UNIT/FGD WERE OPERATIONAL DURING THE REMAINDER OF 1985. THE SYSTEM WILL CONTINUE USING LIME UNTIL THE END OF 1987 OR DURING THE FIRST QUARTER OF 1988 WHEN ALL FOUR MILL CREEK FGD SYSTEMS ARE SCHEDULED TO USE LIMESTONE ALL AT THE SAME TIME. THE REASON FOR THE CONVERSION ON THE MILL CREEK SYSTEMS TO LIMESTONE IS TO HELP CONSERVE CARBIDE LIME RESERVES FOR THE CANE RUN 4 AND 5 SYSTEMS.

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

THE FGD SYSTEM IS SCHEDULED FOR SPRAY HEADER REPLACEMENT IN THE SPRING OF 1988.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986. FGD OPERABILITY WAS REPORTED TO BE 88.5%.

1/87	SYSTEM						744
2/87	SYSTEM						672

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
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	9999		999.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. FGD OPERABILITY WAS REPORTED TO BE 71.2%. THE SYSTEM IS SCHEDULED TO SWITCH FROM LIME TO LIMESTONE IN NOVEMBER, 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	MILL CREEK	
UNIT NUMBER	2	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****	
GROSS UNIT GENERATING CAPACITY - MW	338	
NET UNIT GENERATING CAPACITY W/FGD - MW	306	
NET UNIT GENERATING CAPACITY WO/FGD - MW	311	
EQUIVALENT SCRUBBED CAPACITY - MW	338	
** 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	660.66	(1400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	151.7	(305 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.8	(19.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10800-12100
AVERAGE ASH CONTENT - %	14.50	
RANGE ASH CONTENT - %	10.0-18.0	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	8.0-10.0	
AVERAGE SULFUR CONTENT - %	3.75	
RANGE SULFUR CONTENT - %	3.5-4.5	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	.03-.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	HOT SIDE	
SUPPLIER	WESTERN PRECIPITATOR	
PRESSURE DROP - KPA	0.1	(1. IN-H2O)
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	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 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	COMBUSTION ENGINEERING
A-E FIRM	FLUOR - PIONEER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	1.5
CURRENT STATUS	1
COMMERCIAL START-UP	4/1982
INITIAL START-UP	12/1981
CONTRACT AWARDED	11/1977

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.50	
DESIGN COAL HEAT CONTENT - J/G	23260.0	(10000 BTU/LB)
DESIGN COAL ASH CONTENT - %	18.00	
DESIGN MOISTURE CONTENT - %	10.00	
DESIGN CHLORIDE CONTENT - %	0.06	

** QUENCHER/PRESATURATOR
TYPE

NONE

** ABSORBER

NUMBER	2	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	26.0 X 31.0	
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	3755.	(59600 GPM)
L/G RATIO - L/CU.M	11.9	(88.9 GAL/1000 ACF)
SUPERFICIAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	316.17	(670000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	86.6	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	4	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	ATLANTIC BRIDGE	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
PRESSURE DROP - KPA	0.1	(0.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.0	(10.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
WASH WATER SOURCE	FRESH	
WASH FREQUENCY	INTERMITTENT	
WASH RATE - L/S	18.9	(300 GAL/MIN)

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

** REHEATER	
NUMBER	2
NUMBER OF SPARES	0
NUMBER PER MODULE	1
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM
TRADE NAME/COMMON TYPE	FIN TUBE
TEMPERATURE INCREASE - C	27.8 (50 F)
OUTLET FLUE GAS TEMPERATURE - C	82.2 (180 F)
NUMBER OF HEAT EXCHANGER BANKS	2
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS TEMPERATURE - C	82.2 (180 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	COMBUSTION ENGINEERING
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.71 (1500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL 'BLADES & FRAMES!; STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	COMBUSTION ENGINEERING
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.71 (1500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL 'BLADES & FRAMES!; STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER
MANUFACTURER	COMBUSTION ENGINEERING
MODULATION	OPEN/CLOSED
SEAL AIR FLOW - CU. M/S	0.71 (1500 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL 'BLADES & FRAMES!; STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110; AUSTENITIC

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	ABSORBER INLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	ABSORBER OUTLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** 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
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	1
REAGENT FEED	1
** PUMPS	
SERVICE	NUMBER
-----	-----
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	140 DIA X 15.0
CAPACITY	1050000 GAL
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	N/A
BELT SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	1120 GPM/10% SOLIDS
OUTLET STREAM CHARACTERISTICS	280 GPM/30% SOLIDS
OVERFLOW STREAM CHARACTERISTICS	840 GPM
OUTLET STREAM DISPOSITION	VACUUM FILTER
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	1
NUMBER OF SPARES	0
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
BELT GENERIC MATERIAL TYPE	NR
BELT SPECIFIC MATERIAL TYPE	NR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

OUTLET STREAM CHARACTERISTICS 45% SOLIDS

*** SALEABLE BYPRODUCTS
NATURE NONE
DISPOSITION N/A

*** SLUDGE

** TREATMENT
METHOD FIXATION
DEVICE PUG MILL
PROPRIETARY PROCESS CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - % 45.0

** DISPOSAL
NATURE FINAL
TYPE LANDFILL
LOCATION ON-SITE
SITE TRANSPORTATION METHOD TRUCK
SITE TREATMENT CLAY LINING
SITE SERVICE LIFE - YRS 10

** WATER BALANCE
WATER LOOP TYPE CLOSED
MAKEUP WATER ADDITION - LITERS/S 125.0 (1984 GPM)

** FGD SPARE CAPACITY INDICES
ABSORBER - % 0.0
MIST ELIMINATOR - % 0.0
REHEATER - % 0.0
FAN - % 0.0
THICKENER - % 0.0
VACUUM FILTER - % 0.0

** FGD SPARE COMPONENT INDICES
ABSORBER 0.0
MIST ELIMINATOR 0.0
REHEATER 0.0
FAN 0.0
THICKENER 0.0
VACUUM FILTER 0.0

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
12/81	SYSTEM	100.0	57.3	75.0	100.0	95.00	99.00	744	262	150	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

MILL CREEK 2 COMMENCED OPERATIONS ON DECEMBER 18, 1981. THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME SINCE START-UP.

1/82	SYSTEM	24.1	25.3	25.3	24.1			744	707	179	50.0
2/82	SYSTEM	88.5	88.5	88.5	88.5			672	672	595	50.0
3/82	SYSTEM	73.8	73.8	73.8	73.8			744	744	549	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1982 THE UTILITY EXPERIENCED START-UP PROBLEMS WITH THE UNIT 2 FGD SYSTEM.

4/82	SYSTEM	85.6	84.1	100.0	75.7			720	648	545	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/82	SYSTEM	100.0	100.0	100.0	22.4		744	167	167	50.0
6/82	SYSTEM	81.7	81.1	81.1	78.7		720	699	567	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE SECOND QUARTER FAILURE OF THE RECIRCULATION PUMP CAUSED SOME OUTAGE TIME.										
7/82	SYSTEM	0.0	0.0	0.0	0.0		744	714	0	50.0
8/82	SYSTEM	0.0	0.0	0.0	0.0		744	713	0	50.0
9/82	SYSTEM	0.0	0.0	0.0	0.0		720	558	0	50.0
10/82	SYSTEM	0.0	0.0	0.0	0.0		744	739	0	50.0
11/82	SYSTEM	0.0	0.0	0.0	0.0		720	691	0	50.0
12/82	SYSTEM	55.8	70.1	70.1	50.4		744	535	375	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT A MAJOR BEARING FAILURE ON THE 2B BOOSTER FAN OCCURRED DURING THE PERIOD OF JULY THROUGH DECEMBER 1982.										
1/83	SYSTEM	36.8	38.6	38.6	36.8		744	710	274	50.0
2/83	SYSTEM	56.3	59.3	59.3	52.4		672	594	352	50.0
3/83	SYSTEM	93.5	92.7	92.7	81.5		744	654	606	50.0
4/83	SYSTEM	86.8	87.2	87.2	67.2		720	555	484	50.0
5/83	SYSTEM	0.0	0.0	0.0	0.0		744	184	0	50.0
6/83	SYSTEM	0.0	0.0		0.0		720	151	0	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THICKENER PROBLEMS DURING THE PERIOD OF JANUARY THROUGH JUNE 1983.										
BLEED LINE PROBLEMS WERE ALSO EXPERIENCED DURING THE FIRST SIX MONTHS OF 1983.										
PUMP FAILURES WERE REPORTED CAUSING OUTAGE TIME DURING THE PERIOD OF JANUARY THROUGH JUNE 1983.										
7/83	SYSTEM	63.6	63.7	63.7	63.6		744	743	473	50.0
8/83	SYSTEM	81.0	89.3	89.3	77.6		744	646	577	50.0
9/83	SYSTEM	71.8	74.2	74.2	57.1		720	554	411	50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
REPAIRS ON THE ABSORBER VENT SYSTEM WERE MADE DURING THE THIRD QUARTER OF 1983.										
THE NEED TO ISOLATE THE SERVICE WATER SYSTEM RESULTED IN DOWN TIME DURING THE THIRD QUARTER.										
10/83	SYSTEM	77.6	72.9	72.9	48.4		744	494	360	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
11/83	SYSTEM	70.4	58.9	58.9	45.1			720	552	325
12/83	SYSTEM	58.3	47.7	47.7	39.1			744	610	291

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM							744		
11/84	SYSTEM							720		
12/84	SYSTEM							744		

** 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		
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		

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM IS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS.

THE MILL CREEK 2 LIME/LIMESTONE FGD SYSTEM HAS UNDERGONE THE SAME DESIGN MODIFICATIONS AS UNIT 1. THE PROCESS CONTROL MODIFICATIONS FOR UNITS 1 AND 2 ARE SCHEDULED TO TAKE PLACE DURING THE THIRD QUARTER 1986. THE SYSTEM WILL CONTINUE USING LIME UNTIL THE END OF 1987 OR DURING THE FIRST QUARTER OF 1988 WHEN ALL FOUR MILL CREEK FGD SYSTEMS ARE SCHEDULED TO USE LIMESTONE ALL AT THE SAME TIME. THE REASONS FOR THE CONVERSION ON THE MILL CREEK SYSTEMS TO LIMESTONE IS TO HELP CONSERVE CARBIDE LIME RESERVES FOR THE CANE RUN 4 AND 5 SYSTEMS.

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

THE FGD SYSTEM IS SCHEDULED FOR SPRAY HEADER REPLACEMENT IN THE FALL OF 1987.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986. FGD OPERABILITY WAS REPORTED TO BE 86.9%.

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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	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	9999	999.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. FGD OPERABILITY WAS REPORTED TO BE 73%. SPRAY HEADER REPLACEMENT WAS PERFORMED IN 1987. THE SYSTEM IS SCHEDULED TO SWITCH FROM LIME TO LIMESTONE IN NOVEMBER, 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC	
PLANT NAME	MILL CREEK	
UNIT NUMBER	3	
CITY	LOUISVILLE	
STATE	KENTUCKY	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(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	1084	
GROSS UNIT GENERATING CAPACITY - MW	412	
NET UNIT GENERATING CAPACITY W/FGD - MW	391	
NET UNIT GENERATING CAPACITY WO/FGD - MW	396	
EQUIVALENT SCRUBBED CAPACITY - MW	412	
*** 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	755.04	(1600000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.4	(21.0 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	26284.	(11300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-12000
AVERAGE ASH CONTENT - %	15.00	
RANGE ASH CONTENT - %	13.0-16.0	
AVERAGE MOISTURE CONTENT - %	10.00	
RANGE MOISTURE CONTENT - %	9.0-15.0	
AVERAGE SULFUR CONTENT - %	3.87	
RANGE SULFUR CONTENT - %	3.5-4.0	
AVERAGE CHLORIDE CONTENT - %	0.04	
RANGE CHLORIDE CONTENT - %	.03-.06	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
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	377.5	(800000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9	(300 F)
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	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	AMERICAN AIR FILTER
A-E FIRM	FLUOR POWER SERVICES
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	1.2
CURRENT STATUS	1
COMMERCIAL START-UP	3/1979
INITIAL START-UP	8/1978
CONTRACT AWARDED	11/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	27912.0	(12000 BTU/LB)
DESIGN COAL ASH CONTENT - %	16.00	
DESIGN MOISTURE CONTENT - %	15.00	
DESIGN CHLORIDE CONTENT - %	0.06	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	120.0	

** QUENCHER/PRESATURATOR

NUMBER	4	
TYPE	VENTURI	
SUPPLIER	AMERICAN AIR FILTER	
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	0.5	(2.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	126.	(2000 GPM)
L/G RATIO - L/CU. M	0.7	(5.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ENTRAINED PACKING	
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	16.0 X 20.0	
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	HYDRAULICALLY-BONDED MORTAR	
LINER MATERIAL TRADE NAME/COMMON TYPE	PRE-KRETE G-8	
GAS CONTACTING DEVICE TYPE	POLYURETHANE BALLS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1285.	(20400 GPM)
L/G RATIO - L/CU.M	7.4	(55.0 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	175.03	(370900 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
SO2 REMOVAL EFFICIENCY - %	85.7	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	8
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	2
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

MANUFACTURER	ATLANTIC BRIDGE
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	3
FREEBOARD DISTANCE - M	2.13 (7.0 FT)
DISTANCE BETWEEN STAGES - CM	7.62 (3.0 IN)
DISTANCE BETWEEN VANES - CM	2.5 (1.00 IN)
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	4.6 (15.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
WASH WATER SOURCE	FRESH
WASH FREQUENCY	10% OF THE AREA WASHED EACH 1/2 MINUTE
WASH RATE - L/S	2.5 (40 GAL/MIN)
** REHEATER	
NUMBER	4
NUMBER OF SPARES	0
NUMBER PER MODULE	1
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM
TRADE NAME/COMMON TYPE	BARE TUBE
LOCATION	TOP OF ABSORBER
TEMPERATURE INCREASE - C	27.8 (50 F)
INLET FLUE GAS TEMPERATURE - C	54.4 (130 F)
OUTLET FLUE GAS TEMPERATURE - C	82.2 (180 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	377.52 (800000 ACFM)
FLUE GAS TEMPERATURE - C	148.9 (300 F)
PRESSURE DROP - KPA	12.9 (42.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	2
FUNCTION	SHUT-OFF
GENERIC TYPE	GUILLotine
SPECIFIC TYPE	TOP-ENTRY GUILLotine
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	TOP-ENTRY GUILLotine
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	TOP-ENTRY GUILLotine
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

** DUCTWORK	
LOCATION	ABSORBER 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	ABSORBER OUTLET
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	DOWNSTREAM OF REHEATER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	HYDRAULICALLY-BONDED MORTAR
** DUCTWORK	
LOCATION	BYPASS
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	FOAM GLASS BLOCKS
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	TUBE MILL
NUMBER	1
NUMBER OF SPARES	0
PRODUCT QUALITY - % SOLIDS	25.0
** TANKS	
SERVICE	NUMBER
-----	-----
CARBIDE LIME SLURRY	2
ADDITIVE SLURRY DAY	1
REACTION	4
THICKENER	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ADDITIVE SLURRY TRANSFER	7
RECYCLE	10
ABSORBER BLEED	6
THICKENER UNDERFLOW	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	125.0 X 10.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	20% SOLIDS
OUTLET STREAM DISPOSITION	VACUUM FILTER
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	5
NUMBER OF SPARES	1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

FEED STREAM SOURCE	THICKENER UNDERFLOW
FEED STREAM CHARACTERISTICS	20% SOLIDS
OUTLET STREAM CHARACTERISTICS	45% SOLIDS
OUTLET STREAM DISPOSITION	PUG MILL
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	PUG MILL
PROPRIETARY PROCESS	CONVERSION SYSTEMS 'POZ-O-TEC'
INLET QUALITY - %	45.0
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING
SITE SERVICE LIFE - YRS	10
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SLURRY RECYCLE
CHEMICAL PARAMETERS	PH
MONITOR TYPE	UNILOC
MONITOR LOCATION	IN REACTION TANK
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN/CLOSED
MAKEUP WATER ADDITION - LITERS/S	9.5 (150 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	CARBIDE LIME
PRINCIPAL CONSTITUENT	90% CAOH2
SOURCE/SUPPLIER	AIRCO
POINT OF ADDITION	RECYCLE TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
REHEATER - %	0.0
FAN - %	0.0
BALL MILL - %	0.0
EFFLUENT HOLD TANK - %	0.0
RECIRCULATION PUMP - %	25.0
THICKENER - %	0.0
VACUUM FILTER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.0
BALL MILL	0.0
EFFLUENT HOLD TANK	0.0
RECIRCULATION PUMP	1.0
THICKENER	0.0
VACUUM FILTER	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
INITIAL FGD OPERATIONS BEGAN ON AUGUST 13, 1978. OPERATIONAL HOURS WERE NOT AVAILABLE FOR AUGUST.									
9/78	SYSTEM	81.0	80.7	80.0	80.0		720	714	576 52.0
** PROBLEMS/SOLUTIONS/COMMENTS									
FRP PIPING PROBLEMS WERE ENCOUNTERED.									
SOME BEARING AND SHAFT RELATED PUMP PROBLEMS WERE ALSO ENCOUNTERED DURING SEPTEMBER.									
10/78	SYSTEM	86.0	85.5	85.0	81.6		744	710	607 54.0
11/78	SYSTEM	93.0	85.2	85.0	41.5		720	351	299 40.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS SHUT DOWN NOVEMBER 18, 1978 FOR SCHEDULED INSPECTION. RESTART IS PROJECTED FOR FEBRUARY 1, 1979.									
12/78	SYSTEM				0.0		744	0	0 0.0
1/79	SYSTEM				0.0		744	0	0 0.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT DID NOT OPERATE DURING DECEMBER OR JANUARY.									
2/79	SYSTEM	26.0	18.0	18.0	17.4		672	651	117 52.0
3/79	SYSTEM	62.0	53.1	53.0	52.4		744	735	390 51.0
** PROBLEMS/SOLUTIONS/COMMENTS									
COMPLIANCE TESTING WAS PERFORMED DURING MARCH AND THE UNIT WAS DECLARED COMMERCIAL.									
4/79	SYSTEM	75.0	63.6	63.0	44.4		720	503	320 40.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE ONLY PROBLEMS REPORTED WERE WITH DAMPERS AND PUMP FAILURES.									
5/79	SYSTEM	100.0	97.8	97.0	64.7		744	492	481 38.0
6/79	SYSTEM	56.0	51.9	51.0	47.9		720	665	345 48.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO UNUSUAL OPERATING PROBLEMS WERE ENCOUNTERED DURING MAY OR JUNE.									
7/79	SYSTEM	63.0	59.9	59.0	55.2		744	686	411 53.0
8/79	SYSTEM	76.0	68.0	68.0	50.3		744	550	374 47.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 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

IN JULY AND AUGUST REHEATER PROBLEMS WERE ENCOUNTERED. THE REHEATER WILL HAVE TO BE REPLACED DURING EITHER NOVEMBER OR DECEMBER OF THIS YEAR.

9/79	SYSTEM	91.0	90.6	91.0	83.9	720	667	604	50.0
10/79	SYSTEM	83.0	82.0	82.0	76.1	744	690	566	44.0

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE END OF OCTOBER THE UNIT WENT DOWN FOR A TURBINE OVERHAUL AND IS SCHEDULED TO BE DOWN UNTIL LATE JANUARY OR EARLY FEBRUARY.

11/79	SYSTEM				0.0	720	0	0	0.0
12/79	SYSTEM				0.0	744	0	0	0.0
1/80	SYSTEM				0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OVERHAUL GENERAL SCRUBBER MAINTENANCE WAS DONE BUT NO MAJOR MODIFICATIONS WERE MADE.

2/80	SYSTEM	37.0	36.1	36.0	26.6	696	512	185	39.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/80	SYSTEM	37.0	36.9	37.0	30.6	744	618	228	46.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

THE UTILITY IS IN THE PROCESS OF REPLACING THE REHEATER TUBES.

4/80	SYSTEM	42.9	42.5	42.5	42.2	720	715	304	53.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE REHEATER TUBE REPLACEMENT CONTINUED INTO APRIL.

THE OTHER OUTAGE TIME ENCOUNTERED DURING APRIL WAS CAUSED BY A BLOWN GASKET IN THE CONDENSATE PUMP.

5/80	SYSTEM	67.5	51.4	51.4	34.4	744	498	256	47.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE PLASTIC MIST ELIMINATOR COMPONENTS WERE REPLACED WITH STAINLESS STEEL. THIS KEPT THE SYSTEM OFF LINE FOR APPROXIMATELY 10 DAYS.

REHEATER TUBE LEAKS WERE ALSO ENCOUNTERED IN MAY.

6/80	SYSTEM	88.2	0.0	0.0	0.0	720	85	0	14.0

LOUISVILLE GAS & ELECTRIC: MILL CREEK 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

IN LATE MAY THE TURBINE LOST TWO BLADES CAUSING THE SYSTEM TO SHUTDOWN UNTIL THE LATTER PART OF JUNE. DURING THE OUTAGE THE UTILITY DECIDED TO REPLACE THE LIME STORAGE TANK LINES WITH LARGER ONES TO SERVICE THE NEW UNITS. THE WORK WAS NOT COMPLETED WHEN THE BOILER WAS RETURNED TO SERVICE; THUS, THE FGD UNIT DID NOT OPERATE DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. HOURS	FACTORS
7/80	SYSTEM	92.0	91.3	91.3	83.9		744	684	625	52.0	

** PROBLEMS/SOLUTIONS/COMMENTS

RECYCLE PUMP FAILURES CAUSED THE FGD SYSTEM TO SHUTDOWN FOR PART OF JULY.

8/80	SYSTEM	58.7	81.7	81.7	58.7		744	535	437	60.0	

9/80	SYSTEM	57.2	60.4	60.4	57.2		720	682	412	60.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE AUGUST THROUGH SEPTEMBER PERIOD THE PUMP HOUSE WAS FLOODED DUE TO THE FAILURE OF THE BLEED PUMP FRP PIPE LINE. BECAUSE OF THIS FAILURE, 23 PUMPS AND 23 PUMP MOTORS WERE DAMAGED.

10/80	SYSTEM	100.0	97.1	97.1	96.9		744	742	721	99.7	

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/80	SYSTEM	57.1	49.4	49.4	41.9		720	611	302	60.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER OPERATION OF THE FGD SYSTEM WAS LOW DUE TO PUMP DAMAGES WHICH RESULTED FROM THE PUMP HOUSE FLOODING IN AUGUST.

12/80	SYSTEM	100.0	100.0	100.0	61.1		744	455	455	60.0	

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/81	SYSTEM	0.0	0.0	0.0	0.0		744	521	0	40.0	

2/81	SYSTEM	0.0	0.0	0.0	0.0		672	593	0	50.0	

3/81	SYSTEM	1.0	1.0	1.0	1.0		744	675	8	50.0	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 MAJOR CORROSION DAMAGE CAUSED FAILURE OF THE PRECRETE-G.

FROZEN LINES ENCOUNTERED DURING THE PERIOD ACCOUNTED FOR SOME OUTAGE TIME.

REPAIRS TO THE MIST ELIMINATOR SHELL CAUSED ADDITIONAL OUTAGE TIME.

DURING MARCH STRIKING WORKERS ADDED TO THE OUTAGE TIME OF THE SYSTEM.

4/81	SYSTEM	32.9	33.2	33.2	32.9		720	714	237	45.0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 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 THE MONTH OF APRIL THE UTILITY REPORTED HAVING PROBLEMS WITH FROZEN PIPELINE FAILURES.

5/81	SYSTEM	33.7	37.9	37.9	33.7	744	662	251	55.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF MAY THE UTILITY REPORTED HAVING PROBLEMS WITH THE THICKENER.

6/81	SYSTEM	34.6	34.6	34.6	34.6	720	719	249	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE MONTH OF JUNE THE UTILITY REPORTED HAVING MODULE CORROSION PROBLEMS.

7/81	SYSTEM	63.4	73.6	73.6	63.4	744	641	472	60.0
8/81	SYSTEM	89.2	91.8	91.8	88.3	744	716	657	65.0
9/81	SYSTEM	80.8	80.8	80.8	80.8	720	720	582	65.0

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR MODULE FAILURES WERE ENCOUNTERED DURING THE THIRD QUARTER 1981.

10/81	SYSTEM	41.4	89.7	89.7	41.4	744	332	298	50.0
11/81	SYSTEM	32.4	37.4	37.4	32.4	720	623	233	50.0
12/81	SYSTEM	41.4	42.7	42.7	41.4	744	721	308	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FOURTH QUARTER PUMP FAILURES WERE ENCOUNTERED.

PROBLEMS DURING THE PERIOD WERE ALSO EXPERIENCED WITH THE THICKENER AND CORROSION.

1/82	SYSTEM	0.0	0.0		0.0	744	743	0	50.0
2/82	SYSTEM	0.0	0.0		0.0	672	612	0	50.0
3/82	SYSTEM	0.0	0.0		0.0	744	202	0	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1982 THE FGD SYSTEM WAS OFF-LINE TO REBUILD THE MODULES AND THE MIST ELIMINATORS.

4/82	SYSTEM	0.0	0.0	0.0	0.0	720	704	0	50.0
5/82	SYSTEM	0.0	0.0	0.0	0.0	744	665	0	50.0
6/82	SYSTEM	8.9	12.7	12.7	8.9	720	502	64	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (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 SECOND QUARTER, THE MIST ELIMINATOR SHELL ON ALL MODULES WAS
 RELINED.

7/82	SYSTEM	36.4	36.5	36.5	36.4	744	742	271	50.0
8/82	SYSTEM	60.5	59.8	59.8	58.3	744	726	434	50.0
9/82	SYSTEM	15.3	43.7	43.7	15.3	720	252	110	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THICKENER PROBLEMS WERE EXPERIENCED DURING THE
 MONTHS OF JULY, AUGUST AND SEPTEMBER, 1982.

10/82	SYSTEM	71.5	73.4	73.4	59.7	744	605	444	50.0
11/82	SYSTEM	74.0	60.6	60.6	30.1	720	358	217	50.0
12/82	SYSTEM	0.0	0.0	0.0	0.0	744	550	0	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT MIST ELIMINATORS WERE BEING REBUILT DURING THE
 PERIOD OF JULY THROUGH DECEMBER 1982.

REHEAT TUBES WERE ALSO REBUILT/REPLACED DURING THIS PERIOD.

1/83	SYSTEM	0.0	0.0	0.0	0.0		42	0	50.0
2/83	SYSTEM	9.4	71.6	71.6	9.4	672	88	63	50.0
3/83	SYSTEM	25.0	41.0	41.0	25.0	744	454	186	50.0
4/83	SYSTEM	0.0	0.0	0.0	0.0	720	416	0	50.0
5/83	SYSTEM	57.0	72.5		56.5	744	579	420	50.0
6/83	SYSTEM	30.0	43.1	43.1	30.0	720	501	216	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED PROBLEMS WITH PLUGGING IN THE REHEATER DURING THE
 PERIOD OF JANUARY THROUGH JUNE 1983.

FAILURE OF THE REHEAT TUBES OCCURRED DURING THE FIRST SIX MONTHS OF 1983
 CAUSING FGD SYSTEM OUTAGE TIME.

7/83	SYSTEM	28.1	28.2	28.2	28.1	744	742	209	50.0
8/83	SYSTEM	2.7	2.7	2.7	2.7	744	737	20	50.0
9/83	SYSTEM	0.0	0.0	0.0	0.0	720	659	0	50.0

** PROBLEMS/SOLUTIONS/COMMENTS

LEAKS IN THE STACK REHEAT SYSTEM WERE REPAIRED DURING THE THIRD QUARTER OF
 1983.

10/83	SYSTEM	13.8	14.7	14.7	13.6	744	685	101	
11/83	SYSTEM	56.7			0.0	720	0	0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

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

12/83	SYSTEM	25.9	8.6	8.6	6.7		744	583	25	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM						744			

11/84	SYSTEM						720			

12/84	SYSTEM						744			

** 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			

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			

LOUISVILLE GAS & ELECTRIC: MILL CREEK 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 THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM IS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS.

THE MILL CREEK 3 LIME FGD SYSTEM UNDERWENT MAJOR DESIGN MODIFICATIONS DURING JUNE 1, 1984, THROUGH THE END OF OCTOBER, 1985. THE FGD SYSTEM WAS REPORTEDLY NOT RUN ALL OF 1984. DESIGN MODIFICATIONS INCLUDED CONVERSION OF THE AAF MOBILE BED LIME ABSORBERS TO SPRAY TOWER DESIGN, A NEW LIME/ LIMESTONE SLURRY PREPARATION AND HANDLING SYSTEM (I.E., NEW PUMPS, PIPING, VALVES) AND REPLACEMENT OF LOUVRE DAMPER WITH GUILLOTINE DAMPERS. THE QUENCHER SECTION OF THE ABSORBER SPRAY TOWER WILL BE CONSTRUCTED OF ALLOY C-276 AND THE ABSORBER TOWERS THEMSELVES WILL BE CONSTRUCTED OF 317LM STAINLESS STEEL. TITANIUM TEST PANELS WILL ALSO BE PLACED IN THE QUENCHER FOR TESTING. REASONING BEHIND THIS IS BECAUSE TRIMBLE COUNTY 1 DESIGNS CALL FOR THE USE OF TITANIUM CONSTRUCTED QUENCHERS. THE FGD SYSTEM WILL USE LIME REAGENT UNTIL THE END OF 1987 OR DURING THE FIRST QUARTER OF 1988 WHEN ALL FOUR MILL CREEK FGD SYSTEMS ARE SCHEDULED TO GO LIMESTONE ALL AT THE SAME TIME. THE REASON FOR THE CONVERSION OF MILL CREEK SYSTEMS TO LIMESTONE IS TO HELP CONSERVE CARBIDE LIME RESERVES FOR THE CANE RUN 4 AND 5 SYSTEMS.

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

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED IN 1986. FGD SYSTEM OPERABILITY AND AVAILABILITY WERE REPORTED TO BE 83.5 AND GREATER THAN 90%, RESPECTIVELY.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744
4/87	SYSTEM	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
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	9999 999.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED IN 1987. FGD OPERABILITY WAS REPORTED TO BE 80.7%. THE SYSTEM IS SCHEDULED TO SWITCH FROM LIME TO LIMESTONE IN NOVEMBER, 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	LOUISVILLE GAS & ELECTRIC
PLANT NAME	MILL CREEK
UNIT NUMBER	4
CITY	LOUISVILLE
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	495
GROSS UNIT GENERATING CAPACITY - MW	496
NET UNIT GENERATING CAPACITY W/FGD - MW	465
NET UNIT GENERATING CAPACITY WO/FGD - MW	477
EQUIVALENT SCRUBBED CAPACITY - MW	496
** 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	755.04 (1600000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9 (300 F)
STACK HEIGHT - M	183. (600 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26749. (11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	11000-12000
AVERAGE ASH CONTENT - %	15.00
RANGE ASH CONTENT - %	13.0-16.0
AVERAGE MOISTURE CONTENT - %	10.00
RANGE MOISTURE CONTENT - %	3.5-4.0
AVERAGE SULFUR CONTENT - %	3.75
RANGE SULFUR CONTENT - %	****
AVERAGE CHLORIDE CONTENT - %	0.08
RANGE CHLORIDE CONTENT - %	.03-.06
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** FABRIC FILTER	
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	377.5 (800000 ACFM)
INLET FLUE GAS TEMPERATURE - C	148.9 (300 F)
PARTICLE REMOVAL EFFICENCY - %	99.5
** PARTICLE SCRUBBER	
NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON NAME	N/A
SHELL GENERIC MATERIAL	N/A
SHELL SPECIFIC MATERIAL	N/A
LINER GENERIC MATERIAL	N/A
LINER SPECIFIC MATERIAL	N/A

LOUISVILLE GAS & ELECTRIC: MILL CREEK 4 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	AMERICAN AIR FILTER
A-E FIRM	FLUOR POWER SERVICES
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	2.4
CURRENT STATUS	1
COMMERCIAL START-UP	10/1982
INITIAL START-UP	7/1982
CONTRACT AWARDED	2/1976

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.00	
DESIGN COAL HEAT CONTENT - J/G	27912.0	(12000 BTU/LB)
DESIGN COAL ASH CONTENT - %	16.00	
DESIGN MOISTURE CONTENT - %	15.00	
DESIGN CHLORIDE CONTENT - %	0.06	

** QUENCHER/PRESATURATOR

NUMBER	4	
TYPE	VENTURI	
SUPPLIER	AMERICAN AIR FILTER	
INLET GAS FLOW - CU. M/S	188.76	(400000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
L/G RATIO - L/CU. M	0.7	(5.0 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	PACKED TOWER	
SPECIFIC TYPE	ENTRAINED PACKING	
TRADE NAME/COMMON TYPE	MOBILE BED CONTACTOR	
SUPPLIER	AMERICAN AIR FILTER	
DIMENSIONS - FT	16.0 X 20.0	
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	HYDRAULICALLY-BONDED MORTAR	
LINER MATERIAL TRADE NAME/COMMON TYPE	PRE-KRETE G-8	
GAS CONTACTING DEVICE TYPE	POLYURETHANE BALLS	
LIQUID RECIRCULATION RATE - LITER/S	1285.	(20400 GPM)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
SO2 REMOVAL EFFICIENCY - %	85.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	8	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	2	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	ATLANTIC BRIDGE	
CONFIGURATION	HORIZONTAL	
NUMBER OF PASSES PER STAGE	3	
FREEBOARD DISTANCE - M	2.13	(7.0 FT)
DISTANCE BETWEEN STAGES - CM	7.62	(3.0 IN)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
PRESSURE DROP - KPA	0.2	(1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	4.6	(15.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 4 (CONT.)

WASH WATER SOURCE	FRESH	
WASH RATE - L/S	2.5	(40 GAL/MIN)
** REHEATER		
NUMBER	4	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	BARE TUBE	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
** FANS		
NUMBER	2	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	AMERICAN STANDARD	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	377.52	(800000 ACFM)
FLUE GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	12.9	(42.3 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
NUMBER	4	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	TOP-ENTRY GUILLOTINE	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DUCTWORK		
LOCATION	ABSORBER INLET	
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	ABSORBER OUTLET	
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	DOWNSTREAM OF REHEATER	
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	
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	
NUMBER	1	

LOUISVILLE GAS & ELECTRIC: MILL CREEK 4 (CONT.)

** TANKS	
SERVICE	NUMBER
-----	-----
CARBIDE LIME SLURRY	2
ADDITIVE SLURRY DAY	1
REACTION	4
THICKENER	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ADDITIVE SLURRY TRANSFER	7
RECYCLE	10
SCRUBBER BLEED	6
THICKENER	2
NR	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
DIMENSIONS - FT	125.0 X 10.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	20% 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	FLY ASH/LIME
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	100 ACRES
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	SLURRY RECYCLE
CHEMICAL PARAMETERS	PH
MONITOR TYPE	UNILOC
MONITOR LOCATION	IN REACTION TANK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	CARBIDE LIME
PRINCIPAL CONSTITUENT	90% CAOH ₂
SOURCE/SUPPLIER	AIRCO

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
7/82	SYSTEM	5.4	21.8	21.8	4.6			744	156	34 50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT START-UP FOR THE NEW BOILER WAS ON JULY 15, 1982										
8/82	SYSTEM	41.4	78.5	78.5	41.1			744	390	306 50.0
9/82	SYSTEM	39.4	52.4	52.9	38.5			720	529	277 50.0
10/82	SYSTEM	0.0			0.0			744	0	0 50.0
11/82	SYSTEM	0.0	0.0	0.0	0.0			720	347	0 50.0
12/82	SYSTEM	35.1	56.6	56.6	35.1			744	461	261 50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT PROBLEMS ASSOCIATED WITH START-UP OF THE NEW BOILER WERE ENCOUNTERED DURING THE PERIOD OF JULY THROUGH DECEMBER, 1982.										
1/83	SYSTEM	18.1	24.2	24.2	18.1			744	558	135 50.0
2/83	SYSTEM	0.0	0.0	0.0	0.0			672	600	0 50.0
3/83	SYSTEM	25.3	64.4	64.4	24.1			744	278	179 50.0
4/83	SYSTEM	44.7	48.5	48.5	41.3			720	612	297 50.0
5/83	SYSTEM	65.2	95.3	95.3	59.4			744	464	442 50.0
6/83	SYSTEM	6.4	7.4	7.4	6.4			720	619	46 50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
BYPASS DAMPER REPAIRS WERE MADE DURING THE PERIOD OF JANUARY THROUGH JUNE, 1983.										
THE UTILITY REPORTED A THICKENER RAKE FAILURE DURING THE PERIOD OF JANUARY THROUGH JUNE, 1983.										
THE UTILITY REPORTED REHEAT PROBLEMS DURING THE PERIOD OF JANUARY THROUGH JUNE, 1983.										
7/83	SYSTEM	37.5	40.7	40.7	36.8			744	673	274 50.0
8/83	SYSTEM	36.6	39.1	39.1	36.6			744	695	272 50.0
9/83	SYSTEM	15.7	15.7	15.7	15.7			720	720	113 50.0
** PROBLEMS/SOLUTIONS/COMMENTS										
A THICKENER RAKE STOPPED UP IN ACCUMULATED THICKENER SOLIDS DURING THE THIRD QUARTER RESULTING IN OUTAGE TIME.										
THICKENER UNDERFLOW PUMP PROBLEMS CONTRIBUTED TO LOW AVAILABILITY DURING THE PERIOD.										
THE UTILITY REPORTED PLUGGING IN THE ABSORBER MOBILE BALL BEDS DURING THE THIRD QUARTER.										
10/83	SYSTEM	4.8	12.4	12.4	4.8			744	290	36
11/83	SYSTEM	43.6	32.5	32.5	31.7			720	701	228

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 4 (CONT.)

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

12/83	SYSTEM	57.4	45.8	45.8	39.4			744	640 293

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM							744	
11/84	SYSTEM							720	
12/84	SYSTEM							744	

** 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	
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	

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE EARLY PART OF 1983, LOUISVILLE GAS & ELECTRIC IMPLEMENTED A PROGRAM TO UPGRADE AND IMPROVE SEVEN SULFUR DIOXIDE REMOVAL SYSTEMS (SDRS). THE SEVEN BEING THE CANE RUN 4, 5 AND 6 FACILITIES AND THE MILL CREEK 1, 2, 3 AND 4 FACILITIES. THE GOAL OF THE SDRS PROGRAM IS TO IMPROVE FGD SYSTEM RELIABILITY TO A MINIMUM LEVEL OF 90% WHILE REDUCING EXCESSIVE OPERATING AND MAINTENANCE COSTS.

THE DESIGN MODIFICATIONS TO THE MILL CREEK 4 FGD SYSTEM ARE TO BE SIMILAR TO THOSE CONDUCTED ON MILL CREEK 3 BECAUSE OF ORIGINAL DESIGN SIMILARITY. LIKE MILL CREEK 3, THE AAF ABSORBERS ARE TO BE CONVERTED FROM A MOBILE BED DESIGN TO SPRAY TOWER DESIGN CAPABLE OF OPERATING WITH A LIMESTONE REAGENT. THE MODIFICATIONS ARE SCHEDULED TO COMMENCE IN MARCH 1986 AND LAST UNTIL JUNE 1987. THE UNIT/FGD WAS OPERATIONAL IN 1985 AND IS SCHEDULED TO CONTINUE TO DO SO UNTIL THE SCHEDULED OUTAGE PERIOD.

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

MILL CREEK 4 WAS THE LAST OF THE MILL CREEK UNITS TO BE MODIFIED. WORK COMMENCED MARCH 10, 1986 AND IS SCHEDULED TO BE COMPLETED BY SPRING 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

LOUISVILLE GAS & ELECTRIC: MILL CREEK 4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/87	SYSTEM						744			
11/87	SYSTEM						720			
12/87	SYSTEM						744	9999		999.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODIFICATION OF MILL CREEK 4 WAS COMPLETED IN MARCH 1987. THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS OCCURRED IN 1987. THE SYSTEM IS SCHEDULED TO SWITCH FROM LIME TO LIMESTONE IN NOVEMBER, 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MARQUETTE BOARD OF LIGHT & PWR
PLANT NAME	SHIRAS
UNIT NUMBER	3
CITY	MARQUETTE
STATE	MICHIGAN
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	13. (0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	172. (0.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	215. (0.500 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	40
GROSS UNIT GENERATING CAPACITY - MW	44
NET UNIT GENERATING CAPACITY W/FGD - MW	40
NET UNIT GENERATING CAPACITY WO/FGD - MW	41
EQUIVALENT SCRUBBED CAPACITY - MW	44
** 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	92.63 (196292 ACFM)
BOILER FLUE GAS TEMPERATURE - C	68.3 (155 F)
STACK HEIGHT - M	107. (350 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	2.7 (9.0 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	20129. (8654 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	10.25
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	23.42
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.30
RANGE SULFUR CONTENT - %	****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** FABRIC FILTER	
NUMBER	1
SUPPLIER	GE ENVIRONMENTAL SERVICES
PRESSURE DROP - KPA	1.7 (6.8 IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.8
TYPICAL GAS/CLOTH RATIO - M/MIN	0.6 (2.0 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	GE ENVIRONMENTAL SERVICES
A-E FIRM	LUTZ, DALY, & BRAIN
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MARQUETTE BOARD OF LIGHT & PWR: SHIRAS 3 (CONT.)

UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	80.00	
ENERGY CONSUMPTION - %	2.3	
CURRENT STATUS	1	
COMMERCIAL START-UP	4/1983	
INITIAL START-UP	3/1983	
CONTRACT AWARDED	10/1980	
** 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		
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER	
DIMENSIONS - FT	35'6" 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	
INLET GAS TEMPERATURE - C	129.4	(265 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
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		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
PERCENT GAS BYPASSED - AVG	3.0	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** FANS		
DESIGN	NR	
FUNCTION	NR	
APPLICATION	NR	
SERVICE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
** DAMPERS		
FUNCTION	NR	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NR	
SHELL SPECIFIC MATERIAL TYPE	NR	
LINER GENERIC MATERIAL TYPE	NR	
LINER SPECIFIC MATERIAL TYPE	NR	

MARQUETTE BOARD OF LIGHT & PWR: SHIRAS 3 (CONT.)

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	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 TREATMENT	NR

-----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

INITIAL START-UP FOR THE FGD SYSTEM OCCURRED DURING MARCH, 1983.

4/83	SYSTEM								720	

5/83	SYSTEM								744	

6/83	SYSTEM								720	

** PROBLEMS/SOLUTIONS/COMMENTS

COMMERCIAL OPERATIONS COMMENCED ON APRIL 1, 1983. THE FGD SYSTEM IS PRESENTLY IN THE DEBUGGING PHASE OF OPERATION. NO PERFORMANCE OR WARRANTY TESTS HAVE BEEN RUN.

THE UTILITY REPORTED EXPERIENCING PROBLEMS WITH MATERIAL BUILD UP ON THE SPRAY DRYER WALLS AND PLUGGING ON THE SWIRL VANES OF THE ATOMIZER DUE TO IMPROPER PARTICLE SIZING. ADDITIONAL PROBLEMS HAVE BEEN ENCOUNTERED WITH SOLIDS REMOVAL FROM THE BOTTOM OF THE SPRAY DRYER. THE SYSTEM WAS DESIGNED PRIMARILY TO REMOVE A FLY-ASH TYPE MATERIAL. THE UTILITY PLANS TO INSTALL A GRANULATOR IN THE BOTTOM OF THE SPRAY DRYER TO AID BYPRODUCT REMOVAL.

7/83	SYSTEM								744	

8/83	SYSTEM								744	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MARQUETTE BOARD OF LIGHT & PWR: SHIRAS 3 (CONT.)

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

9/83 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT BOTH PERFORMANCE AND CONTRACT AGREEMENT TESTING WAS PERFORMED IN MID-SEPTEMBER. NO CONCLUSIONS ARE YET AVAILABLE FOR RELEASE, BUT INITIAL RESULTS LOOK FAVORABLE.

INSTALLATION OF THE GRANULATOR FOR WASTE REMOVAL IS REPORTED NEAR COMPLETION. THE UTILITY NOW AWAITS THE DELIVERY OF THE REMAINING EQUIPMENT AND MATERIALS TO COMPLETE THE JOB. ISOLATION OF THE DRYER HAS ENABLED THE UTILITY TO KEEP THE UNIT ON LINE DURING THE ENTIRE INSTALLATION PERIOD.

PROBLEMS WITH SCRUBBER MATERIAL BUILDUP ON THE SPRAY DRYER WALLS AND ATOMIZER SWIRL VANES WAS DETERMINED TO BE A RESULT OF OPERATING THE SYSTEM NEAR OR BELOW THE DEW POINT TEMPERATURE. THE PROBLEM HAS BEEN RESOLVED BY ADDING INSTRUMENTATION WHICH ALLOWS THE OPERATORS TO MONITOR MORE CLOSELY THE INLET AND OUTLET TEMPERATURE OF THE SPRAY DRYER.

10/83 SYSTEM

744

11/83 SYSTEM

720

12/83 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1983.

FINAL INSTALLATION AND TESTING OF THE NEW GRANULATOR WASTE REMOVAL SYSTEM IS SCHEDULED FOR FEBRUARY 1984.

GE ENVIRONMENTAL SERVICES, IN COOPERATION WITH THE UTILITY, WILL DESIGN AND TEST A NEW VARIABLE SPEED TYPE ATOMIZER AT THE SHIRAS 3 FACILITY. ATOMIZER SPEEDS WILL BE CONTROLLED VIA A DC MOTOR IN COMPARISON TO CONVENTIONAL DRIVE SYSTEMS, WHICH REQUIRE MANUALLY CHANGING THE DRIVE SHAFT PULLEY. PRESENTLY, A FULL DAY IS REQUIRED TO CHANGE A DRIVE SHAFT PULLEY.

1/84 SYSTEM 61.3

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN PART OF JANUARY DUE TO A PLUGGED ATOMIZER. THE PROBLEM WAS DIAGNOSED AS BEING CAUSED BY HIGH LEVELS OF SATURATION IN THE FLUE GAS.

2/84 SYSTEM 82.8

696

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN PART OF FEBRUARY DUE TO A PLUGGED PNEUMATIC LINE. THE UTILITY STATED THIS IS THE ONLY ON-GOING PROBLEM THAT THEY HAVE HAD WITH THE DRY SCRUBBER.

3/84 SYSTEM 100.0

744

4/84 SYSTEM 99.3

720

5/84 SYSTEM 95.8

744

6/84 SYSTEM 96.9

720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MARQUETTE BOARD OF LIGHT & PWR: SHIRAS 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 FOR THE PERIOD OF MARCH THROUGH JUNE, 1984. THE AVERAGE AVAILABILITY FOR THIS PERIOD WAS APPROXIMATELY 98%.

7/84	SYSTEM	100.0	744
8/84	SYSTEM	100.0	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN HALF THE MONTH OF JULY AND ALL OF AUGUST FOR SCHEDULED MAINTENANCE.

9/84	SYSTEM	5.9	720

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT THE UNIT WAS DOWN FOR 40 HOURS DUE TO FGD REPAIRS DURING THE MONTH OF SEPTEMBER.

10/84	SYSTEM	98.4	744
11/84	SYSTEM	99.7	720
12/84	SYSTEM	99.7	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984. THE AVERAGE FGD AVAILABILITY FOR THE PERIOD WAS APPROXIMATELY 99%.

1/85	SYSTEM	92.1	744
2/85	SYSTEM	100.0	672
3/85	SYSTEM	100.0	744
4/85	SYSTEM	100.0	720
5/85	SYSTEM	100.0	744
6/85	SYSTEM	100.0	720
7/85	SYSTEM	100.0	744
8/85	SYSTEM	42.0	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY THROUGH AUGUST 1985. THE UNIT AND FGD SYSTEM WERE REPORTEDLY OFF-LINE IN AUGUST FOR 3 WEEKS OF SCHEDULED MAINTENANCE.

9/85	SYSTEM	100.0	720
10/85	SYSTEM	100.0	744
11/85	SYSTEM	100.0	720
12/85	SYSTEM	100.0	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MARQUETTE BOARD OF LIGHT & PWR: SHIRAS 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 OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF SEPTEMBER THROUGH DECEMBER 1985. ALTHOUGH THE UNIT WAS OFF-LINE IN DECEMBER FOR A SCHEDULED 3 WEEK MAINTENANCE OUTAGE, THE FGD SYSTEM WAS AVAILABLE FOR OPERATION. TO DATE, NO MAJOR FGD PROBLEMS HAVE BEEN EXPERIENCED. THE ONLY PROBLEM SO FAR HAS BEEN WITH POOR LIME QUALITY. THE UTILITY HAS TAKEN STEPS TO CHECK LIME QUALITY PRIOR TO USAGE

SYSTEM AVAILABILITY AND SO2 REMOVAL EFFICIENCY FOR THE YEAR 1985 WAS REPORTED TO BE 94.5% AND 71.9%, RESPECTIVELY.

1/86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF-LINE JANUARY 1-19 DUE TO A SCHEDULED MAINTENANCE OUTAGE WHICH STARTED THE END OF DECEMBER 1985.

2/86 SYSTEM 672

3/86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1986. THE SYSTEM HAD APPROXIMATELY 48 HOURS OF NORMAL OPERATING DOWNTIME. FGD SYSTEM AVAILABILITY AND SO2 REMOVAL EFFICIENCY WERE 97.8 AND 72.3%, RESPECTIVELY. FGD SYSTEM DOWNTIME WAS FOR ATOMIZER NOZZLE CLEANING AND OTHER SCRUBBER MALFUNCTIONS.

4/86 SYSTEM 720

5/86 SYSTEM 774

6/86 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE SECOND QUARTER OF 1986. THE SYSTEM HAD APPROXIMATELY 6 HOURS OF NORMAL OPERATING DOWNTIME. FGD SYSTEM AVAILABILITY AND SO2 REMOVAL EFFICIENCY WERE 99.7 AND 73.9%, RESPECTIVELY. FGD SYSTEM DOWNTIME WAS FOR ATOMIZER CLEANING AND OTHER SCRUBBER MALFUNCTIONS.

7/86 SYSTEM 774

8/86 SYSTEM 774

9/86 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1986. THE UNIT WAS OFF-LINE FROM SEPTEMBER 23 TO OCTOBER 15 FOR A SCHEDULED MAINTENANCE OUTAGE. FGD SYSTEM AVAILABILITY AND SO2 REMOVAL EFFICIENCY WERE 96.9 AND 73.9%, RESPECTIVELY. FGD SYSTEM DOWNTIME WAS FOR ATOMIZER NOZZLE CLEANING AND OTHER SCRUBBER MALFUNCTIONS.

10/86 SYSTEM 774

11/86 SYSTEM 720

12/86 SYSTEM 774

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MARQUETTE BOARD OF LIGHT & PWR: SHIRAS 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

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1986. FGD SYSTEM AVAILABILITY AND SO2 REMOVAL EFFICIENCY WERE 99.3 AND 80.6%, RESPECTIVELY. FGD SYSTEM DOWNTIME WAS FOR ATOMIZER NOZZLE CLEANING AND OTHER SCRUBBER MALFUNCTIONS.

1/87	SYSTEM	744
2/87	SYSTEM	672
3/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT OPERATED APPROXIMATELY 1920 HOURS DURING THE FIRST QUARTER OF 1987. FGD SYSTEM AVAILABILITY FOR THE QUARTER WAS REPORTED TO BE 99.0 PERCENT.

4/87	SYSTEM	720
5/87	SYSTEM	744
6/87	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT OPERATED APPROXIMATELY 2184 HOURS DURING THE SECOND QUARTER OF 1987. FGD SYSTEM AVAILABILITY FOR THE QUARTER WAS REPORTED AS 97.8 PERCENT.

7/87	SYSTEM	744
8/87	SYSTEM	744
9/87	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT OPERATED APPROXIMATELY 1848 HOURS DURING THE THIRD QUARTER OF 1987. FGD SYSTEM AVAILABILITY FOR THE QUARTER WAS REPORTED TO BE 98.4 PERCENT.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FLYASH PLUGGING IN PNEUMATIC FLYASH RECYCLE LINE AND ELBOWS WAS SOLVED BY FEEDING WASHED PEE GRAVEL ONCE A WEEK THRU THE ASH RECYCLE SYSTEM. THE GRAVEL CLEANS THE PIPING IN JUST A FEW HOURS COMPARED TO SEVERAL MORE HOURS WHEN CLEANING BY HAND. THIS PROCEDURE DOES NOT REQUIRE DOWNTIME TO THE SCRUBBER AND DOES NOT HARM THE PNEUMATIC FEED SYSTEM. ALL USED GRAVEL IS DISCARDED WITH THE FLYASH TO THE UTILITY'S LANDFILL.

THE UTILITY REPORTED THAT THE UNIT OPERATED APPROXIMATELY 2040 HOURS DURING THE FOURTH QUARTER OF 1987. FGD SYSTEM AVAILABILITY FOR THE QUARTER WAS REPORTED TO BE 91.8 PERCENT.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MICHIGAN SO CENTRAL PWR AGENCY	
PLANT NAME	ENDICOTT	
UNIT NUMBER	1	
CITY	LITCHFIELD	
STATE	MICHIGAN	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	365.	(0.850 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	55	
GROSS UNIT GENERATING CAPACITY - MW	55	
NET UNIT GENERATING CAPACITY W/FGD - MW	50	
NET UNIT GENERATING CAPACITY WO/FGD - MW	51	
EQUIVALENT SCRUBBED CAPACITY - MW	55	

*** 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	103.83	(220015 ACFM)
BOILER FLUE GAS TEMPERATURE - C	156.7	(314 F)
STACK HEIGHT - M	76.	(250 FT)
STACK SHELL	CARBON STEEL	
STACK TOP DIAMETER - M	2.9	(9.5 FT)

*** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28377.	(12200 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-13000
AVERAGE ASH CONTENT - %	10.00	
RANGE ASH CONTENT - %	6.0-15.0	
AVERAGE MOISTURE CONTENT - %	6.00	
RANGE MOISTURE CONTENT - %	4.0-8.0	
AVERAGE SULFUR CONTENT - %	2.25	
RANGE SULFUR CONTENT - %	0.0-4.3	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

*** ESP

NUMBER	1	
TYPE	HOT SIDE	
SUPPLIER	BELCO	
INLET FLUE GAS CAPACITY - CU.M/S	126.2	(267510 ACFM)
INLET FLUE GAS TEMPERATURE - C	156.7	(314 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

*** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	BABCOCK & WILCOX

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MICHIGAN SO CENTRAL PWR AGENCY: ENDICOTT 1 (CONT.)

A-E FIRM	CAMPBELL DEBOE & ASSOCIATES	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00	
ENERGY CONSUMPTION - %	1.8	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/1983	
INITIAL START-UP	5/1983	
CONTRACT AWARDED	6/1979	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	BABCOCK & WILCOX	
DIMENSIONS - FT	22.5 X 92.5	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
SHELL MATERIAL TRADE NAME/COMMON TYPE	TYPE 316L	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
GAS CONTACTING DEVICE TYPE	NONE	
L/G RATIO - L/CU.M	1.3	(10.0 GAL/1000 ACF)
SUPERFICAL GAS VELOCITY - M/SEC	2.4	(7.9 FT/S)
INLET GAS FLOW - CU. M/S	87.84	(186147 ACFM)
INLET GAS TEMPERATURE - C	160.0	(320 F)
SO2 REMOVAL EFFICIENCY - %	90.0	
** MIST ELIMINATOR		
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	1	
GENERIC TYPE	NR	
SPECIFIC TYPE	NR	
TRADE NAME/COMMON TYPE	NR	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	2	
NUMBER OF PASSES PER STAGE	1	
DISTANCE BETWEEN STAGES - CM	25.91	(10.2 IN)
DISTANCE BETWEEN VANES - CM	6.9	(2.70 IN)
VANE ANGLES - DEGREES	107	
PRESSURE DROP - KPA	0.1	(0.3 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7	(8.8 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	BLENDED	
WASH RATE - L/S	5.4	(85 GAL/MIN)
** REHEATER		
NUMBER	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	NR	
TEMPERATURE INCREASE - C	27.8	(50 F)
INLET FLUE GAS FLOW RATE - CU. M/S	88.35	(187219 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
** FANS		
DESIGN	NR	
FUNCTION	NR	
APPLICATION	NR	

MICHIGAN SO CENTRAL PWR AGENCY: ENDICOTT 1 (CONT.)

SERVICE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	HORIZONTAL IN-VERTICAL OUT
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	1
THICKENER OVERFLOW	2
SPARGER/OXIDIZER	1
REAGENT PREP PRODUCT	2
THICKENER UNDERFLOW	1
** PUMPS	
SERVICE	NUMBER
-----	-----
LIME PRODUCT	2
SLURRY TRANSFER	2
THICKENER UNDERFLOW	2
ABSORBER RECIRCULATION	3
SAND	2
CYCLONE	2
VACUUM FILTER FEED	2
FILTRATE	2
VACUUM	2
CLARIFIED RECYCLE	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	70.0 DIA
FEED STREAM CHARACTERISTICS	17% SOLIDS
OUTLET STREAM CHARACTERISTICS	29% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
SHELL SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER
FEED STREAM CHARACTERISTICS	29% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MICHIGAN SO CENTRAL PWR AGENCY: ENDICOTT 1 (CONT.)

*** SLUDGE

** TREATMENT		
METHOD	FORCED OXIDATION	
DEVICE	NR	
PROPRIETARY PROCESS	NR	
** DISPOSAL		
NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	OFF-SITE	
SITE TRANSPORTATION METHOD	TRUCK/RAIL	
SITE TREATMENT	NONE	
** PROCESS CONTROL AND INSTRUMENTATION		
CHEMICAL PARAMETERS	PH-SOLIDS-ADDITIVES	
MONITOR LOCATION	RECYCLE SLURRY LINE	
PROCESS CONTROL MANNER	AUTOMATIC	
PROCESS CHEMISTRY MODE	FEEDBACK/FEED FORWARD	
** WATER BALANCE		
WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	4.0	(64 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	.1	(17 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0	
RECEIVING WATER STREAM	105	
MAKEUP WATER ADDITION - LITERS/S	5.4	(85 GPM)

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

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

5/83	SYSTEM						744			

6/83	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL FGD OPERATIONS COMMENCED IN MAY 1983.

THE UTILITY REPORTED EXPERIENCING SOME MINOR PUMP BEARING AND VACUUM FILTER PROBLEMS DURING STARTUP.

7/83	SYSTEM						744			

8/83	SYSTEM						744			

9/83	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED MINOR PROBLEMS ASSOCIATED WITH START-UP DURING THE THIRD QUARTER, HOWEVER, NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

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			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MICHIGAN SO CENTRAL PWR AGENCY: ENDICOTT 1 (CONT.)

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

2/84 SYSTEM

696

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD OF OCTOBER 1983 THROUGH FEBRUARY 1984. SO2 REMOVAL DURING THIS PERIOD WAS ESTIMATED AT 95%.

THE LIMESTONE CRUSHER WAS REPLACED DURING THE PERIOD OF OCTOBER 1983 TO FEBRUARY 1984 DUE TO INADEQUATE SIZING.

THE UTILITY REPORTED PROBLEMS WITH THE VACUUM FILTRATION SYSTEM DURING THE PERIOD OF OCTOBER 1983 TO FEBRUARY 1984. THE PROBLEMS WERE SUBSEQUENTLY WORKED OUT AND REPAIRS WERE MADE.

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

A GENERATOR FAILURE OCCURRED IN LATE FEBRUARY 1984, FORCING A SHUT DOWN OF THE TOTAL FACILITY FOR THE REMAINDER OF THE FIRST THREE QUARTERS OF 1984.

THE UTILITY IS CURRENTLY DISCUSSING MODIFICATIONS OF THE DEWATERING SYSTEM TO PROVIDE EASIER AND MORE ECONOMICAL DEWATERING. A SIX MONTH TEST PROGRAM BEGINNING IN JANUARY 1985 WILL DETERMINE WHETHER OR NOT THE MODIFICATIONS SHOULD BE MADE PERMANENT.

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. THE UTILITY IS VERY PLEASED WITH THE FGD OPERATION AND MAINTENANCE. GENERATOR REPAIRS WERE ALSO COMPLETED DURING THE PERIOD WITH THE UNIT COMING BACK ON-LINE OCTOBER 1.

1/85 SYSTEM

744

2/85 SYSTEM

672

3/85 SYSTEM

744

4/85 SYSTEM

720

5/85 SYSTEM

744

6/85 SYSTEM

720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MICHIGAN SO CENTRAL PWR AGENCY: ENDICOTT 1 (CONT.)

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

7/85	SYSTEM						744
8/85	SYSTEM						744
9/85	SYSTEM						720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF JANUARY THROUGH SEPTEMBER OF 1985. THE UTILITY HAS SO FAR BEEN PLEASED WITH SCRUBBER OPERATIONS.

10/85	SYSTEM						744
11/85	SYSTEM						720
12/85	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT AND FGD WENT OFF-LINE IN OCTOBER FOR A SCHEDULED ONE MONTH MAINTENANCE OUTAGE. DURING THE OUTAGE, THE UTILITY REPLACED THE INLINE STEAM REHEAT EXCHANGER WITH ONE CONSTRUCTED OF GLASS. THE ORIGINAL REHEATER HAD BECOME BADLY CORRODED DUE TO GALVANIC CORROSION. SOON AFTER INSTALLATION, THE GLASS TUBES FRACTURED AND THE UTILITY HAD TO TAKE THE UNIT AND FGD SYSTEM OFF-LINE. THE UNIT AND FGD REMAINED OFF-LINE FOR THE REMAINDER OF THE YEAR. THE UTILITY IS CURRENTLY INVESTIGATING TITANIUM CONSTRUCTED STEAM TUBE BUNDLES AS A POSSIBLE REPLACEMENT.

1/86	SYSTEM						774
2/86	SYSTEM						672
3/86	SYSTEM						774
4/86	SYSTEM						720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF-LINE FROM JANUARY UNTIL THE END OF APRIL 1986 DUE TO REPAIRS TO THE IN-LINE STEAM REHEATER.

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 SLUDGE FROM THE LOCAL MUNICIPAL WASTE WATER TREATMENT FACILITY WAS FOUND TO HAVE A SATISFACTORY CHEMICAL COMPOSITION, HOWEVER, THE SOLIDS CONTENT WAS LOW. FURTHER EVALUATIONS BY THE UTILITY WILL BE CONDUCTED

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MICHIGAN SO CENTRAL PWR AGENCY: ENDICOTT 1 (CONT.)

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

TO SEE IF THEIR DEWATERING EQUIPMENT CAN HANDLE AN INCREASED LOAD IF
 NECESSARY.

UTILITY REPORTED THAT NO OTHER MAJOR OUTAGES WERE ENCOUNTERED DURING THE
 MAY THROUGH DECEMBER PERIOD. UNIT AND FGD AVAILABILITY FOR THE PERIOD
 WAS APPROXIMATELY 96 TO 97%. NO PROBLEMS WITH THE IN-LINE STEAM REHEATER
 WERE ENCOUNTERED.

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 REHEAT SYSTEM CORROSION AND SEAL PROBLEMS.
 THE UTILITY IS CURRENTLY INVESTIGATING THE POSSIBILITY OF EMPLOYING
 WET STACK OPERATIONS, AND ELIMINATING THE REHEAT STAGE. A CONTRACTOR
 HAS BEEN HIRED TO INVESTIGATE THE PROBLEM.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED UNIT OUTAGES WERE
 ENCOUNTERED DURING THE YEAR 1987. THE UNIT WAS OFF-LINE IN THE FALL FOR
 APPROXIMATELY 4 WEEKS FOR SCHEDULED MAINTENANCE. DURING THIS OUTAGE
 ROUTINE MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MINNESOTA POWER & LIGHT	
PLANT NAME	CLAY BOSWELL	
UNIT NUMBER	4	
CITY	COHASSET	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NO _x EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1000	
GROSS UNIT GENERATING CAPACITY - MW	554	
NET UNIT GENERATING CAPACITY W/FGD - MW	504	
NET UNIT GENERATING CAPACITY WO/FGD - MW	511	
EQUIVALENT SCRUBBED CAPACITY - MW	475	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1086.40	(2302181 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9	(300 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	11.3	(37.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19276.	(8287 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	7509-9923	
AVERAGE ASH CONTENT - %	9.40	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	24.50	
RANGE MOISTURE CONTENT - %	20.3-28.3	
AVERAGE SULFUR CONTENT - %	0.94	
RANGE SULFUR CONTENT - %	0.4-2.8	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

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	94.4 (200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	398.9 (750 F)
PRESSURE DROP - KPA	0.6 (3. IN-H ₂ O)
PARTICLE REMOVAL EFFICIENCY - %	99.7

** PARTICLE SCRUBBER

NUMBER	4
NUMBER OF SPARES	1
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/ADJUSTABLE DRUM
TRADE NAME/COMMON NAME	RADIAL FLOW VENTURI
SUPPLIER	PEABODY PROCESS SYSTEMS
DIMENSIONS - FT	30.0 DIA X 40.0
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	NATURAL RUBBER
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

LIQUID RECIRCULATION RATE - LITER/S	841.7	(13360 GPM)
L/G RATIO - LITER/CU.M	2.1	(16.0 GAL/1000ACF)
PH CONTROL ADDITIVE	ABSORBER SLURRY	
PRESSURE DROP - KPA	3.0	(12.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	394.4	(835840 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
PARTICLE REMOVAL EFFICIENCY - %	99.7	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.73
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	89.00
ENERGY CONSUMPTION - %	1.3
CURRENT STATUS	1
COMMERCIAL START-UP	4/1980
INITIAL START-UP	2/1980

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	2.80	
DESIGN COAL HEAT CONTENT - J/G	19980.3	(8590 BTU/LB)
DESIGN COAL ASH CONTENT - %	9.40	
DESIGN MOISTURE CONTENT - %	25.00	
DESIGN CHLORIDE CONTENT - %	0.01	
SPACE REQUIREMENTS - SQ M	14864.0	(160000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	100.0	

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	PEABODY PROCESS SYSTEMS	
DIMENSIONS - FT	35.0 DIA X 60.0	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	2104.	(33400 GPM)
L/G RATIO - L/CU.M	7.0	(52.2 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	5.0	(20.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.7	(12.0 FT/S)
INLET GAS FLOW - CU. M/S	302.08	(640130 ACFM)
INLET GAS TEMPERATURE - C	53.3	(128 F)
SO2 REMOVAL EFFICIENCY - %	89.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRECOLLECTOR
NUMBER PER SYSTEM	4
NUMBER OF SPARES PER SYSTEM	1
NUMBER PER MODULE	1
GENERIC TYPE	BULK SEPARATION
SPECIFIC TYPE	PERFORATED TRAYS
TRADE NAME/COMMON TYPE	SIEVE TRAY
CONFIGURATION	HORIZONTAL

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	3.4 (11.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
WASH WATER SOURCE	MAKEUP OVERSPRAY AND MAKEUP/SUPERNATANT MIXTURE
WASH RATE - L/S	29.9 (474 GAL/MIN)
** REHEATER	
NUMBER	1
GENERIC TYPE	BYPASS
SPECIFIC TYPE	HOT SIDE
TRADE NAME/COMMON TYPE	N/A
PERCENT GAS BYPASSED - AVG	5.0
TEMPERATURE INCREASE - C	14.4 (26 F)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM
** FANS	
NUMBER	4
NUMBER OF SPARES	1
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FAN
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	WET
FLUE GAS FLOW RATE - CU.M/S	320.33 (678800 ACFM)
FLUE GAS TEMPERATURE - C	62.2 (144 F)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
** DAMPERS	
NUMBER	4
FUNCTION	NR
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DAMPERS	
NUMBER	4
FUNCTION	NR
GENERIC TYPE	GUILLOTINE
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DAMPERS	
NUMBER	4
FUNCTION	NR
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	ABSORBER TO REHEATER
DIMENSIONS	12.0 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

** DUCTWORK	
LOCATION	REHEAT SECTION
DIMENSIONS	NR
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	PEABODY PROCESS SYSTEMS
NUMBER	5
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	18.2 (20 TPH)
PRODUCT QUALITY - % SOLIDS	20.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	4
REAGENT PREP PRODUCT	1
MIST ELIMINATOR WASH	1
FLYASH	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ALKALI FEED	2
FLY ASH SLURRY FEED	2
SCRUBBER RECIRCULATION	8
ABSORBER RECIRCULATION	12
WASH WATER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	19.7 (21.7 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	45.0
% CASO3 - DRY	5.0
% CASO4 - DRY	3.0
% CAOH2 - DRY	0.0
% CACO3 - DRY	1.0
% ASH - DRY	91.0
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	276 ACRES
SITE CAPACITY - CU.M	9556522 (7814.0 ACRE-FT)
SITE SERVICE LIFE - YRS	35

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

** PROCESS CONTROL AND INSTRUMENTATION

CHEMICAL PARAMETERS	PH AND SO2
PHYSICAL VARIABLES	DENSITY IN RECYCLE TANK
CONTROL LEVELS	PH 3-6; 7-9% SOLIDS
MONITOR TYPE	DUPONT AND LEAR SIEGLER FOR SO2
MONITOR LOCATION	RECYCLE TANK
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK

** WATER BALANCE

WATER LOOP TYPE	CLOSED	
EVAPORATION WATER LOSS - LITER/S	27.6	(438 GPM)
SLUDGE HYDRATION WATER LOSS - LITER/S	0.1	(1 GPM)
SLUDGE INTERSTITIAL WATER LOSS - LITERS/S	4.3	(69 GPM)
MAKEUP WATER ADDITION - LITERS/S	32.0	(508 GPM)
SOURCE OF MAKEUP WATER	RIVER WATER	

** CHEMICALS AND CONSUMPTION

FUNCTION	ABSORBENT
NAME	LIME
PRINCIPAL CONSTITUENT	CAO
CONSUMPTION	NONE 'ALKALINITY PROVIDED BY FLY ASH!
POINT OF ADDITION	SLAKER

** FGD SPARE CAPACITY INDICES

SCRUBBER - %	33.0
ABSORBER - %	33.0

** FGD SPARE COMPONENT INDICES

SCRUBBER	1.0
ABSORBER	1.0

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

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

4/80 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER BEGAN OPERATIONS ON FEBRUARY 26, 1980 AND FIRED OIL THROUGH THE MONTH OF MARCH. INITIAL FGD SYSTEM OPERATIONS BEGAN IN EARLY APRIL WITH THE BOILER FIRING COAL FOR TESTING PURPOSES. THE UNIT WAS SHUTDOWN IN MID-APRIL TO RECTIFY MINOR SHAKEDOWN PROBLEMS. A TRIAL RUN OF THE FGD SYSTEM IN AN INTEGRATED MODE OCCURRED IN LATE APRIL.

5/80 SYSTEM

744

6/80 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

SHAKEDOWN OPERATIONS CONTINUED THROUGH THE SECOND QUARTER OF 1980. THE FGD SYSTEM WILL BE FINE TUNED TO MEET DESIGN CRITERIA THROUGH JULY. TO DATE THE UTILITY REPORTED THAT, ALTHOUGH MANY TYPICAL STARTUP PROBLEMS ATTRIBUTABLE TO OPERATOR ERROR AS WELL AS MECHANICAL MALFUNCTIONS HAVE OCCURRED, NO UNUSUAL PROBLEMS HAVE OCCURRED. THE COMPLIANCE TEST IS SCHEDULED FOR EARLY SEPTEMBER.

7/80	1	87.8	100.0	86.8				
	2	97.8	100.0	96.7				
	3	100.0	100.0	100.0				
	4	0.0		0.0				
	SYSTEM	96.1	100.0	95.0	720	712	684	79.0
8/80	1	71.8	100.0	62.9				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

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

	2		75.5	100.0	66.1				
	3		29.4	100.0	25.8				
	4		49.7	100.0	43.5				
	SYSTEM		75.5	100.0	66.1	744	652	492	61.7

9/80	1		71.6	100.0	71.0				
	2		89.6	100.0	88.7				
	3		14.7	100.0	14.5				
	4		65.1	100.0	64.5				
	SYSTEM		80.3	100.0	79.6	744	737	592	73.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM IS STILL IN THE DEBUGGING PHASE OF OPERATION. MUCH OF THE EQUIPMENT IS STILL BEING WORKED ON AND TESTED.

10/80	1		31.6	100.0	22.6				
	2		38.4	100.0	27.4				
	3		0.0		0.0				
	4		83.6	100.0	59.7				
	SYSTEM		51.2	100.0	36.6	744	531	272	59.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE AVAILABLE HOURS AND UNAVAILABLE HOURS DURING OCTOBER WERE NOT RECORDED.

THE UNIT OUTAGE TIME WAS DUE TO MISCELLANEOUS MAINTENANCE AND AN INSPECTION.

11/80	1	94.4	67.2	100.0	60.7				
	2	85.6	55.5	100.0	50.1				
	3	98.1	59.1	100.0	53.3				
	4	55.4	26.0	100.0	23.4				
	SYSTEM	100.0	69.2	100.0	62.5	720	650	450	60.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 4 OUTAGE TIME DURING NOVEMBER WAS DUE TO NECESSARY CLEANING AND GENERAL REPAIRS.

12/80	1	100.0	100.0	100.0	100.0				
	2	93.4	62.0	100.0	61.3				
	3	19.4	2.4	100.0	2.4				
	4	96.5	87.6	100.0	86.6				
	SYSTEM	100.0	87.6	100.0	83.5	744	735	621	89.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER MODULE 3 OUTAGE TIME WAS DUE TO GENERAL MAINTENANCE AND REPAIRS TO THE VENTURI LINER.

1/81	1	100.0	100.0	100.0	100.0				
	2	69.4	48.1	100.0	48.1				
	3	100.0	98.4	100.0	98.4				
	4	73.1	38.7	100.0	38.7				
	SYSTEM	100.0	95.0	100.0	95.0	744	744	707	93.0

2/81	1	100.0	92.2	100.0	91.5				
	2	82.1	36.4	100.0	36.2				
	3	75.7	48.9	100.0	48.5				
	4	100.0	67.8	100.0	67.3				
	SYSTEM	100.0	81.7	100.0	81.1	672	667	545	86.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

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

3/81	1	79.8	55.6	100.0	53.2					
	2	40.2	29.5	100.0	28.2					
	3	100.0	94.8	100.0	90.7					
	4	100.0	95.8	100.0	91.7					
	SYSTEM	100.0	91.8	100.0	87.9		744	712	654	88.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

4/81	1	54.3	28.2	100.0	26.3					
	2	88.1	70.5	100.0	65.7					
	3	94.0	56.7	100.0	52.8					
	4	100.0	88.1	100.0	82.1					
	SYSTEM	100.0	81.1	100.0	75.6		720	671	545	83.5

5/81	1	95.2	51.2	100.0	46.8					
	2	95.3	75.2	100.0	67.7					
	3	98.0	66.0	100.0	59.5					
	4	0.0	0.0		0.0					
	SYSTEM	96.1	64.3	100.0	58.0		744	671	432	63.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY MODULE 4 WAS DOWN FOR AN INSPECTION, MAINTENANCE AND VENTURI MODIFICATIONS.

6/81	1	100.0	71.6	100.0	71.6					
	2	96.1	74.9	100.0	74.9					
	3	94.0	78.3	100.0	78.3					
	4	33.5	31.7	100.0	31.7					
	SYSTEM	100.0	85.5	100.0	85.5		720	720	616	89.5

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/81	1	66.5	56.2	100.0	49.2					
	2	100.0	93.9	100.0	82.1					
	3	100.0	78.8	100.0	69.0					
	4	79.0	29.5	100.0	25.8					
	SYSTEM	100.0	86.1	100.0	75.4		744	651	561	78.0

8/81	1	27.3	9.3	100.0	8.3					
	2	100.0	100.0	100.0	91.5					
	3	78.5	31.3	100.0	28.0					
	4	100.0	100.0	100.0	91.5					
	SYSTEM	100.0	80.2	100.0	73.1		744	665	544	73.8

9/81	1	100.0	60.0	100.0	56.8					
	2	100.0	100.0	100.0	95.4					
	3	58.2	41.8	100.0	39.6					
	4	66.7	65.0	100.0	61.5					
	SYSTEM	100.0	88.9	100.0	84.4		720	682	608	87.8

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO MAJOR FGD-RELATED PROBLEMS REPORTED FOR THE THIRD QUARTER 1981.

10/81	1	100.0	90.8	100.0	90.8					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	2	56.4	56.4	100.0	56.4						
	3	87.6	78.5	100.0	78.5						
	4	60.7	58.7	100.0	58.7						
	SYSTEM	100.0	94.8	100.0	94.8			744	744	705	88.0
11/81	1	87.5	67.6	100.0	51.2						
	2	35.0	38.8	100.0	29.4						
	3	100.0	100.0	100.0	76.4						
	4	64.4	80.6	100.0	61.1						
	SYSTEM	93.8	95.9	100.0	72.8			720	546	524	66.5
12/81	1	100.0	77.4	100.0	77.4						
	2	100.0	98.0	100.0	98.0						
	3	25.0	20.2	100.0	20.2						
	4	75.8	75.1	100.0	75.1						
	SYSTEM	100.0	90.2	100.0	90.2			744	744	671	79.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/82	1	78.0	48.0	100.0	48.0					
	2	100.0	100.0	100.0	100.0					
	3	75.1	75.1	100.0	75.1					
	4	90.4	82.5	100.0	82.5					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	98.0
2/82	1	0.0	0.0		0.0					
	2	100.0	100.0	100.0	97.8					
	3	100.0	89.6	100.0	81.8					
	4	100.0	100.0	100.0	94.0					
	SYSTEM	100.0	99.8	100.0	91.2		672	614	613	86.0
3/82	1	68.4	59.5	100.0	59.0					
	2	100.0	92.3	100.0	91.5					
	3	100.0	94.6	100.0	53.5					
	4	47.8	43.8	100.0	43.4					
	SYSTEM	100.0	96.7	100.0	96.0		744	738	714	92.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982.

4/82	SYSTEM						720			
5/82	SYSTEM						744			
6/82	1	64.9	65.4	100.0	50.4					
	2	100.0	86.7	100.0	66.8					
	3	83.9	62.2	100.0	47.9					
	4	82.4	82.2	100.0	63.3					
	SYSTEM	100.0	98.8	100.0	76.2		720	555	549	62.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/82	SYSTEM						744			
8/82	SYSTEM						744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 JULY 1982 THROUGH MARCH 1983

4/83	1	96.9	80.3	100.0	80.2					
	2	76.0	50.6	100.0	50.6					
	3	65.3	66.1	100.0	66.0					
	4	34.9	33.5	100.0	33.5					
	SYSTEM	91.0	76.8	100.0	76.7		720	719	553	82.0
5/83	1	78.2	59.4	100.0	59.4					
	2	88.6	65.2	100.0	65.2					
	3	79.2	15.2	100.0	15.2					
	4	96.6	93.5	100.0	93.5					
	SYSTEM	100.0	77.8	100.0	77.8		744	744	579	68.9
6/83	1	89.7	56.8	100.0	35.3					
	2	71.0	1.8	100.0	1.1					
	3	99.6	53.9	100.0	33.5					
	4									
	SYSTEM	86.8	37.5	100.0	23.3		720	448	168	34.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF APRIL THROUGH JUNE 1983.

7/83	1	96.8	78.1	100.0	69.6					
	2	100.0	19.8	100.0	17.6					
	3	100.0	72.5	100.0	64.7					
	4	100.0	83.7	100.0	74.6					
	SYSTEM	100.0	84.7	100.0	75.5		744	663	562	78.0
8/83	1	100.0	33.5	100.0	33.5					
	2	98.3	85.9	100.0	85.9					
	3	100.0	80.4	100.0	80.4					
	4	86.0	67.9	100.0	67.9					
	SYSTEM	100.0	89.2	100.0	89.2		744	744	664	78.5
9/83	1	100.0	55.9	100.0	44.8					
	2	100.0	79.0	100.0	63.3					
	3	100.0	72.5	100.0	58.1					
	4	92.2	50.5	100.0	40.4					
	SYSTEM	100.0	86.0	100.0	68.8		720	577	496	61.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

10/83	1	98.1	9.0	100.0	4.5						
	2	100.0	100.0	100.0	53.1						
	3	100.0	59.6	100.0	29.7						
	4	100.0	96.2	100.0	47.9						
	SYSTEM	100.0	88.3	100.0	45.1			744	371	335	34.2
11/83	1	60.0	0.0		0.0						
	2	100.0	51.0	100.0	51.0						
	3	100.0	63.8	100.0	63.8						
	4	100.0	79.9	100.0	79.9						
	SYSTEM	100.0	64.9	100.0	64.9			720	720	467	62.8
12/83	1	89.8	9.9	100.0	9.9						
	2	100.0	30.4	100.0	30.4						
	3	100.0	52.4	100.0	52.4						
	4	100.0	45.6	100.0	45.6						
	SYSTEM	100.0	46.1	100.0	46.1			744	744	343	88.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/84	1	40.2	25.9	100.0	22.2						
	2	100.0	100.0	100.0	93.8						
	3	68.8	71.0	100.0	61.0						
	4	100.0	100.0	100.0	89.4						
	SYSTEM	100.0	99.0	100.0	88.8			744	639	661	80.0
2/84	1	100.0	86.5	100.0	86.4						
	2	54.0	46.6	100.0	46.6						
	3	83.0	66.8	100.0	66.7						
	4	100.0	97.1	100.0	96.9						
	SYSTEM	100.0	99.0	100.0	98.9			696	695	688	85.0
3/84	1	61.0	48.2	100.0	47.8						
	2	99.6	98.0	100.0	97.3						
	3	100.0	99.4	100.0	98.7						
	4	77.2	47.1	100.0	46.8						
	SYSTEM	100.0	97.5	100.0	96.9			744	739	721	97.0
4/84	1	100.0	80.9	100.0	80.7						
	2	100.0	84.2	100.0	84.0						
	3	100.0	38.2	100.0	38.1						
	4	95.8	85.5	100.0	85.3						
	SYSTEM	100.0	96.3	100.0	96.0			720	718	691	94.4
5/84	1	43.1	36.4	100.0	36.1						
	2	100.0	100.0	100.0	99.4						
	3	90.3	69.8	100.0	69.2						
	4	100.0	98.4	100.0	97.6						
	SYSTEM	100.0	100.0	100.0	100.0			744	738	744	97.0
6/84	1	100.0	92.3	100.0	92.3						
	2	34.5	30.5	100.0	30.5						
	3	100.0	92.1	100.0	92.1						
	4	76.7	56.9	100.0	56.9						
	SYSTEM	100.0	90.6	100.0	90.6			720	720	652	90.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS AROSE DURING THE FIRST TWO QUARTERS OF 1984.

7/84	1	100.0	82.2	100.0	81.7					
	2	72.4	49.9	100.0	49.6					
	3	84.8	76.5	100.0	75.9					
	4	90.3	58.7	100.0	58.3					
	SYSTEM	100.0	89.1	100.0	88.5		744	739	658	83.9
8/84	1	32.3	24.3	100.0	24.2					
	2	100.0	95.5	100.0	95.2					
	3	87.1	62.7	100.0	62.4					
	4	96.8	87.6	100.0	87.2					
	SYSTEM	100.0	90.0	100.0	89.7		744	741	667	84.6
9/84	1	99.9	75.1	100.0	75.1					
	2	100.0	78.3	100.0	78.3					
	3	100.0	85.2	100.0	85.2					
	4	62.3	38.6	100.0	38.6					
	SYSTEM	100.0	92.4	100.0	92.4		720	720	665	90.3
10/84	1	100.0	99.6	100.0	71.4					
	2	100.0	40.5	100.0	29.0					
	3	100.0	100.0	100.0	78.0					
	4	64.5	59.8	100.0	42.9					
	SYSTEM	100.0	100.0	100.0	73.8		744	533	549	69.0
11/84	1	99.8	67.0	100.0	66.9					
	2	96.5	59.1	100.0	59.1					
	3	100.0	90.5	100.0	90.5					
	4	98.7	64.9	100.0	64.9					
	SYSTEM	100.0	93.9	100.0	93.8		720	710	675	90.0
12/84	1	99.1	90.9	100.0	90.9					
	2	0.0	0.0		0.0					
	3	98.7	90.7	100.0	90.7					
	4	97.3	86.5	100.0	86.5					
	SYSTEM	98.3	89.3	100.0	89.3		744	744	665	83.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD AND FOURTH QUARTERS OF 1984.

1/85	1	100.0	86.1	100.0	83.4					
	2	100.0	66.2	100.0	64.1					
	3	41.8	40.6	100.0	39.3					
	4	100.0	57.4	100.0	55.6					
	SYSTEM	100.0	83.4	100.0	80.8		744	721	601	82.0
2/85	1	72.3	52.7	100.0	51.5					
	2	73.3	61.9	100.0	60.4					
	3	71.1	61.8	100.0	60.3					
	4	100.0	92.9	100.0	90.7					
	SYSTEM	100.0	89.8	100.0	87.6		672	656	589	89.0
3/85	1	70.4	65.1	100.0	65.1					
	2	59.1	54.4	100.0	54.4					
	3	70.0	63.4	100.0	63.4					
	4	100.0	93.8	100.0	93.8					
	SYSTEM	99.8	92.2	100.0	92.2		744	744	686	89.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

PERIOD	MODULE	AVAILABILITY	OPERABILITY	PERFORMANCE DATA		RELIABILITY	UTILIZATION	% REMOVAL		PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
				SO2	PART.								
4/85	1	99.9	93.0	100.0	92.9								
	2	99.9	89.8	100.0	89.7								
	3	99.9	92.6	100.0	92.4								
	4	0.8	0.8	100.0	0.8								
	SYSTEM	100.0	92.1	100.0	91.9			720	719	662	89.3		
5/85	1	87.2	77.7	100.0	77.6								
	2	100.0	90.7	100.0	90.6								
	3	28.6	27.1	100.0	27.1								
	4	91.5	83.8	100.0	83.7								
	SYSTEM	100.0	93.1	100.0	93.0			744	743	692	86.1		
6/85	1	15.3	14.7	100.0	14.7								
	2	93.3	79.6	100.0	79.6								
	3	97.2	86.3	100.0	86.3								
	4	98.8	86.9	100.0	86.9								
	SYSTEM	100.0	89.2	100.0	89.2			720	720	642	76.6		
7/85	1	100.0	86.9	100.0	78.4								
	2	100.0	74.2	100.0	66.9								
	3	97.7	71.5	100.0	64.5								
	4	48.7	29.7	52.2	26.7								
	SYSTEM	100.0	87.4	100.0	78.9			744	671	587	66.0		
8/85	1	98.3	81.3	100.0	81.3								
	2	79.8	57.5	100.0	57.5								
	3	62.3	15.7	100.0	15.7								
	4	100.0	81.8	100.0	81.8								
	SYSTEM	100.0	78.7	100.0	78.7			744	744	586	65.3		
9/85	1	46.3	40.1	100.0	40.1								
	2	53.7	48.5	100.0	48.5								
	3	100.0	89.0	100.0	89.0								
	4	100.0	87.6	100.0	87.6								
	SYSTEM	100.0	88.4	100.0	88.4			720	720	637	80.9		
10/85	1	67.9	67.3	100.0	48.3								
	2	64.7	78.5	100.0	56.3								
	3	76.1	94.2	100.0	67.6								
	4	19.6	26.1	100.0	18.8								
	SYSTEM	76.1	88.7	100.0	63.7			744	534	474	59.3		
11/85	1	67.4	60.3	100.0	60.1								
	2	65.6	62.0	100.0	61.7								
	3	69.4	64.6	100.0	64.3								
	4	100.0	93.9	100.0	93.5								
	SYSTEM	100.0	93.6	100.0	93.2			720	717	671	91.9		
12/85	1	96.6	82.4	100.0	82.4								
	2	67.1	50.7	100.0	50.7								
	3	100.0	77.7	100.0	77.7								
	4	80.8	49.5	100.0	49.5								
	SYSTEM	100.0	86.7	100.0	86.7			744	744	645	79.0		

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH DECEMBER.

1/86	1	72.2	57.9	100.0	57.9					
	2	31.1	24.9	100.0	24.9					
	3	100.0	79.9	100.0	79.9					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	4	100.0	83.5	100.0	83.5					
	SYSTEM	100.0	82.1	100.0	82.1		744	744	611	76.6
2/86	1	27.7	25.5	100.0	25.5					
	2	100.0	94.2	100.0	94.2					
	3	71.1	65.9	100.0	65.9					
	4	100.0	89.5	100.0	89.5					
	SYSTEM	99.6	91.7	100.0	91.7		672	672	616	87.9
3/86	1	100.0	95.8	100.0	95.6					
	2	97.0	68.2	100.0	68.1					
	3	66.6	32.8	100.0	32.8					
	4	33.4	33.4	100.0	33.4					
	SYSTEM	99.0	76.8	100.0	76.7		744	743	570	81.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FIRST QUARTER OF 1986.

4/86	1	76.3	61.9	100.0	60.5					
	2	36.1	24.5	100.0	23.9					
	3	51.9	67.9	100.0	66.3					
	4	95.9	69.7	100.0	68.1					
	SYSTEM	86.7	74.7	100.0	72.9		720	703	525	66.1
5/86	1	40.5	34.0	100.0	34.0					
	2	100.0	80.6	100.0	80.6					
	3	62.8	53.1	100.0	53.1					
	4	100.0	86.0	100.0	86.0					
	SYSTEM	100.0	84.6	100.0	84.6		744	744	629	75.1
6/86	1	100.0	92.4	100.0	77.0					
	2	100.0	76.3	100.0	63.5					
	3	0.0	0.0		0.0					
	4	100.0	96.9	100.0	80.8					
	SYSTEM	100.0	88.5	100.0	73.8		720	600	531	61.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE SECOND QUARTER OF 1986.

7/86	1	99.3	87.4	100.0	83.9					
	2	98.7	36.2	100.0	34.7					
	3	70.7	61.8	100.0	59.3					
	4	62.4	49.9	100.0	47.8					
	SYSTEM	100.0	78.4	100.0	75.2		744	714	560	67.0
8/86	1	100.0	96.1	100.0	86.9					
	2	99.0	81.9	100.0	74.1					
	3	97.4	79.9	100.0	72.2					
	4	0.0	0.0		0.0					
	SYSTEM	98.8	86.0	100.0	77.8		744	673	579	64.0
9/86	1	100.0	89.4	100.0	89.4					
	2	96.9	80.8	100.0	80.8					
	3	100.0	92.8	100.0	92.8					
	4	0.0	0.0		0.0					
	SYSTEM	99.0	87.6	100.0	87.6		720	720	631	82.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 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

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE THIRD
 QUARTER OF 1986.

10/86	1	100.0	88.1	100.0	88.2				
	2	72.6	64.0	100.0	64.1				
	3	43.6	37.7	100.0	37.7				
	4	93.1	77.4	100.0	77.6				
	SYSTEM	100.0	89.1	100.0	89.2	744	745	664	83.7
11/86	1	96.7	100.0	100.0	82.6				
	2	100.0	100.0	100.0	89.5				
	3	75.0	60.0	100.0	48.3				
	4	50.3	29.3	100.0	23.6				
	SYSTEM	100.0	96.4	100.0	81.4	720	580	586	66.9
12/86	1	80.6	46.9	100.0	45.2				
	2	41.9	38.1	100.0	36.8				
	3	100.0	86.5	100.0	83.5				
	4	100.0	54.7	100.0	52.8				
	SYSTEM	100.0	75.4	100.0	72.8	744	718	541	67.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE FOURTH
 QUARTER OF 1986.

1/87	1	86.9	67.1	100.0	67.1				
	2	34.5	30.6	100.0	30.6				
	3	100.0	91.5	100.0	91.5				
	4	77.4	53.6	100.0	53.6				
	SYSTEM	99.6	80.9	100.0	80.9	744	744	602	74.0
2/87	1	85.8	80.7	100.0	80.5				
	2	100.0	85.4	100.0	85.1				
	3	100.0	94.8	100.0	94.5				
	4	13.5	13.6	100.0	13.5				
	SYSTEM	99.8	91.5	100.0	91.2	672	670	613	86.9
3/87	1	0.0	0.0		0.0				
	2	100.0	95.8	100.0	95.8				
	3	100.0	92.7	100.0	92.7				
	4	100.0	90.1	100.0	90.1				
	SYSTEM	100.0	92.9	100.0	92.9	744	744	691	87.9
4/87	1	96.5	91.4	100.0	91.3				
	2	99.9	91.9	100.0	91.7				
	3	99.9	93.2	100.0	93.1				
	4	3.2	3.1	100.0	3.1				
	SYSTEM	99.8	93.2	100.0	93.1	720	719	670	88.4
5/87	1	74.3	76.2	100.0	70.5				
	2	98.5	91.1	100.0	84.3				
	3	51.1	54.6	100.0	50.5				
	4	73.9	79.0	100.0	73.1				
	SYSTEM	99.3	100.0	100.0	92.8	744	688	690	88.0
6/87	1	99.9	65.0	100.0	64.9				
	2	99.9	97.8	100.0	97.7				
	3	34.6	27.7	100.0	27.6				
	4	94.0	92.0	100.0	91.9				
	SYSTEM	100.0	94.2	100.0	94.1	720	719	677	92.3

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNESOTA POWER & LIGHT: CLAY BOSWELL 4 (CONT.)

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

7/87	1	100.0	94.4	100.0	94.4					
	2	100.0	87.2	100.0	87.2					
	3	94.9	86.3	100.0	86.3					
	4	6.6	6.6	100.0	6.6					
	SYSTEM	100.0	91.5	100.0	91.5		744	744	681	87.3
8/87	1	92.4	79.3	100.0	79.3					
	2	59.7	53.7	100.0	53.7					
	3	100.0	89.2	100.0	89.2					
	4	96.8	51.9	100.0	51.9					
	SYSTEM	100.0	91.4	100.0	91.4		744	744	680	88.4
9/87	1	59.0	89.5	100.0	53.7					
	2	0.0	0.0		0.0					
	3	60.0	84.1	100.0	50.5					
	4	60.0	94.3	100.0	56.6					
	SYSTEM	59.7	89.3	100.0	53.6		720	432	386	54.0
10/87	1	0.0			0.0					
	2	0.0			0.0					
	3	0.0			0.0					
	4	0.0			0.0					
	SYSTEM	0.0			0.0		744	0	0	0.0
11/87	1	75.0	83.1	100.0	61.4					
	2	0.0	0.0		0.0					
	3	83.3	100.0	100.0	74.2					
	4	83.3	92.0	100.0	68.0					
	SYSTEM	80.5	91.7	100.0	67.8		720	532	489	57.0
12/87	1	100.0	95.4	100.0	91.1					
	2	58.1	57.1	100.0	54.6					
	3	100.0	73.7	100.0	70.4					
	4	68.1	61.0	100.0	58.3					
	SYSTEM	100.0	95.7	100.0	91.5		744	711	681	87.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE YEAR 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MINNKOTA POWER	
PLANT NAME	MILTON R. YOUNG	
UNIT NUMBER	2	
CITY	CENTER	
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	690	
GROSS UNIT GENERATING CAPACITY - MW	440	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	407	
EQUIVALENT SCRUBBED CAPACITY - MW	374	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	958.33	(2030800 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	168.	(550 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.6	(25.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	15119.	(6500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		6000-6800
AVERAGE ASH CONTENT - %	8.90	
RANGE ASH CONTENT - %	7.2-14.3	
AVERAGE MOISTURE CONTENT - %	38.00	
RANGE MOISTURE CONTENT - %	30-45	
AVERAGE SULFUR CONTENT - %	0.60	
RANGE SULFUR CONTENT - %	.4-.8	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	2	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	WHEELABRATOR-FRYE	
INLET FLUE GAS CAPACITY - CU.M/S	479.2	(1015400 ACFM)
INLET FLUE GAS TEMPERATURE - C	176.7	(350 F)
PRESSURE DROP - KPA	0.3	(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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	SANDERSON & PORTER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	78.00
ENERGY CONSUMPTION - %	1.6
CURRENT STATUS	1
COMMERCIAL START-UP	6/1978
INITIAL START-UP	9/1977
CONTRACT AWARDED	4/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	*****
OPER. & MAINT. REQUIREMENT - MANHR/DAY	92.0

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	2
NUMBER OF SPARES	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	THYSSEN/CEA
DIMENSIONS - FT	40.0 DIA X 120.0
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 500
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	3456. (54850 GPM)
L/G RATIO - L/CU.M	8.7 (64.8 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	2.8 (9.1 FT/S)
INLET GAS FLOW - CU. M/S	399.70 (847000 ACFM)
INLET GAS TEMPERATURE - C	168.3 (335 F)
SO2 REMOVAL EFFICIENCY - %	85.0
PARTICLE REMOVAL EFFICIENCY - %	70.0

** 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
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	5
FREEBOARD DISTANCE - M	2.44 (8.0 FT)
VANE ANGLES - DEGREES	120
PRESSURE DROP - KPA	0.2 (1.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.8 (9.1 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE
WASH WATER SOURCE	BLENDED
WASH FREQUENCY	CONTINUOUS

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

WASH RATE - L/S	50.5	(800 GAL/MIN)
** REHEATER		
NUMBER	1	
NUMBER OF SPARES	0	
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	COLD SIDE	
TRADE NAME/COMMON TYPE	N/A	
LOCATION	OUTLET DUCT	
PERCENT GAS BYPASSED - AVG	12.0	
TEMPERATURE INCREASE - C	22.2	(40 F)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	76.7	(170 F)
NUMBER OF TUBES PER BUNDLE	0	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
** FANS		
NUMBER	2	
NUMBER OF SPARES	1	
DESIGN	AXIAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	519.09	(1100000 ACFM)
FLUE GAS TEMPERATURE - C	176.7	(350 F)
PRESSURE DROP - KPA	3.2	(10.6 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** FANS		
NUMBER	2	
NUMBER OF SPARES	1	
DESIGN	AXIAL	
SUPPLIER	TLT-BABCOCK	
FUNCTION	BOOSTER	
APPLICATION	FORCED DRAFT	
SERVICE	DRY	
PRESSURE DROP - KPA	8.8	(28.8 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
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		
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	NR	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 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	OUTLET
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	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	SLAKER
DEVICE	NR
DEVICE TYPE	NR
MANUFACTURER	WALLACE & TIERNAN
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	3.6 (4 TPH)
PRODUCT QUALITY - % SOLIDS	13.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	2
THICKENER UNDERFLOW	1
FLY ASH SLURRY FEED	1
LIME SLAKER TRANSFER	1
THICKENER OVERFLOW	1
CLARIFIER OVERFLOW/ME WASH	1
TRAY RECYCLE	2
LIME SLURRY FEED	1
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	8
TRAY RECIRCULATION	4
TRAY SPRAY/CLARIFIER OVERFLOW	2
THICKENER UNDERFLOW	2
THICKENER OVERFLOW	2
LIME SLAKER TRANSFER	2
LIME SLURRY FEED	2
FLYASH SLURRY FEED	2
MIST ELIMINATOR SPRAY	2
CLARIFIER UNDERFLOW	2
FILTER BELT WASH	2
BLOW DOWN SUMP	2
FILTRATE	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	CENTRIFUGE
NUMBER	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
DIMENSIONS - FT	130 DIA X 15 HIGH
CAPACITY	3000000

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

SHELL GENERIC MATERIAL TYPE	INORGANIC
SHELL SPECIFIC MATERIAL TYPE	CONCRETE
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	FIBER-REINFORCED POLYESTER
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	12% SOLIDS
OUTLET STREAM CHARACTERISTICS	40% SOLIDS
OUTLET STREAM DISPOSITION	TO VACUUM FILTER
OVERFLOW STREAM DISPOSITION	TO FLYASH SLURRY, VACUUM FILTER WASH, & ME WASH
*** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	0
CAPACITY	750 TON/DAY
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	NATURAL RUBBER
BELT GENERIC MATERIAL TYPE	ORGANIC
BELT SPECIFIC MATERIAL TYPE	POLYPROPYLENE
FEED STREAM SOURCE	THICKENER & CLARIFIER UNDERFLOW
FEED STREAM CHARACTERISTICS	30% SOLIDS
OUTLET STREAM CHARACTERISTICS	60% SOLIDS
OUTLET STREAM DISPOSITION	TO LANDFILL
OVERFLOW STREAM DISPOSITION	TO THICKENER
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
FULL LOAD SLUDGE QUANTITY - M.TONS/HR (DRY)	19.1 (21.0 TPH)
MOISTURE CONTENT - % TOTAL FREE WATER	40.0
% CASO3 - DRY	0.0
** TREATMENT	
METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	TRUCK
SITE TREATMENT	CLAY LINING
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE SERVICE LIFE - YRS	1
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE DIMENSIONS	11.92 ACRES X 15 FT DEEP 'SEMI-CIRCLE!
SITE CAPACITY - CU.M	218672 (178.8 ACRE-FT)
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

SITE DIMENSIONS	11.92 ACRES X 15 FT DEEP 'SEMI-CIRCLE!
SITE CAPACITY - CU.M	218672 (178.8 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	PERCENT SOLIDS
CONTROL LEVELS	SOLIDS 5.5-12%; PH 4.0-5.5
PROCESS CONTROL MANNER	MANUAL
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	34.7 (550 GPM)
MAKEUP WATER ADDITION - LITERS/S	44.1 (700 GPM)
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	FLY ASH
PRINCIPAL CONSTITUENT	20-25% CAO, 5-9% MGO
CONSUMPTION	16 TPH
UTILIZATION - %	83.0
POINT OF ADDITION	SLURRY FEED TANK
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	100.0
** 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	FACTOR

0/77 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

ALTHOUGH THE MILTON R YOUNG 2 SCRUBBING SYSTEM ORIGINAL DESIGN DID NOT INCLUDE SPARE FGD CAPACITY, THE SYSTEM DOES, IN ACTUALITY, GENERALLY HAVE A SPARE MODULE AS A CONSEQUENCE OF THE VARIABILITY IN LIGNITE SULFUR CONTENT. THE LIGNITE BLEND AT M.R.YOUNG 2 VARIES IN SULFUR CONTENT FROM 0.35 TO 1.3%. WHEN THE SULFUR CONTENT RISES TO 1.3% BOTH SCRUBBING TOWERS ARE REQUIRED (WITH 5 TO 15% OF THE FLUE GAS BYPASSED FOR REHEAT). WHEN THE SULFUR CONTENT DROPS TO 0.7% OR BELOW ONLY ONE TOWER IS REQUIRED. 0.7% SULFUR IS TYPICAL FOR THE M.R.YOUNG 2 LIGNITE BLEND. BECAUSE OF THE EFFECTIVE SPARE MODULE THE SYSTEM DEPENDABILITY FIGURES THAT APPEAR IN THIS SECTION WILL GENERALLY NOT BE EQUIVALENT TO THE AVERAGE OF THE MODULAR DEPENDABILITIES (E.G. WITH 0.7% SULFUR LIGNITE THERE IS 100% SPARE CAPACITY. IF A-MODULE OPERATES THE FIRST HALF OF THE MONTH (50%) AND B-MODULE THE SECOND HALF OF THE MONTH (50%) THE TOTAL SYSTEM UTILIZATION WILL BE 100%).

9/77 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL SCRUBBING OPERATIONS BEGAN IN SEPTEMBER. THE FGD SYSTEM IS EXPECTED TO BE OPERATING IN AN INTEGRATED MODE IN LATE OCTOBER, HOWEVER, A SCRUBBER LINING FAILURE MAY RESULT IN SOME DELAYS. THE UTILITY EXPECTS THE SYSTEM OPERATIONS TO STABILIZE BY MID-NOVEMBER.

10/77 SYSTEM

744

11/77 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED INTERMITTENT FGD SYSTEM OPERATIONS SINCE START-UP.

MAJOR OPERATIONAL PROBLEMS HAVE OCCURRED AS A RESULT OF SEVERE WINTER

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

WEATHER CONDITIONS, PARTICULARLY NUMEROUS INSTANCES OF FROZEN AND RUPTURE LINES. THE SYSTEM WAS SHUT DOWN DURING THE FIRST PART OF THE MONTH OF DECEMBER TO INSTALL HEAT TRACING IN THE LIQUID CIRCUIT.

SOME MINOR PROBLEMS HAVE OCCURRED WITH THE FLOW METERS (ROTAMETERS).

THE UTILITY ENCOUNTERED PROBLEMS WITH GUILLOTINE GAS DAMPER GUIDES DURING OCTOBER AND NOVEMBER.

12/77 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WAS AN EMERGENCY SHUTDOWN ON DECEMBER 5 AS A RESULT OF TURBINE BEARING DAMAGE. THE SHUTDOWN CONTINUED SO THAT A COMPLETE TURBINE INSPECTION COULD BE MADE.

WORK CONTINUED ON INSTALLATION OF ELECTRICAL HEAT TRACING ON SLURRY LINES AND WATER PIPING.

1/78 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

BECAUSE OF THE TURBINE BEARING PROBLEMS THE COMPLIANCE TEST ORIGINALLY SCHEDULED FOR THE DECEMBER-JANUARY PERIOD WAS TENTATIVELY RESCHEDULED WITH THE EPA FOR THE END OF MARCH. THE UTILITY EXPECTS THE FGD SYSTEM TO ACHIEVE EQUILIBRIUM (WATER BALANCE) WHEN THE UNIT COMES BACK ON LINE IN FEBRUARY.

2/78 SYSTEM

672

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH THE BOILER AND FGD SYSTEM CAME BACK ON LINE FEBRUARY 21 AFTER COMPLETION OF THE TURBINE REPAIRS. THE COMPLIANCE TEST HAS AGAIN BEEN RESCHEDULED WITH EPA FOR THE END OF MAY.

ONE FORCED-DRAFT FAN (UPSTREAM OF THE FGD SYSTEM) HAD AN OIL LEAK AND A SHAFT ALIGNMENT PROBLEM. THE FAN WAS TAKEN OFF LINE AND SHIPPED TO BUFFALO FORGE FOR REPAIRS.

THE VACUUM FILTER MALFUNCTIONED, ALLOWING LARGER SIZE PARTICLES TO ESCAPE THE FILTER. THIS CAUSED THE RUBBER LINING DOWN STREAM TO PEEL WHICH, IN TURN, CREATED A PLUGGING PROBLEM. EIMCO ENGINEERS ARE PRESENTLY STUDYING THE PROBLEM AND HOPE TO INCORPORATE MODIFICATIONS TO IMPROVE THE PERFORMANCE OF THE FILTERS.

3/78 SYSTEM

744

4/78 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE DAMAGED FD FAN WAS REINSTALLED DURING APRIL. THE AFFECTED MODULE WAS DOWN FROM FEBRUARY 23 THROUGH APRIL 10.

5/78 SYSTEM

744

6/78 SYSTEM

720

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

** PROBLEMS/SOLUTIONS/COMMENTS

COMPLIANCE TESTING TOOK PLACE DURING THE WEEK OF JUNE 5. THE REPORT SHOULD BE AVAILABLE TO THE UTILITY BY THE END OF JUNE.

THE UNIT WAS DOWN WITH DAMPER PROBLEMS (DOWN ON THE 24TH OF JUNE). APPARENTLY THE CHAINS THAT PULL THE GUILLOTINE DAMPERS WERE UNDERDESIGNED AND PRONE TO FAILURE. THE CHAINS ARE CURRENTLY BEING REPLACED.

7/78	SYSTEM									744

8/78	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

OFFICIAL RESULTS OF THE COMPLIANCE TEST PERFORMED ON JUNE 6 ARE STILL NOT AVAILABLE. BECAUSE OF INTERMITTENT OPERATION, FGD SYSTEM PERFORMANCE FIGURES ARE NOT YET AVAILABLE.

9/78	SYSTEM									720

10/78	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE THICKENER HAS BEEN A MAJOR PROBLEM AREA. THE POLYETHYLENE LINER WAS ACCIDENTLY PIERCED WHILE REPAIRS WERE BEING MADE TO SOME OTHER COMPONENTS THE LINER IS CURRENTLY BEING PATCHED.

THE UTILITY REPORTED THAT OPERATION OF THE BOILER AND FGD SYSTEM CONTINUE ON AN INTERMITTENT BASIS THROUGHOUT THE PERIOD.

11/78	SYSTEM									720

** PROBLEMS/SOLUTIONS/COMMENTS

THICKENER PROBLEMS ARE CONTINUING. THE RUBBER LINER HAS BEEN DETACHING FROM THE THICKENER CONE. THE THICKENER MUST BE DRAINED TO MAKE THE REPAIRS.

FAN PROBLEMS OCCURRED DURING THE PERIOD. THERE IS NO DAMPER BETWEEN THE MODULE AND FAN. UNDER SOME OPERATING CONDITIONS WET GAS CAN BACK INTO THE FAN AREA RESULTING IN CORROSION AND OTHER MOISTURE RELATED PROBLEMS.

12/78	A	4.6	5.1		4.6					
	B	37.7	28.4		25.7					
	SYSTEM	42.3	33.5	33.8	30.3	744	673	225	54.0	

** PROBLEMS/SOLUTIONS/COMMENTS

MINNKOTA POWER COOP REPORTED THE FOLLOWING STATISTICS FOR THE YEAR OF 1978

TOTAL PERIOD HOURS: 8760

TOTAL BOILER HOURS: 6926

TOTAL A-MODULE HOURS: 1790

TOTAL B-MODULE HOURS: 2110

ANNUAL BOILER CAPACITY FACTOR: 66.7%

FGD SYSTEM PERFORMANCE:

	A-MODULE	B-MODULE	SYSTEM
AVAILABILITY	92.3	28.5	46.1
OPERABILITY	28.0	25.9	52.7
RELIABILITY			53.9
UTILIZATION	22.2	20.4	41.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

THE B-TOWER WAS OUT OF SERVICE DURING DECEMBER DUE TO PLUGGING OF THE THICKENER UNDERFLOW BY RUBBER LINING. THE THICKENER WAS PUMPED OUT AND REPAIRED.

1/79	A	4.6	5.1		4.6				
	B	37.7	28.4		25.7				
	SYSTEM	42.3	33.5	33.8	30.3	744	673	225	54.0

** PROBLEMS/SOLUTIONS/COMMENTS

SOME WEATHER-RELATED PROBLEMS OCCURRED WITH FGD SYSTEM PIPING FREEZE-UPS.

THE UTILITY REPORTED THAT THE A-TOWER WAS OUT OF SERVICE FOR A PERIOD IN JANUARY DUE TO BROKEN INLET ISOLATION DAMPER CHAINS.

THE A-TOWER WAS OUT OF SERVICE TO REPAIR A BOOSTER FAN SERVO MECHANISM THROUGH JANUARY 28.

THE B-TOWER WAS OUT OF SERVICE FROM DECEMBER 27 THROUGH JANUARY 31 DUE TO A FAN MOTOR FAILURE.

THE UTILITY REPORTED THAT EROSION PROBLEMS IN THE SCRUBBER TOWERS ARE SEVERE ENOUGH THAT HOLES HAVE BEEN DISCOVERED IN TOWER WALLS.

2/79	A	19.4	26.5		19.4				
	B	32.1	44.0		32.1				
	SYSTEM	51.5	70.5	70.5	51.5	672	491	346	58.1

3/79	A	19.4	26.5		19.4				
	B	32.1	44.0		32.1				
	SYSTEM	51.5	70.5	70.5	51.5	744	543	383	58.1

** PROBLEMS/SOLUTIONS/COMMENTS

TWO DAYS OF DOWN TIME WERE REQUIRED TO REMOVE LOOSE RUBBER FROM THE THICKENER PIPING DURING THE FEBRUARY-MARCH PERIOD.

A BOOSTER FAN MOTOR FIRE OCCURRED IN THE A-MODULE.

HOLES IN THE B-SIDE ABSORBER TOWER WERE REPAIRED DURING THE PERIOD.

COLD WEATHER INHIBITED SCRUBBER STARTUPS AFTER REPAIRS WERE MADE DURING THE PERIOD.

4/79	A	3.0	3.2		3.0				
	B	57.1	61.6		57.1				
	SYSTEM	60.1	64.8	65.4	60.1	720	668	432	69.4

5/79	A	3.0	3.2		3.0				
	B	57.1	61.6		57.1				
	SYSTEM	60.1	64.8	65.4	60.1	744	690	448	88.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-MODULE IS STILL EXPERIENCING FAN PROBLEMS. DURING APRIL AND MAY THE FAN HAD ALIGNMENT PROBLEMS POSSIBLY RELATED TO THE FAN FOUNDATION.

DURING APRIL AND MAY HOLES WERE REPAIRED IN THE ABSORBER WALLS, VALVE REPAIRS WERE MADE, AND REPAIRS WERE MADE ON A THICKENER DRIVE GEAR.

6/79	A	17.2	17.2		17.2				
	B	36.3	36.3		36.3				
	SYSTEM	52.8	52.8	52.8	52.8	720	720	380	88.7

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE A-TOWER WAS DOWN FOR REPAIR TO THE FLAKE LINING.

THE FGD SYSTEM WAS DOWN FOR PART OF THE MONTH FOR REPAIRS AFTER EXCESS SOLIDS ENTERING THE TRAY RECYCLE LOOP OVERLOADED THE CLARIFIER.

AN A-TOWER TRAY RECYCLE DISTRIBUTION HEADER WAS CLEANED DURING JUNE.

THE SYSTEM WAS FORCED OUT OF SERVICE WHEN BOILER PROBLEMS CAUSED AN EXCESSIVE AMOUNT OF HEAVY PARTICLES (SLAG CARRYOVER) TO ENTER THE FGD SYSTEM RESULTING IN THE PLUGGING OF SEVERAL LINES AND STOPPING THE THICKENER RAKE SLUDGE HAD TO BE DREDGED AND HAULED OUT FROM THE TOP OF THE THICKENER.

THE A-TOWER WAS OUT OF SERVICE DUE TO PROBLEMS WITH THE WATER BALANCE AND THE VACUUM FILTERS AS WELL AS TO UNPLUG THE ABSORBER BLEED LINE. LIME WAS USED FOR SEVERAL DAYS AS MAKE UP CHEMICAL (AS OPPOSED TO PRIMARILY ALKALINE FLYASH) TO EASE THE HIGH SOLIDS PROBLEM.

A-TOWER AGITATOR GEARS WHICH FAILED AS A RESULT OF A CLARIFIER OVERLOAD WERE REPLACED DURING THE PERIOD.

7/79	A	44.5	44.5		44.5				
	B	0.0	0.0		0.0				
	SYSTEM	44.0	44.0	44.0	44.0	744	744	331	86.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY HAS REPORTED THAT A TRAY RECYCLE CONTROL VALVE AND AN ABSORBER TRIN VALVE FAILED DURING JULY.

THE UTILITY REPORTED PROBLEMS WITH PLUGGING IN THE MIST ELIMINATORS, THE THICKENER AND IN THE ABSORBER FEED LINE.

THE UNIT EXPERIENCED A BOOSTER FAN TRIP IN JULY.

PROBLEMS WITH THE VACUUM FILTERS AND THE SEAL WATER PUMP WERE ENCOUNTERED.

THE ABSORBER AGITATOR WAS REPLACED DURING JULY.

8/79	A	28.7	28.7		28.7				
	B	10.6	10.6		10.6				
	SYSTEM	39.0	39.0	39.0	39.0	744	744	293	92.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST EXCESSIVE VIBRATION AND HIGH BEARING TEMPERATURE IN THE A-SIDE BOOSTER FAN WERE ENCOUNTERED CAUSING SOME DOWN TIME.

THE INABILITY TO ADD ALKALI (FLYASH OR LIME) TO THE SYSTEM CAUSED SOME OPERATIONAL PROBLEMS ON THE A-SIDE SCRUBBER.

DURING AUGUST THE B-SIDE THICKENER RAKE WAS BURIED IN THE SLUDGE. THE SLUDGE HAD TO BE REMOVED BY MINING IT FROM THE TOP.

PLUGGING OF THE FLYASH TANK AND THE LIME SLURRY FEED LINE CAUSED SOME B-SIDE OUTAGE TIME DURING AUGUST.

DUE TO A LACK OF LIME (THE UTILITY SUPPLY WAS EXHAUSTED) THE FGD SYSTEM HAD TO SHUT DOWN.

THE HOLES IN THE SIDES OF THE B-SIDE ABSORBER TOWER HAD TO BE REPAIRED CAUSING SOME OUTAGE TIME IN AUGUST.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
9/79	A	21.4	21.5		21.4				
	B	1.2	1.2		1.2				
	SYSTEM	23.0	23.0	23.0	23.0		720	717	163 96.6

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THE A-SIDE WAS DOWN DUE TO HEAVY SOLIDS IN THE THICKENER AND CLARIFIER. HIGH VIBRATIONS WERE EXPERIENCED WITH THE BOOSTER FAN.

THE B-SIDE REMAINED OUT OF SERVICE DUE TO PROBLEMS WITH THE THICKENER AND CLARIFIER.

10/79	A	0.0	0.0		0.0				
	B	31.3	31.4		31.3				
	SYSTEM	31.3	31.4	31.4	31.3		744	743	233 89.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS IN THE PROCESS OF CLEANING THE CLARIFIER.

THE CLARIFIER AGITATOR DRIVE GEAR FAILED CAUSING DOWN TIME FOR REPAIR IN OCTOBER.

THE BLEED LINE TO THE THICKENER PLUGGED AND NEEDED MAINTENANCE.

THE GEAR HOUSING FAILED ON THE THICKENER LIFT MECHANISM CAUSING OUTAGE TIME FOR REPAIR.

11/79	A	0.6	0.7		0.6				
	B	15.4	16.7		15.4				
	SYSTEM	16.0	17.4	17.4	16.0		720	661	115 80.0

** PROBLEMS/SOLUTIONS/COMMENTS

AN EXCESS OF SOLIDS CAUSED PLUGGING IN THE THICKENER AND THE CLARIFIER DURING NOVEMBER.

12/79	A	26.6	31.5		26.6				
	B	9.7	11.5		9.7				
	SYSTEM	36.3	43.0	43.0	36.3		744	628	270 67.2

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING OF THE SEAL WATER SYSTEM RESULTED IN SOME OUTAGE TIME DURING DECEMBER.

BOOSTER FAN PROBLEMS RELATED TO EXCESSIVE VIBRATION WERE ENCOUNTERED ON MODULE B IN DECEMBER.

A HOLE IN A BLOCKING VALVE RESULTED IN SOME DOWNTIME.

THE GEAR HOUSING FAILED ON THE THICKENER LIFT MECHANISM.

1/80	A	7.1	10.5		7.1				
	B	0.0	0.0		0.0				
	SYSTEM	7.1	10.5	10.5	7.1		744	504	53 58.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY, COLD WEATHER CAUSED SOME PIPE LINES AND A BOOSTER FAN TO ICE UP.

A HIGH PERCENTAGE OF COARSE SOLIDS IN THE THICKENER CAUSED SOME OUTAGE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

TIME. THE WORM GEAR ON THE THICKENER FAILED ADDING TO THE OUTAGE TIME.

CLEANING AND REPAIR OF THE THICKENER WAS COMPLICATED BY SUB-ZERO AMBIENT TEMPERATURES.

2/80	SYSTEM	0.0	0.0	0.0	696	696	0	97.1

** PROBLEMS/SOLUTIONS/COMMENTS

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

SHAFT SLEEVES ON SEVERAL SPRAY RECYCLE PUMPS WERE REPLACED DURING FEBRUARY.

THE GEAR REDUCER FAILED ON THE B-SIDE ABSORBER AGITATOR PREVENTING SCRUBBER OPERATION.

THE ISOLATION DAMPER CHAINS BROKE DURING THE MONTH.

3/80	A	22.6	22.6	22.6				
	B	6.2	6.2	6.2				
	SYSTEM	28.9	28.8	28.8	744	743	214	89.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH COLD WEATHER CONTINUED TO BE A PROBLEM.

THE TORQUE SWITCHES ON THE ISOLATION DAMPERS WERE REPLACED. THE DAMPER PROBLEMS CAUSED THE BOOSTER FAN TO TRIP. THE OUTAGE TIME WAS EXTENDED BECAUSE THE UTILITY HAD TO WAIT FOR THE SWITCHES TO BE DELIVERED.

AN EXCESSIVE AMOUNT OF COARSE PARTICLES IN THE THICKENER CONTINUED TO BE A PROBLEM. PLUGGED BLEED LINES FROM THE ABSORBER TO THE THICKENER WERE ALSO ENCOUNTERED.

THE A-SIDE ABSORBER AGITATOR ANCHOR BOLTS SHEARED DURING MARCH CAUSING MODULE DOWN TIME.

THE SHAFT SLEEVES ON THE SPRAY RECYCLE PUMPS WOULD NOT HOLD THE PUMP GLAND PACKING. THE SHAFT SLEEVES ARE CURRENTLY BEING REPLACED.

4/80	A	100.0	0.0	0.0				
	B	0.0	0.0	0.0				
	SYSTEM	100.0	0.0	0.0	720	154	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR APPROXIMATELY 3 WEEKS FOR THE ANNUAL UNIT OUTAGE DURING APRIL.

PLUGGED BLEED LINES AND THE REPLACEMENT OF THE SHAFT SLEEVES ON THE RECYCLE PUMPS CAUSED THE FGD SYSTEM TO REMAIN OFF LINE DURING THE TIME THE BOILER OPERATED.

5/80	A	0.0	0.0	0.0				
	B	47.2	48.4	50.6				
	SYSTEM	47.2	48.4	50.6	744	700	339	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OPERATED DURING MAY WHILE REPAIR WORK WAS BEING DONE ON MODULE A.

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

THE REPAIRS ON MODULE A INCLUDED WORK ON THE SPRAY RECYCLE NOZZLE PIPING, AND THE RECYCLE HEADER.

THE VALVES ON BOTH THE SPRAY RECYCLE PUMP AND THE DISCHARGE SPRAY CYCLE PUMP WERE REPAIRED.

THE ABSORBER LINING HAS STARTED TO WEAR AND IS NOW BEING REPAIRED.

HIGH SOLIDS RESULTED IN THICKNER LINE PLUGGING. HIGH SOLIDS ALSO CAUSED PROBLEMS WITH THE RAKE AND CONE. BOTH THE THICKNER AND THE CLARIFIER HAD TO BE DRAINED AND CLEANED.

THE ABSORBER AGITATOR TUNNEL WAS ALSO CLEANED DURING THE MONTH.

6/80	A	0.0	0.0		0.0			
	B	41.8	40.4	41.4	39.3			
	SYSTEM	41.8	40.4	41.4	39.3	720	701	283

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B CONTINUED TO OPERATE THROUGH JUNE.

PROBLEMS WITH THE THICKNER CONTINUED THROUGH THE MONTH. HIGH SOLIDS CAUSE PROBLEMS WITH THE RAKE MECHANISM AND THE LIMIT SWITCH.

TROUBLE WAS ENCOUNTERED DURING JUNE WITH THE VACUUM FILTER.

THE REPAIR WORK CONTINUED ON THE ABSORBER FLAKE LININGS.

MODULE A REPAIR WORK CONTINUED DURING JUNE.

7/80	A	0.0	0.0		0.0			
	B	65.3	64.5	65.8	52.0			
	SYSTEM	65.3	64.5	65.8	52.0	744	600	387 60.0

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS WITH THE RAKE MECHANISM AND UNDERFLOW PUMPS IN THE THICKENER CONTINUED IN JULY. HIGH SOLIDS IN THE THICKENER ARE CAUSED WHEN FLY ASH IS ADDED TO THE LIME IN THE ABSORBER TOWER. THE ABSORBER REAGENT IS CHANGED TO STRAIGHT LIME WHEN THIS OCCURS.

PROBLEMS WERE ENCOUNTERED WITH THE TWO VACUUM FILTER PUMPS. ONE WAS BEING REBUILT WHILE THE OTHER FUNCTIONED POORLY.

REPAIRS WERE MADE TO THE LEAK IN THE ABSORBER TOWER.

PROBLEMS WERE REPORTED WITH THE MOTOR AND DISCHARGE VALVE ON THE TRAY RECYCLE PUMPS.

THE FGD SYSTEM WAS NOT PLACED IN SERVICE WHEN THE BOILER WAS RUN AT REDUCE LOAD DURING THE MONTH.

8/80	A	90.7	54.3	98.8	53.9			
	B	56.9	44.2	99.4	44.0			
	SYSTEM	99.2	98.6	99.2	98.0	744	739	729 92.8

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH MODULES WERE OPERATED DURING AUGUST.

DURING THE MONTH, MAINTENANCE WORK WAS DONE ON THE SPRAY RECYCLE PUMPS (TEFLON PACKING), THE VACUUM FILTER DRUM, SPRAY NOZZLES, THE ABSORBER AGITATOR, THE CLARIFIER CONE, AND THE THICKNER RAKE MECHANISM.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

9/80	A	70.1	72.6	100.0	66.9				
	B	66.7	25.1	100.0	23.2				
	SYSTEM	100.0	97.9	100.0	90.3	720	664	650	78.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS AVAILABLE DURING ALL OF SEPTEMBER.

BOTH MODULES WERE OPERATED DURING THE MONTH.

10/80	A	90.4	85.4	87.1	76.2				
	B	17.7	0.0		0.0				
	SYSTEM	100.0	85.4	87.1	76.2	744	664	744	75.7

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER AVAILABILITY FOR MODULE B WAS LOW DUE TO LEAKS IN THE TOWER

11/80	A	42.2	40.4	100.0	38.7				
	B	98.6	54.0	96.4	50.1				
	SYSTEM	100.0	94.5	99.1	90.6	720	690	720	88.6

** PROBLEMS/SOLUTIONS/COMMENTS

AVAILABILITY WAS LOW FOR MODULE A DUE TO LEAKS IN THE TOWER DURING THE MONTH OF NOVEMBER.

12/80	A	41.5	33.2	54.5	40.0				
	B	30.0	29.5	88.6	28.4				
	SYSTEM	71.5	62.8	66.7	60.5	744	716	450	92.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER AVAILABILITY WAS LOW DUE TO DOWN TIME NECESSARY TO CONVERT FROM A THICKENER TO SLUDGE PONDS AND PROBLEMS WITH THE OVERFLOW LEVEL CONTROL OF THE ABSORBER.

ISOLATION DAMPER PROBLEMS DURING THE MONTH DELAYED THE STARTUP OF THE FGD SYSTEM.

1/81	A	83.8	94.4	100.0	83.9				
	B	0.0	0.0		0.0				
	SYSTEM	83.9	94.4	100.0	83.9	744	661	624	83.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SYSTEM WAS SHUT DOWN FOR PART OF THE MONTH TO REPACK THE ABSORBER TOWER AGITATOR.

ADDITIONAL OUTAGE TIME WAS DUE TO ISOLATION DAMPER PROBLEMS.

2/81	A	33.9	11.8	100.0	11.8				
	B	83.3	87.4	100.0	83.3				
	SYSTEM	95.0	99.8	100.0	95.0	672	641	639	88.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

3/81	A	58.3	66.3	100.0	58.3				
	B	29.6	28.4	100.0	25.0				
	SYSTEM	87.8	94.6	100.0	83.8	744	655	620	78.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 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 MARCH SOME OUTAGE TIME WAS DUE TO ISOLATION DAMPER PROBLEMS.

BOOSTER FAN PROBLEMS CAUSED ADDITIONAL DOWN TIME.

4/81	A	0.0	0.0	0.0	0.0				
	B	2.7	5.4	5.6	2.7				
	SYSTEM	2.7	5.4	5.6	2.7	720	360	20	78.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE MIST ELIMINATOR PLUGGED CAUSING SYSTEM DOWN TIME.

PROBLEMS WERE ENCOUNTERED WITH THE BOOSTER FAN.

5/81	A	65.4	73.3	75.0	65.4				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	65.4	73.3	75.0	65.4	744	661	487	80.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY MODULE A EXPERIENCED BOOSTER FAN PROBLEMS.

6/81	A	72.3	66.3	68.2	52.6				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	72.3	66.3	68.2	52.6	720	571	379	77.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE MODULE B WAS OUT OF SERVICE FOR MAINTENANCE. MAINTENANCE WAS PERFORMED ON THE SPRAY NOZZLES, MIST ELIMINATOR, TRAY UNDERSPRAY STRAINER, ISOLATION DAMPER, AND THE FLAKE LINING.

MODULE B SPRAY RECYCLE NOZZLES WERE CLEANED AND THE WASH TRAY HEADER WAS CHECKED FOR PLUGGING.

THE RECYCLE TANK TRAY ON MODULE A WAS CLEANED DURING JUNE.

7/81	A	28.8	32.1	33.3	28.8				
	B	0.0	0.0	0.0	0.0				
	SYSTEM	28.8	32.1	33.3	28.8	744	666	214	82.9

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS REMOVED FROM SERVICE ON JULY 10 WHEN THE THICKENER RAKE DRIVE BROKE. THIS CAUSED THE MODULE TO REMAIN OUT OF SERVICE THE REST OF THE MONTH.

DURING THE MONTH, THE FLAKE LINING WAS BEING REPAIRED ON MODULE B.

NEW MIST ELIMINATORS WERE INSTALLED IN MODULE B DURING JULY.

8/81	A	0.0	0.0	0.0	0.0				
	B	58.1	48.6	49.5	44.2				
	SYSTEM	58.1	48.6	49.5	44.2	744	677	329	79.9

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST, MODULE A WAS OFF LINE AWAITING FAN BLADES AND REPAIRS TO THE ABSORBER TOWER.

MODULE B WAS DOWN FOR PART OF THE MONTH AS REPAIRS CONTINUED TO THE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

THICKENER RAKE DRIVE.

9/81	A	0.0	0.0	0.0	0.0					
	B	100.0	97.2	100.0	85.8					
	SYSTEM	100.0	97.2	100.0	85.8		720	636	618	83.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN TWICE DURING THE MONTH AS A RESULT OF BOILER TUBE LEAKS.

THE A MODULE REMAINED DOWN DURING THE MONTH FOR REPAIRS.

10/81	A	78.7	49.7	53.2	30.8					
	B	35.5	56.9	60.9	35.3					
	SYSTEM	100.0	100.0	100.0	66.1		744	461	492	83.0

11/81	A	100.0	98.0	98.9	88.9					
	B	0.0	0.0	0.0	0.0					
	SYSTEM	100.0	98.0	98.9	88.9		720	653	640	87.4

12/81	A	22.6	21.7	21.5	21.5					
	B	78.6	78.6	79.2	78.6					
	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	90.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE MAJOR PROBLEM ENCOUNTERED DURING THE FOURTH QUARTER WAS FAILURE OF THE FLAKEGLASS LINERS.

SPRAY NOZZLE PLUGGING WAS ALSO ENCOUNTERED DURING THE THREE MONTH PERIOD.

1/82	A	17.0	19.1	19.2	17.0					
	B	68.5	77.0	77.7	68.5					
	SYSTEM	85.5	85.5	97.0	85.5		744	662	636	81.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN PART OF JANUARY TO DESLAG THE BOILER.

DURING THE MONTH THE FLAKE LINING IN MODULE A WAS REPAIRED.

MODULE B WAS TAKEN OUT OF SERVICE WHEN THE REAR BEARING TEMPERATURE ON THE BOOSTER FAN BEGAN TRENDING UP.

THE ISOLATION DAMPERS WOULD NOT OPERATE DURING THE FRIGID WEATHER.

2/82	A	65.9	65.9	65.9	65.9					
	B	31.1	31.1	31.1	31.1					
	SYSTEM	96.9	96.9	96.9	96.9		672	672	651	81.1

3/82	A	0.0	0.0		0.0					
	B	55.9	96.2	100.0	55.9					
	SYSTEM	55.9	96.2	100.0	55.9		744	432	415	72.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE UNIT WENT DOWN FOR A SCHEDULED ANNUAL OUTAGE.

4/82	A	0.0			0.0					
	B	0.0			0.0					
	SYSTEM	0.0			0.0		720	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 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 UNIT WAS OFF-LINE DURING APRIL FOR AN ANNUAL OUTAGE. THE FGD SYSTEM
 WAS ALSO DOWN FOR THE ENTIRE MONTH.

5/82	A	78.0	88.9	94.9	72.5				
	B	0.0	0.0		0.0				
	SYSTEM	78.0	88.9	94.9	72.5	744	607	539	76.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS DOWN THE MONTH OF MAY BECAUSE OF REPAIRS BEING PERFORMED ON
 THE FLAKE LINING AND THE SPRAY RECYCLE NOZZLES.

MODULE A WAS DOWN AT THE BEGINNING OF MAY BECAUSE OF THE ANNUAL OUTAGE.
 LATER IN THE MONTH THE MODULE WAS TAKEN OFF-LINE DUE TO ID FAN PROBLEMS.

6/82	A	86.2	91.9	93.8	76.4				
	B	0.0	0.0		0.0				
	SYSTEM	86.2	91.9	93.8	76.5	720	599	550	73.5

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE B WAS OUT OF SERVICE DURING JUNE BECAUSE WORK WAS BEING
 PERFORMED ON THE FLAKE LINING AND THE SPRAY RECYCLE NOZZLES.

MODULE A WAS OFF-LINE AT THE BEGINNING OF JUNE DUE TO SCHEDULED MAINTENANC
 ON THE TURBINE. THE MODULE WAS ALSO DOWN DURING MID-MONTH WHEN THE BOILER
 WAS OFF-LINE DUE TO A TUBE LEAK AND TO SET THE LIMIT SWITCHES.

7/82	A-11	97.6	97.6	100.0	97.6				
	A-21	0.0	0.0		0.0				
	SYSTEM	97.6	97.6	100.0	97.6	744	744	726	80.2

8/82	A-11	7.4	7.4	7.4	7.4				
	A-21	96.8	92.0	92.0	92.0				
	SYSTEM	100.0	99.4	99.4	99.4	744	744	740	80.2

9/82	A-11	0.0	0.0	0.0	0.0				
	A-21	98.9	98.9	98.9	98.9				
	SYSTEM	98.9	98.9	98.9	98.9	720	720	712	81.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE PERIOD OF JULY THROUGH SEPTEMBER 1982.

10/82	A-11	50.5	62.6	63.2	50.5				
	A-21	49.5	35.0	35.3	28.3				
	SYSTEM	100.0	97.5	98.5	78.8	744	601	586	75.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/82	A-11	79.5	77.1	77.8	71.9				
	A-21	0.0	0.0		0.0				
	SYSTEM	79.5	77.1	77.8	71.9	720	672	518	62.3

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 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 A-11 WAS DOWN FROM NOVEMBER 16 TO NOVEMBER 22 FOR REPAIR OF LEAKS.

MODULE A-21 WAS OUT OF SERVICE FOR THE ENTIRE MONTH TO ALLOW FOR THE PERFORMANCE OF MAINTENANCE WORK.

12/82	A-11	42.1	48.0	48.9	42.1				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	42.1	48.0	48.9	42.1	744	653	313	65.7

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH VIBRATIONS FROM AN ID FAN FORCED THE REMOVAL OF A SET OF FANS ON THE UNIT AND CONSEQUENTLY, AN FGD SYSTEM OUTAGE.

REPAIRS CONTINUED DURING DECEMBER ON THE LEAKS THAT DEVELOPED IN MODULE A-11.

MAINTENANCE WORK CONTINUED DURING THE MONTH ON MODULE A-21.

A DAMAGED COLD REHEAT LINE PRODUCING A LOW VACUUM RESULTED IN A UNIT TRIP ON DECEMBER 10. THE UNIT WAS BROUGHT DOWN ON DECEMBER 13 TO REPAIR THE COLD REHEAT LINE.

1/83	A-11	100.0	97.7	92.3	90.8				
	A-21	3.0	1.2	1.1	1.1				
	SYSTEM	100.0	98.9	93.4	91.9	744	692	684	82.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

2/83	A-11	100.0	94.8	86.0	83.7				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	100.0	94.8	86.0	83.7	672	594	562	82.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/83	A-11	80.6	95.6	94.8	75.7				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	80.6	95.6	94.8	75.7	744	589	563	77.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A-21 HAD BEEN OUT OF SERVICE SINCE OCTOBER AND REMAINED OUT OF SERVICE DURING MARCH FOR REPAIRS TO THE ABSORBER LINING.

THE UNIT WAS TAKEN OUT OF SERVICE ON MARCH 25 FOR A SCHEDULED OUTAGE.

4/83	A-11	33.3	88.1	87.6	29.7				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	33.3	88.1	86.0	29.7	720	243	214	69.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL OUTAGE WHICH BEGAN ON MARCH 25 ENDED ON APRIL 20.

WHEN ATTEMPTING TO START A BOOSTER FAN, THE FAN HOUSING FLOODED AND CAUSED

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
A FAN HOUSING EXPANSION JOINT TO RUPTURE.									
5/83	A-11	98.2	95.4	86.9	84.8				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	98.2	95.4	86.9	84.8		744	661	631 83.8
6/83	A-11	99.3	98.4	98.4	94.9				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	99.3	98.4	98.4	94.9		720	695	683 83.5
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MAY AND JUNE.									
7/83	A-11	99.6	98.2	95.3	76.6				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	99.6	98.2	95.3	76.6		744	580	570 81.5
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING JULY.									
8/83	A-11	89.4	97.3	97.3	89.4				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	89.4	97.3	97.3	89.4		744	684	665 83.5
** PROBLEMS/SOLUTIONS/COMMENTS									
WORK CONTINUED DURING AUGUST ON RELINING THE A-21 MODULE ABSORBER TOWER.									
MODULE A-11 EXPERIENCED EXPANSION JOINT PROBLEMS DURING AUGUST.									
MODULE A-11 ALSO EXPERIENCED FLYASH SLURRY LINE PROBLEMS DURING THE MONTH.									
9/83	A-11	76.3	89.3	91.2	70.1				
	A-21	0.0	0.0	0.0	0.0				
	SYSTEM	76.3	89.3	91.2	70.1		720	566	505 80.2
** PROBLEMS/SOLUTIONS/COMMENTS									
WORK CONTINUED DURING SEPTEMBER ON RELINING THE A-21 MODULE ABSORBER TOWER									
FLYASH SLURRY LINE PROBLEMS CONTINUED DURING SEPTEMBER AT THE A-11 MODULE.									
MODULE A-11 ALSO EXPERIENCED PROBLEMS WITH THE SPRAY RECYCLE PUMP STRAINER DURING THE MONTH.									
10/83	A-11	16.1	14.4	100.0	13.0				
	A-21	90.3	83.9	87.3	75.9				
	SYSTEM	100.0	98.3	100.0	88.9		744	673	662 89.8
11/83	A-11	0.0	0.0		0.0				
	A-21	100.0	100.0	100.0	100.0				
	SYSTEM	100.0	100.0	100.0	100.0		720	720	720 87.4
** PROBLEMS/SOLUTIONS/COMMENTS									
NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER AND NOVEMBER 1983.									
12/83	A-11	0.0	0.0	0.0	0.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (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
	A-21	70.1	78.1	54.3	54.3					
	SYSTEM	70.1	78.1	54.3	54.3		744	518	404	75.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A-11 WAS BEING RELINED DURING DECEMBER.

MAINTENANCE WORK WAS PERFORMED ON THE MODULE A-21 ABSORBER SLURRY RECYCLE SYSTEM DURING DECEMBER ACCOUNTING FOR LOW FGD SYSTEM AVAILABILITY.

THREE UNIT OUTAGES OCCURRED DURING DECEMBER DUE TO BOILER TUBE LEAK AND HYDROGEN LEAK REPAIRS.

1/84	A-11	0.0	0.0	0.0	0.0					
	A-21	84.5	84.5	100.0	84.5					
	SYSTEM	84.5	84.5	100.0	84.5		744	744	629	87.8

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A-11 WAS NOT AVAILABLE FOR SERVICE DUE TO MODULE RELINING.

THE UTILITY REPORTED THAT THE ABSORBER WAS SHUT DOWN TO MAKE REPAIRS ON MODULE A21 SPRAY RECYCLE SYSTEM.

2/84	A-11	3.4	0.0	0.0	0.0					
	A-21	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		696	696	696	78.4

3/84	A-11	100.0	0.0	0.0	0.0					
	A-21	100.0	100.0	100.0	100.0					
	SYSTEM	100.0	100.0	100.0	100.0		744		744	76.8

4/84	A-11	100.0	0.0	0.0	0.0					
	A-21	100.0	99.1	99.8	88.3					
	SYSTEM	100.0	99.1	99.8	88.3		720	641	636	74.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS AROSE DURING THE PERIOD OF FEBRUARY THROUGH APRIL 1984.

5/84	A-11	100.0			0.0					
	A-21	100.0			0.0					
	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN THROUGHOUT MAY FOR ITS ANNUAL OUTAGE.

6/84	A-11	0.0	0.0	0.0	0.0					
	A-21	100.0	89.8	100.0	45.6					
	SYSTEM	100.0	89.8	100.0	45.6		720	366	328	79.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/84	A-11	0.0	0.0	0.0	0.0					
	A-21	99.8	85.9	85.9	73.8					
	SYSTEM	99.8	85.9	85.9	73.8		744	639	549	76.2

8/84	A-11	1.4	1.8		1.4					
	A-21	63.4	86.8	86.8	70.0					
	SYSTEM	64.9	88.6	86.8	71.4		744	600	532	66.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MINNKOTA POWER: MILTON R. YOUNG 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 JULY AND AUGUST 1984

9/84	A-11	82.6	98.6	98.6	59.2				
	A-21	0.0	0.0		0.0				
	SYSTEM	82.6	98.6	98.6	59.2	720	432	426	57.9

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT TOWER A-11 DEVELOPED A LEAK IN THE SPRAY RECYCLE DISCHARGE HEADER, REQUIRING REPAIRS TO BE MADE AT TWO SEPERATE TIMES DURING SEPTEMBER.

THE UNIT WAS TAKEN OUT OF SERVICE ON SEPTEMBER 18 FOR A THREE WEEK OUTAGE FOR GENERAL BOILER MAINTAINENCE.

10/84	A-11	55.8	44.1	62.9	38.6				
	A-21	25.9	29.6	99.4	25.9				
	SYSTEM	81.8	73.8	100.0	64.6	744	652	480	64.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY WAS FORCED TO REMOVE ID FAN 2A FROM SERVICE IN OCTOBER TO MAKE ROTOR REPAIRS.

WORK ALSO CONTINUED ON REPAIRING THE SPRAY HEADER LEAKS IN MODULE A-21.

11/84	A-11	25.0	12.9	100.0	12.8				
	A-21	99.3	98.7	100.0	98.5				
	SYSTEM	100.0	100.0	100.0	100.0	720	719	720	66.9

12/84	A-11	100.0	91.8	95.2	82.8				
	A-21	8.3	9.2	100.0	8.3				
	SYSTEM	100.0	100.0	100.0	91.2	744	671	678	72.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING NOVEMBER AND DECEMBER 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 1987

MINNKOTA POWER: MILTON R. YOUNG 2 (CONT.)

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

12/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

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

NO INFORMATION WAS REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1986.

1/87 SYSTEM 744

2/87 SYSTEM 672

3/87 SYSTEM 744

4/87 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO UNIT OUTAGES OCCURRED DURING THE FIRST FOUR MONTHS OF 1987. HOWEVER, BEGINNING IN MAY, THE UTILITY WILL BEGIN A NUMBER OF MAJOR FGD DESIGN CHANGES. ALL DESIGN CHANGES ARE SCHEDULED TO BE COMPLETED BY THE END OF MAY 1988. THE MAJOR DESIGN CHANGES ARE DUE TO CONTINUED PROBLEMS WITH EQUIPMENT CORROSION, PROCESS CONTROL, AND SO2 REMOVAL. THE CHANGES WILL INCLUDE REPLACING THE INLET AND OUTLET GUILLOTINE DAMPERS, REPLACING THE BYPASS LOUVRE DAMPERS, RELINING THE OUTLET AND BYPASS DUCTWORK, RELINING THE ABSORBER VESSELS, MODIFYING THE ABSORBER SLURRY SPRAY SYSTEM, REPLACING THE MIST ELIMINATORS, AND INCREASING THE SLAKING CAPACITY OF THE SLURRY PREPARATION SYSTEM.

5/87 SYSTEM 744

MINNKOTA POWER: MILTON R. YOUNG 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 INLET AND OUTLET DAMPERS ON MODULE A WERE REPLACED DURING THE MONTH OF MAY. THE ORIGINAL GUILLOTINE DAMPERS WERE REPLACED WITH NEW DAMPERS EQUIPPED WITH SEAL AIR SYSTEMS.

DURING THE 4-WEEK SCHEDULED UNIT OUTAGE IN MAY, REPAIRS WERE MADE TO THE REHEATER DUCTWORK ON MODULE A. THE CARBON STEEL DUCTWORK WAS CLADDED WITH ALLOY C-22.

6/87	SYSTEM	720
7/87	SYSTEM	744
8/87	SYSTEM	744
9/87	SYSTEM	720
10/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER OUTLET DUCTWORK ON MODULE A WAS RELINED WITH 316L STAINLESS STEEL. THE ORIGINAL MATERIAL WAS A GLASS FLAKE-FILLED POLYESTER.

A NEW SLAKING SYSTEM WAS INSTALLED WITH ADDED SLAKER CAPACITY.

THE MODULE A ABSORBER VESSEL WAS RELINED WITH STIBBINS TILE IN THE BASE OF THE TOWER AND 316L STAINLESS STEEL IN THE MIST ELIMINATOR SECTION. THE TOWER WAS ORIGINALLY LINED WITH A GLASS FLAKE-FILLED POLYESTER THROUGHOUT.

THE NORYL TYPE MIST ELIMINATORS WERE REPLACED IN MODULE A WITH A COMBUSTION ENGINEERING CHEVRON DESIGN WHICH IS MORE DURABLE AND LESS LIKELY TO PLUG.

THE SLURRY SPRAY SYSTEM ON MODULE A WAS MODIFIED SUCH THAT EACH SPRAY ZONE IS FED BY A SEPARATE PUMP AS OPPOSED TO A COMMON HEADERED SYSTEM FOR THE NEW SYSTEM PROVIDES ADDED CONTROL.

DURING THE PERIOD OF JUNE THROUGH THE END OF OCTOBER, THE UTILITY COMPLETED THE REST OF THE REPAIRS INCLUDING MAJOR MODIFICATIONS TO MODULE A. NO UNIT OUTAGES WERE ENCOUNTERED DURING THIS PERIOD SINCE MODULE B WAS IN OPERATION.

11/87	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FOR A SCHEDULED OUTAGE IN NOVEMBER FOR APPROXIMATELY 5 DAYS FOR REPAIRS TO THE OUTLET MODULE A DAMPER.

12/87	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO UNIT OUTAGES OCCURRED DURING THE MONTH OF DECEMBER. BEGINNING IN JANUARY OF 1988, SIMILAR MODIFICATIONS WILL COMMENCE ON MODULE B. ALL MODIFICATIONS SHOULD BE COMPLETED BY THE END OF THE NEXT UNIT OUTAGE WHICH IS SCHEDULED FOR MAY 1988.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONONGAHELA POWER	
PLANT NAME	PLEASANTS	
UNIT NUMBER	1	
CITY	WILLOW ISLAND	
STATE	WEST VIRGINIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(0.050 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	1252	
GROSS UNIT GENERATING CAPACITY - MW	684	
NET UNIT GENERATING CAPACITY W/FGD - MW	626	
NET UNIT GENERATING CAPACITY WO/FGD - MW	646	
EQUIVALENT SCRUBBED CAPACITY - MW	547	
** 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	1132.56	(2400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	305.	(1000 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-13300
AVERAGE ASH CONTENT - %	*****	
RANGE ASH CONTENT - %	14.7-16.0	
AVERAGE MOISTURE CONTENT - %	4.50	
RANGE MOISTURE CONTENT - %	3.0-5.0	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	2.5-3.5	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	566.3	(1200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	132.2	(270 F)
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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 1 (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	UNITED ENGINEERS & CONSTRUCTORS
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.55
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.9
CURRENT STATUS	1
COMMERCIAL START-UP	12/1980
INITIAL START-UP	12/1978
CONTRACT AWARDED	9/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.50	
DESIGN COAL HEAT CONTENT - J/G	28842.4	(12400 BTU/LB)
DESIGN COAL ASH CONTENT - %	16.00	
DESIGN MOISTURE CONTENT - %	5.00	
DESIGN CHLORIDE CONTENT - %	0.05	
SPACE REQUIREMENTS - SQ M	20252.2	(218000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	208.0	

** QUENCHER/PRESATURATOR

NUMBER	4	
TYPE	VENTURI	
SUPPLIER	BABCOCK & WILCOX	
INLET GAS FLOW - CU. M/S	283.14	(600000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	504.	(8000 GPM)
L/G RATIO - L/CU. M	1.8	(13.3 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	SYNTHETIC RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	CHLOROBUTYL	
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1008.	(16000 GPM)
L/G RATIO - L/CU.M	4.0	(30.2 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.2	(5.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	250.11	(530000 ACFM)
INLET GAS TEMPERATURE - C	51.7	(125 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** 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	IMPINGEMENT
SPECIFIC TYPE	BAFFLE

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

TRADE NAME/COMMON TYPE	CLOSED VANE
MANUFACTURER	BABCOCK & WILCOX
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	2
NUMBER OF PASSES PER STAGE	3
DISTANCE BETWEEN STAGES - CM	213.36 (84.0 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	THICKENER OVERFLOW/MAKEUP
WASH FREQUENCY	CONTINUOUSLY; ONCE EVERY 2 HOURS
WASH RATE - L/S	15.1 (240 GAL/MIN)
** FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	267.10 (566000 ACFM)
FLUE GAS TEMPERATURE - C	132.2 (270 F)
PRESSURE DROP - KPA	7.9 (26.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	NR
SUPPLIER	AMERICAN STANDARD
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	493.14 (1045000 ACFM)
FLUE GAS TEMPERATURE - C	132.2 (270 F)
PRESSURE DROP - KPA	7.6 (25.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL/OPOSED BLADE MULTILOUVER
MANUFACTURER	FORNEY ENGINEERING
SERVICE CONDITIONS	270
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	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL/OPOSED BLADE MULTILOUVER
MANUFACTURER	FORNEY ENGINEERING
SERVICE CONDITIONS	125
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

** DUCTWORK	
LOCATION	OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC; INORGANIC
LINER SPECIFIC MATERIAL TYPE	ASPHALT-URETHANE; BOROSILICATE GLASS
** DUCTWORK	
LOCATION	OUTLET AFTER BYPASS JUNCTION
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	NR
** 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	SLAKER
DEVICE	DETENTION
DEVICE TYPE	N/A
MANUFACTURER	DORR-OLIVER
NUMBER	3
NUMBER OF SPARES	1
PRODUCT QUALITY - % SOLIDS	15.0
** TANKS	
SERVICE	NUMBER
-----	-----
RECIRCULATION	4
ME WASH	****
SLURRY TRANSFER	1
SLURRY FEED	1
THICKENER OVERFLOW	2
SLUDGE STABILIZATION	2
** PUMPS	
SERVICE	NUMBER
-----	-----
QUENCHER RECIRCULATION	8
ABSORBER RECIRCULATION	16
THICKENER UNDERFLOW	****
LIME SLURRY TRANSFER	2
LIME SLURRY FEED	****
SLUDGE TRANSFER	4
RETURN WATER	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	175.0 DIA X 10.0
CAPACITY	2190000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	COAL TAR EPOXY
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	6% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS '27-32%, PH 8.0
OUTLET STREAM DISPOSITION	TO SLUDGE TREATMENT
OVERFLOW STREAM DISPOSITION	RECIRCULATION TANK

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	MIX TANK
PROPRIETARY PROCESS	DRAVO 'CALCILOX'
INLET QUALITY - %	30.0
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF-SITE '1.5 MILES'
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	200 ACRES X 200 FT
SITE SERVICE LIFE - YRS	31
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	OUTLET FROM ABSORBER
CHEMICAL PARAMETERS	PH, SO2
PHYSICAL VARIABLES	DENSITY, FLOW
CONTROL LEVELS	PH 5.9-6.0, 6% SOLIDS IN SLURRY
MONITOR TYPE	UNILOC 'PH', LEAR SIEGLER 'SO2', TEXAS NUCLEAR '
MONITOR LOCATION	ABSORBER DOWNCOMER FOR PH
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
RECEIVING WATER STREAM	OHIO RIVER
SOURCE OF MAKEUP WATER	RIVER WATER AND COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	THIOSORBIC LIME
PRINCIPAL CONSTITUENT	>90% CAO, 4-7% MGO
SOURCE/SUPPLIER	DRAVO
CONSUMPTION	11.1 TPH
UTILIZATION - %	94.0
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	33.3
FAN - %	0.0
SLAKER - %	1.0
THICKENER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0
FAN	0.0
SLAKER	1.0
THICKENER	0.0

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. HOURS	FACTOR
3/79	SYSTEM							744		
4/79	SYSTEM							720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 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 STARTED ON MARCH 7, 1979. NO HOURS ARE YET AVAILABLE BECAUSE OF THE RECENT OPERATING STATUS.

THE A-MODULE HAS BEEN REMOVED FROM SERVICE DUE TO A WELD FAILURE ON THE ABSORBER DOWNCOMER SECTION.

5/79 SYSTEM 744

6/79 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS TAKEN OUT OF SERVICE ON JUNE 19 DUE TO SEVERE STACK LINER FAILURE. THE UNIT IS PROJECTED TO BE OUT OF SERVICE UNTIL THE MIDDLE OF AUGUST.

7/79 SYSTEM 0.0 0.0 744 0 0 0.0

8/79 SYSTEM 0.0 0.0 744 0 0 0.0

9/79 SYSTEM 0.0 0.0 720 0 0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT RESTARTED IN LATE SEPTEMBER AFTER COMPLETION OF THE STACK RELINING.

10/79 SYSTEM 744

11/79 SYSTEM 720

12/79 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THIS REPORT PERIOD.

1/80 SYSTEM 744

2/80 SYSTEM 690

3/80 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE ON THE OPERATIONS AT PLEASANTS 1 FOR THE FIRST QUARTER OF 1980.

4/80 SYSTEM 720

5/80 SYSTEM 744

6/80 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE SECOND QUARTER 1980 REPORT PERIOD.

7/80 SYSTEM 744

8/80 A 96.3 27.9

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		98.1		28.5						
	C		0.0		0.0						
	D		98.1		28.5						
	SYSTEM		73.1		21.2			744	216	158	23.2
9/80	SYSTEM		0.0		0.0			720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

AN EIGHT WEEK BOILER AND FGD SYSTEM SCHEDULED OUTAGE BEGAN DURING THE WEEK OF AUGUST 11. THE FGD SYSTEM WAS EXPECTED TO BE OUT OF SERVICE FOR 8-12 WEEKS. DURING THE OUTAGE THE FOLLOWING REPAIRS WERE TO BE PERFORMED:

1. REPLACE FABRIC EXPANSION JOINTS WITH ELASTOMER JOINTS
2. REPLACE GUNITE LININGS ON OUTLET DUCTWORK
3. BEGIN RE-LINING SO2 MODULES RUBBER LINING DUE TO SEVERE BLISTERING
4. COAT THICKENER OVERFLOW TANK WITH COAL TAR EPOXY
5. MISCELLANEOUS PUMP AND VALVE MAINTENANCE
6. UPGRADE THE ISOLATION DAMPERS

10/80	SYSTEM	0.0			0.0			744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE PLEASANTS 1 FGD SYSTEM REMAINED OFF LINE THROUGH THE MONTH OF OCTOBER.

11/80	SYSTEM							720			

12/80	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTHS OF NOVEMBER AND DECEMBER WAS NOT AVAILABLE.

1/81	SYSTEM							744			86.2

2/81	SYSTEM							672			81.0

3/81	SYSTEM							744			33.2

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AN FGD SYSTEM OUTAGE IN MARCH IT WAS DISCOVERED THAT THE PLASITE LINING IN THE OUTLET DUCTWORK FOR MODULES B AND D WAS FAILING. THE B MODULE DUCTWORK WAS PATCHED AND THE MODULE RETURNED TO SERVICE. THE D MODULE WAS KEPT OFF LINE AND THE OUTLET DUCTWORK FOR THIS MODULE WILL BE RELINED WITH CHLOROBUTYL RUBBER.

4/81	SYSTEM							720			

5/81	SYSTEM							744			

6/81	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			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL 1981 TO DECEMBER 1982.

1/83	1A	38.7		38.4						
	1B	90.8		90.2						
	1C	68.2		67.7						
	1D	46.8		46.5						
	SYSTEM	81.5		81.0			744	739	602	74.0
2/83	1A	0.0		0.0						
	1B	99.1		99.1						
	1C	100.0		100.0						
	1D	70.7		70.7						
	SYSTEM	89.9		89.9			672	672	604	67.0
3/83	1A	39.5		29.4						
	1B	64.0		47.7						
	1C	90.8		67.7						
	1D	53.3		39.8						
	SYSTEM	82.5		61.6			744	555	458	51.0

** PROBLEMS/SOLUTIONS/COMMENTS

EXPANSION JOINTS WERE REPLACED ON MODULES 1A AND 1B DURING MARCH.

4/83	1A	42.8		33.3						
	1B	76.8		59.9						
	1C	39.0		30.4						
	1D	92.7		72.2						
	SYSTEM	83.8		65.3			720	561	470	48.0
5/83	1A	83.7		67.7						
	1B	57.1		46.2						
	1C	57.6		46.6						
	1D	82.4		66.7						
	SYSTEM	93.6		75.8			744	602	564	54.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING APRIL AND MAY, 1983.

6/83	1A	99.6		33.3						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
	1B	99.2			33.2		
	1C	100.0			34.4		
	1D	0.0			0.0		
	SYSTEM	99.6			33.7	720	241 242 24.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OUT OF SERVICE DURING PART OF JUNE FOR AN ANNUAL OUTAGE.

LIME SLURRY TANKS WERE LINED WITH EPOXY COATING DURING THE ANNUAL OUTAGE IN JUNE.

OUTLET DUCTS WERE RELINED DURING THE OUTAGE IN JUNE.

THE MODULE 1D MIST ELIMINATOR SECTION WAS RELINED WITH CHLOROBUTYL RUBBER DURING THE ANNUAL OUTAGE IN JUNE.

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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.

10/84 SYSTEM 744

11/84 SYSTEM 720

12/84 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 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 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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

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

NO INFORMATION WAS REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1986.

1/87	SYSTEM	744

MONONGAHELA POWER: PLEASANTS 1 (CONT.)

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

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 BOILER ID FAN ROTORS WILL BE REPLACED ON UNIT 1 AS SOON AS THEY ARE FABRICATED.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. SCHEDULED UNIT OUTAGES TOOK PLACE IN APRIL AND OCTOBER AND LASTED APPROXIMATELY 1 WEEK. DURING THESE OUTAGES, ROUTINE MAINTENANCE WAS PERFORMED ON FRESH WATER PUMP SEALS, DUCTWORK EXPANSION JOINTS, SPRAY NOZZLES AND BOILER ID FANS.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONONGAHELA POWER	
PLANT NAME	PLEASANTS	
UNIT NUMBER	2	
CITY	WILLOW ISLAND	
STATE	WEST VIRGINIA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(0.050 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	1252	
GROSS UNIT GENERATING CAPACITY - MW	684	
NET UNIT GENERATING CAPACITY W/FGD - MW	626	
NET UNIT GENERATING CAPACITY WO/FGD - MW	646	
EQUIVALENT SCRUBBED CAPACITY - MW	547	
** 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	1132.56	(2400000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2	(270 F)
STACK HEIGHT - M	305.	(1000 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.1	(20.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	29075.	(12500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11000-13300
AVERAGE ASH CONTENT - %	*****	
RANGE ASH CONTENT - %	14.7-16.0	
AVERAGE MOISTURE CONTENT - %	4.50	
RANGE MOISTURE CONTENT - %	3.0-5.0	
AVERAGE SULFUR CONTENT - %	3.00	
RANGE SULFUR CONTENT - %	2.5-3.5	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** FABRIC FILTER		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	2	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	AIR CORRECTION DIVISION, UOP	
INLET FLUE GAS CAPACITY - CU.M/S	566.3	(1200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	132.2	(270 F)
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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 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	UNITED ENGINEERS & CONSTRUCTORS
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.55
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.9
CURRENT STATUS	1
COMMERCIAL START-UP	12/1980
INITIAL START-UP	10/1980
CONTRACT AWARDED	9/1975

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.50	
DESIGN COAL HEAT CONTENT - J/G	28842.4	(12400 BTU/LB)
DESIGN COAL ASH CONTENT - %	16.00	
DESIGN MOISTURE CONTENT - %	5.00	
DESIGN CHLORIDE CONTENT - %	0.05	
SPACE REQUIREMENTS - SQ M	20252.2	(218000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	208.0	

** QUENCHER/PRESATURATOR

NUMBER	4	
TYPE	VENTURI	
SUPPLIER	BABCOCK & WILCOX	
INLET GAS FLOW - CU. M/S	283.14	(600000 ACFM)
INLET GAS TEMPERATURE - C	148.9	(300 F)
PRESSURE DROP - KPA	1.0	(4.0 IN-H2O)
LIQUID RECIRCULATION RATE - LITERS/S	504.	(8000 GPM)
L/G RATIO - L/CU. M	1.8	(13.3 GAL/1000 ACFM)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	

** ABSORBER

NUMBER	4	
NUMBER OF SPARES	1	
GENERIC TYPE	TRAY TOWER	
SPECIFIC TYPE	SIEVE TRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	BABCOCK & WILCOX	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	NATURAL RUBBER	
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1008.	(16000 GPM)
L/G RATIO - L/CU.M	4.0	(30.2 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.2	(5.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	250.11	(530000 ACFM)
INLET GAS TEMPERATURE - C	51.7	(125 F)
SO2 REMOVAL EFFICIENCY - %	90.0	

** 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	IMPINGEMENT
SPECIFIC TYPE	BAFFLE

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

TRADE NAME/COMMON TYPE	CLOSED VANE
MANUFACTURER	BABCOCK & WILCOX
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	2
NUMBER OF PASSES PER STAGE	3
DISTANCE BETWEEN STAGES - CM	213.36 (84.0 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	THICKENER OVERFLOW/MAKEUP
WASH FREQUENCY	CONTINUOUSLY; ONCE EVERY 2 HOURS
WASH RATE - L/S	15.1 (240 GAL/MIN)
** FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	AMERICAN STANDARD
FUNCTION	BOOSTER
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	267.10 (566000 ACFM)
FLUE GAS TEMPERATURE - C	132.2 (270 F)
PRESSURE DROP - KPA	7.9 (26.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	NR
SUPPLIER	AMERICAN STANDARD
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	493.14 (1045000 ACFM)
FLUE GAS TEMPERATURE - C	132.2 (270 F)
PRESSURE DROP - KPA	7.6 (25.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL/OPOSED BLADE MULTILOUVER
MANUFACTURER	FORNEY ENGINEERING
SERVICE CONDITIONS	270
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	4
FUNCTION	SHUT-OFF
GENERIC TYPE	LOUVER
SPECIFIC TYPE	PARALLEL/OPOSED BLADE MULTILOUVER
MANUFACTURER	FORNEY ENGINEERING
SERVICE CONDITIONS	125
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AIISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

** DUCTWORK	
LOCATION	OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC; INORGANIC
LINER SPECIFIC MATERIAL TYPE	ASPHALT-URETHANE; BOROSILICATE GLASS
** DUCTWORK	
LOCATION	OUTLET AFTER BYPASS JUNCTION
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	INORGANIC
LINER SPECIFIC MATERIAL TYPE	NR
** 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	SLAKER
DEVICE	DETENTION
DEVICE TYPE	N/A
MANUFACTURER	DORR-OLIVER
NUMBER	3
NUMBER OF SPARES	1
PRODUCT QUALITY - % SOLIDS	15.0
** TANKS	
SERVICE	NUMBER
-----	-----
RECIRCULATION	****
ME WASH	****
SLURRY TRANSFER	1
SLURRY FEED	1
THICKENER OVERFLOW	2
SLUDGE STABILIZATION	2
** PUMPS	
SERVICE	NUMBER
-----	-----
QUENCHER RECIRCULATION	8
ABSORBER RECIRCULATION	16
THICKENER UNDERFLOW	****
LIME SLURRY TRANSFER	2
LIME SLURRY FEED	****
SLUDGE TRANSFER	4
RETURN WATER	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	0
CONFIGURATION	CIRCULAR
DIMENSIONS - FT	175.0 DIA X 10.0
CAPACITY	2190000
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	COAL TAR EPOXY
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	6% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS '27-32%!; PH 8.0
OUTLET STREAM DISPOSITION	TO SLUDGE TREATMENT
OVERFLOW STREAM DISPOSITION	RECIRCULATION TANK

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	MIX TANK
PROPRIETARY PROCESS	DRAVO 'CALCILOX!
INLET QUALITY - %	30.0
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF-SITE '1.5 MILES!
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	200 ACRES X 200 FT
SITE SERVICE LIFE - YRS	31
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	OUTLET FROM ABSORBER
CHEMICAL PARAMETERS	PH, SO2
PHYSICAL VARIABLES	DENSITY, FLOW
CONTROL LEVELS	PH 5.9-6.0; 6% SOLIDS IN SLURRY
MONITOR TYPE	UNILOC 'PH!, LEAR SIEGLER 'SO2!, TEXAS NUCLEAR '
MONITOR LOCATION	ABSORBER DOWNCOMER FOR PH
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
RECEIVING WATER STREAM	OHIO RIVER
SOURCE OF MAKEUP WATER	RIVER WATER AND COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	THIOSORBIC LIME
PRINCIPAL CONSTITUENT	>90% CAO, 4-7% MGO
SOURCE/SUPPLIER	DRAVO
CONSUMPTION	11.1 TPH
UTILIZATION - %	94.0
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	33.3
FAN - %	0.0
SLAKER - %	1.0
THICKENER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0
FAN	0.0
SLAKER	1.0
THICKENER	0.0

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

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

10/80 SYSTEM

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION OF THE FGD SYSTEM COMMENCED IN LATE OCTOBER 1980.

11/80	SYSTEM						720		

12/80	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD PROBLEMS HAVE BEEN ENCOUNTERED.

1/81	SYSTEM						744		60.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY IT WAS NECESSARY TO CLEAN THE SOLIDS OUT OF THE THICKENER OVERFLOW TANK AS A RESULT OF PROBLEMS WITH THE DENSITY CONTROL.

2/81	SYSTEM						672		50.0

** PROBLEMS/SOLUTIONS/COMMENTS

A NINE-FOOT SECTION OF PIPE HAD TO BE RELINED DURING THE MONTH ON MODULE B AS A RESULT OF FAILURE OF THE RUBBER LINER.

3/81	SYSTEM						744		72.0

** PROBLEMS/SOLUTIONS/COMMENTS

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

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						744		

5/82	SYSTEM						744		

6/82	SYSTEM						744		

7/82	SYSTEM						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
8/82	SYSTEM						744		
9/82	SYSTEM						720		
10/82	SYSTEM						744		
11/82	SYSTEM						720		
12/82	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL 1981 TO DECEMBER 1982.									
1/83	2A		76.2		62.0				
	2B		94.9		77.2				
	2C		16.4		13.3				
	2D		100.0		81.7				
	SYSTEM		95.8		78.0		744	605	581 58.0
2/83	2A		0.0		0.0				
	2B		72.3		72.3				
	2C		99.3		99.3				
	2D		99.6		99.6				
	SYSTEM		90.4		90.4		672	672	607 70.0
3/83	2A		27.7		27.7				
	2B		90.3		90.3				
	2C		30.6		30.6				
	2D		72.6		72.6				
	SYSTEM		73.7		73.7		744	744	549 70.0
4/83	2A		98.1		63.5				
	2B		100.0		68.1				
	2C		0.0		0.0				
	2D		0.0		0.0				
	SYSTEM		67.7		43.8		720	466	474 35.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT 2 STACK BRICK LINING WAS REPAIRED DURING APRIL. A CROSS-OVER DUC TO UNIT 1 WAS USED DURING THE REPAIR WORK TO KEEP UNIT 2 IN SERVICE.									
5/83	2A		100.0		99.7				
	2B		65.0		64.7				
	2C		0.0		0.0				
	2D		99.2		98.7				
	SYSTEM		88.1		87.7		744	740	652 69.0
6/83	2A		97.9		97.9				
	2B		100.0		100.0				
	2C		63.2		63.2				
	2D		37.2		37.2				
	SYSTEM		99.4		99.4		720	720	716 70.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING MAY AND JUNE, 1983.									
7/83	SYSTEM						744		
8/83	SYSTEM						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.								
10/84	SYSTEM						744		
11/84	SYSTEM						720		
12/84	SYSTEM						744		
	** 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		
6/85	SYSTEM						720		
7/85	SYSTEM						744		
8/85	SYSTEM						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

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

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

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

NO INFORMATION WAS REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1986.

1/87	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE ALL OF DECEMBER 1986 AND THE FIRST 5 DAYS OF JANUARY FOR A SCHEDULED TURBINE/BOILER OUTAGE. THE BOILER WAS REPORTED TO HAVE OPERATED 465 HOURS DURING THE MONTH OF JANUARY 1987.

2/87	SYSTEM							672			
3/87	SYSTEM							744			
4/87	SYSTEM							720			
5/87	SYSTEM							744			
6/87	SYSTEM							720			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONONGAHELA POWER: PLEASANTS 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF FEBRUARY THROUGH JUNE. THE UNIT WAS OFF-LINE 5 DAYS IN JUNE FOR A SCHEDULED BOILER ID FAN INSPECTION AND REPAIRS TO THE BOILER FEED WATER SYSTEM.

7/87	SYSTEM									744
8/87	SYSTEM									744
9/87	SYSTEM									720
10/87	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS TAKEN OFF-LINE IN OCTOBER FOR 5 DAYS TO COMPLETE SCHEDULED FGD SEAL WATER REPAIRS, NOZZLE CLEANING AND BOILER ID FAN INSPECTIONS.

11/87	SYSTEM									720
12/87	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THE UNITS WERE OFF-LINE IN DECEMBER TO REPLACE THE ROTORS IN BOTH ID FANS. UNIT 1 WILL ALSO UNDERGO FAN ROTOR REPLACEMENT AS SOON AS THEY CAN BE FABRICATED.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA POWER	
PLANT NAME	COLSTRIP	
UNIT NUMBER	1	
CITY	COLSTRIP	
STATE	MONTANA	
REGULATORY CLASSIFICATION	D	
PARTICULATE EMISSION LIMITATION - NG/J	43.	(0.100 LB/MMBTU)
SO ₂ EMISSION LIMITATION - NG/J	516.	(1.200 LB/MMBTU)
NO _x EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	664	
GROSS UNIT GENERATING CAPACITY - MW	358	
NET UNIT GENERATING CAPACITY W/FGD - MW	330	
NET UNIT GENERATING CAPACITY WO/FGD - MW	342	
EQUIVALENT SCRUBBED CAPACITY - MW	358	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	674.82	(1430000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	153.	(503 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.0	(16.5 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20569.	(8843 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8162-8897
AVERAGE ASH CONTENT - %	8.60	
RANGE ASH CONTENT - %	6.1-12.6	
AVERAGE MOISTURE CONTENT - %	23.90	
RANGE MOISTURE CONTENT - %	21.0-25.0	
AVERAGE SULFUR CONTENT - %	0.78	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	3	
NUMBER OF SPARES	0	
INITIAL START-UP DATE	9/1975	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	15.0 DIA	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	PREFIRED BRICK/SHAPES	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	415.8	(6600 GPM)
L/G RATIO - LITER/CU.M	1.8	(13.8 GAL/1000ACF)
PH CONTROL ADDITIVE	LIME/ALKALINE FLY ASH	
PRESSURE DROP - KPA	4.2	(17.0 IN-H ₂ O)
SUPERFICIAL GAS VELOCITY - M/S	61.0	(200.0 FT/S)

MONTANA POWER: COLSTRIP 1 (CONT.)

INLET GAS FLOW RATE - CU.M/S	225.1	(477000 ACFM)
INLET GAS TEMPERATURE - C	143.9	(291 F)
PARTICLE REMOVAL EFFICIENCY - %	99.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00
ENERGY CONSUMPTION - %	3.4
CURRENT STATUS	1
COMMERCIAL START-UP	11/1975
INITIAL START-UP	9/1975
CONTRACT AWARDED	10/1972

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	1.00	
DESIGN COAL HEAT CONTENT - J/G	18984.8	(8162 BTU/LB)
DESIGN COAL ASH CONTENT - %	12.60	
DESIGN MOISTURE CONTENT - %	25.00	
DESIGN CHLORIDE CONTENT - %	0.01	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	152.0	

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	COMBINATION TOWER	
SPECIFIC TYPE	VENTURI/SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	35 DIA X 70.5	
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	GLASS FLAKE-FILLED POLYESTER; INERT FLAKE-FILLED	
LINER MATERIAL TRADE NAME/COMMON TYPE	RIGIFLAK 4850; PLASITE 4020 & 4030	
GAS CONTACTING DEVICE TYPE	VENTURI THROAT AND SPRAY ZONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	479.	(7600 GPM)
L/G RATIO - L/CU.M	2.4	(17.8 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.4	(17.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	2.7	(9.0 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
PARTICLE REMOVAL EFFICIENCY - %	99.5	

** 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	HEIL
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 1 (CONT.)

FREEBOARD DISTANCE - M	3.96	(13.0 FT)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
VANE ANGLES - DEGREES	120	
PRESSURE DROP - KPA	0.1	(0.3 IN-H2O)
SUPERFICAL GAS VELOCITY - M/S	2.7	(8.7 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	BLENDED	
WASH FREQUENCY	CONTINUOUS UNDERSPRAY AND ONCE/DAY OVERSPRAY	
WASH RATE - L/S	51.1	(810 GAL/MIN)
** REHEATER		
NUMBER	3	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	PLATECOIL	
LOCATION	IN DUCT AFTER ABSORBER	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	30.6	(55 F)
INLET FLUE GAS FLOW RATE - CU. M/S	201.31	(426600 ACFM)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
OUTLET FLUE GAS TEMPERATURE - C	79.4	(175 F)
NUMBER OF HEAT EXCHANGER BANKS	12	
NUMBER OF BUNDLES PER BANK	11	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM; NIC	
** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	223.21	(473000 ACFM)
FLUE GAS TEMPERATURE - C	79.4	(175 F)
PRESSURE DROP - KPA	11.0	(36.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; ORGANIC	
** DAMPERS		
NUMBER	3	
FUNCTION	SHUT-OFF	
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
MANUFACTURER	ALLIS-CHALMERS	
MODULATION	OPEN/CLOSED	
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	3	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLOTINE	
SPECIFIC TYPE	SIDE-ENTRY GUILLOTINE	
MANUFACTURER	MOSSER	
MODULATION	OPEN/CLOSED	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	6	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	

MONTANA POWER: COLSTRIP 1 (CONT.)

MANUFACTURER	BUFFALO FORGE
MODULATION	VARIOUS
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
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	OUTLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** DUCTWORK	
LOCATION	REHEATER
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	PASTE
MANUFACTURER	BIF
NUMBER	2
NUMBER OF SPARES	1
PRODUCT QUALITY - % SOLIDS	10.0
** TANKS	
SERVICE	NUMBER
-----	-----
VENTURI & ABSORBER RECYCLE	3
SLURRY TRANSFER	1
SLURRY STORAGE	1
EFFLUENT BLEED	1
TRAY WASH WATER RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
VENTURI RECIRCULATION	6
ABSORBER RECIRCULATION	6
POND RETURN	3
LIME SYSTEM	***
EFFLUENT BLEED	2
TRAY WASH WATER RECYCLE	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 1 (CONT.)

** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING 'BENTONITE!
SITE DIMENSIONS	15 ACRE/20-30 FEET DEEP
SITE CAPACITY - CU.M	550350 (450.0 ACRE-FT)
SITE SERVICE LIFE - YRS	3
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING 'BENTONITE!
SITE DIMENSIONS	15 ACRE/20-30 FEET DEEP
SITE CAPACITY - CU.M	550350 (450.0 ACRE-FT)
SITE SERVICE LIFE - YRS	3
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING 'BENTONITE!
SITE DIMENSIONS	150 ACRE/20-30 FEET DEEP
SITE CAPACITY - CU.M	5503500 (4500.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	RECIRCULATING SLURRY
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS, FLOW, PRESSURE
CONTROL LEVELS	PH 4.5 TO 5.5
MONITOR LOCATION	RECIRCULATION TANK
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	1.9 (30 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	18.3 (290 GPM)
SOURCE OF MAKEUP WATER	ME WASH, LIME SLAKER, AND SEAL WATER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME/FLY ASH
PRINCIPAL CONSTITUENT	90% CAO/16-21% CAO AND 5% MGO
SOURCE/SUPPLIER	PETE LIENE
CONSUMPTION	5 TPD 'LIME!
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
SCRUBBER - %	20.0
ABSORBER - %	20.0
MIST ELIMINATOR - %	0.0
REHEATER - %	50.0
FAN - %	20.0
SLAKER - %	100.0
EFFLUENT HOLD TANK - %	20.0
RECIRCULATION PUMP - %	50.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 1 (CONT.)

** FGD SPARE COMPONENT INDICES

SCRUBBER	0.5
ABSORBER	0.5
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.5
SLAKER	1.0
EFFLUENT HOLD TANK	0.5
RECIRCULATION PUMP	1.0

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/75	SYSTEM	0.0						720	72		0.5
10/75	SYSTEM	0.0						744	456		19.4
11/75	SYSTEM	0.0						720	576		42.2
12/75	SYSTEM	0.0						744	720		59.9
1/76	SYSTEM	90.0						744	672		63.8
2/76	SYSTEM	98.0						696	624		65.4
3/76	SYSTEM	97.6						744	576		57.0
4/76	SYSTEM	74.2						720	672		49.9
5/76	SYSTEM	96.8						744	336		26.0
6/76	SYSTEM	0.0			0.0			720	0	0	0.0
7/76	SYSTEM	93.2						744	480		28.0
8/76	SYSTEM	94.7						744	552		37.8
9/76	SYSTEM	88.6						720	720		64.5
10/76	SYSTEM	79.9						744	720		73.1

** PROBLEMS/SOLUTIONS/COMMENTS

A TEMPERATURE EXCURSION RESULTED IN DAMAGE TO SYSTEM COMPONENTS CAUSING SYSTEM DOWNTIME.

THE EMERGENCY SCRUBBER QUENCH WATER SUPPLY SYSTEM FAILED TO OPERATE DURING A TEMPERATURE EXCURSION RESULTING IN INTERNAL DAMAGE.

THE LININGS WERE DAMAGED DURING THE OCTOBER TEMPERATURE EXCURSION.

MIST ELIMINATOR DAMAGE OCCURRED AS THE RESULT OF THE TEMPERATURE EXCURSION IN OCTOBER.

11/76	SYSTEM	62.7					720	720		55.6

** PROBLEMS/SOLUTIONS/COMMENTS

A FAILURE OF AN ID FAN MOTOR OCCURRED IN NOVEMBER.

12/76	SYSTEM	73.8					744	744		67.2
1/77	SYSTEM	92.5					744	744		72.9
2/77	SYSTEM	95.4					672	48		3.0
3/77	SYSTEM	0.0			0.0		744	0	0	0.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	SYSTEM	83.0						720	600		49.9
5/77	SYSTEM	85.4						744	624		64.1
6/77	SYSTEM	87.4						720	672		68.6
7/77	SYSTEM	85.1						744	696		71.8
8/77	SYSTEM	93.3						744			
9/77	SYSTEM	92.5						720			
10/77	SYSTEM	95.6						744			
11/77	SYSTEM	96.3						720			
12/77	SYSTEM	98.3						744			
1/78	SYSTEM	95.7						744			
2/78	SYSTEM	99.5						672			
3/78	SYSTEM	92.0						744			
4/78	SYSTEM	99.8						720			
5/78	SYSTEM	66.0			1.3			744		10	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE 66% MAY AVAILABILITY IS BASED UPON 9.92 HOURS OF OPERATION ON TWO SCRUBBERS WHILE THE UNIT WAS BEING BROUGHT BACK ON LINE AFTER COMPLETION OF ITS ANNUAL OVERHAUL.											
THE ID FAN MOTOR FOR MODULE 1A WAS NOT AVAILABLE DURING UNIT RESTART IN MAY.											
6/78	SYSTEM	76.0						720			
7/78	SYSTEM	95.7						744			
8/78	SYSTEM	97.0						744			
9/78	SYSTEM	96.0						720			
10/78	SYSTEM	95.0						744			
11/78	SYSTEM	91.0						720			
12/78	SYSTEM	96.7						744			
1/79	SYSTEM	97.6						744			
2/79	SYSTEM	90.3						672			
3/79	SYSTEM	97.3						744			
4/79	SYSTEM	98.9	88.4		80.2			720		597	
5/79	SYSTEM	89.7						744			
6/79	SYSTEM	95.2						720			

MONTANA POWER: COLSTRIP 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY AND JUNE THE UNIT WAS BEING OVERHAULED. THE AVAILABILITY FOR THESE PERIODS IS BASED UPON OPERATIONS BEFORE AND AFTER OVERHAUL.

7/79	SYSTEM	98.0								744
8/79	SYSTEM	97.3								744
9/79	SYSTEM	95.2								720
10/79	SYSTEM	92.9								744
11/79	SYSTEM	97.5								720

** PROBLEMS/SOLUTIONS/COMMENTS

THE ROUTINE MAINTENANCE CAN BE PERFORMED WHILE THE MODULES ARE ON LINE SO THE AVAILABILITY REMAINS HIGH.

12/79	SYSTEM	95.9								744
1/80	SYSTEM	96.5								744
2/80	SYSTEM	97.4								696
3/80	SYSTEM	95.4								744

** PROBLEMS/SOLUTIONS/COMMENTS

TOTAL SYSTEM AVAILABILITY CONTINUES TO BE HIGH WITH NO MAJOR FGD SYSTEM PROBLEMS REPORTED DURING THE FIRST QUARTER OF 1980.

4/80	SYSTEM	99.8								720

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WITH THE FGD SYSTEM WERE REPORTED BY THE UTILITY DURING APRIL.

5/80	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

NO AVAILABILITY DATA WERE REPORTED BY THE UTILITY BECAUSE OF A SCHEDULED BOILER AND FGD SYSTEM OUTAGE FOR ROUTINE MAINTENANCE.

6/80	SYSTEM	77.7								720

** PROBLEMS/SOLUTIONS/COMMENTS

LOW AVAILABILITY DURING JUNE WAS A RESULT OF THE ANNUAL BOILER AND FGD SYSTEM MAINTENANCE OUTAGE.

7/80	SYSTEM	98.6								744

** PROBLEMS/SOLUTIONS/COMMENTS

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

8/80	SYSTEM	99.3								744
9/80	SYSTEM	98.3								720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 1 (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 NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED FOR THE MONTHS OF AUGUST AND SEPTEMBER.									
10/80	SYSTEM	96.2					744		
11/80	SYSTEM	98.2					720		
12/80	SYSTEM	99.0					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED NO MAJOR FGD PROBLEMS DURING THE FOURTH QUARTER 1980.									
1/81	SYSTEM	96.0					744		
2/81	SYSTEM	97.4					672		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING JANUARY-FEBRUARY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
3/81	SYSTEM	99.8					744		
4/81	SYSTEM	96.6					720		
5/81	SYSTEM	97.1					744		
6/81	SYSTEM	0.0					720	0	
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING JUNE THE BOILER WAS OUT OF SERVICE FOR A SCHEDULED OVERHAUL. DURING THIS TIME ROUTINE PATCHING WAS PERFORMED ON THE FGD SYSTEM.									
7/81	SYSTEM	99.3					744		
8/81	SYSTEM	99.2					744		
9/81	SYSTEM	96.9					720		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE THIRD QUARTER NO FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
10/81	SYSTEM	98.4					744		
11/81	SYSTEM	92.8					720		
12/81	SYSTEM	96.9					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE FOURTH QUARTER THE UTILITY REPORTED THAT NO PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.									
1/82	SYSTEM	92.8					744		
2/82	SYSTEM	0.0					672		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
3/82	SYSTEM	0.0					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING FEBRUARY AND MARCH THE UNIT AND THE FGD SYSTEM WERE TAKEN OFF-LINE FOR AN ANNUAL OVERHAUL.									
4/82	SYSTEM						720		
5/82	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING APRIL AND MAY THE UNIT AND FGD SYSTEM WERE OFF-LINE FOR SCHEDULED MAINTENANCE.									
6/82	SYSTEM	98.5					720		
7/82	SYSTEM	94.2					744		
8/82	SYSTEM	91.0					744		
9/82	SYSTEM	97.3					720		
10/82	SYSTEM	93.8					744		
11/82	SYSTEM	89.5					720		
12/82	SYSTEM	94.7					744		
1/83	SYSTEM	97.5					744		
2/83	SYSTEM	96.7					672		
3/83	SYSTEM	97.8					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE LAST TEN MONTHS OF OPERATION. DURING THIS PERIOD OF TIME THE AVERAGE FGD SYSTEM AVAILABILITY WAS 95.1 PERCENT.									
4/83	SYSTEM	87.0					720		
5/83	SYSTEM	0.0					744		
6/83	SYSTEM	0.0					720		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING MAY AND JUNE THE UNIT AND THE FGD SYSTEM WERE TAKEN OFF-LINE FOR A SCHEDULED SPRING OVERHAUL.									
7/83	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
INFORMATION WAS UNAVAILABLE FOR THE MONTH OF JULY.									
8/83	SYSTEM	95.6					744		
9/83	SYSTEM	90.0					720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 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 MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST AND SEPTEMBER.

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	92.9	744
2/84	SYSTEM	90.6	696
3/84	SYSTEM	93.9	744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE REPORTED DURING THE FIRST QUARTER OF 1984.

4/84	SYSTEM	98.4	720
5/84	SYSTEM	96.9	744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE REPORTED DURING APRIL AND MAY 1984.

6/84	SYSTEM		720
7/84	SYSTEM		744

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED OVERHAUL WAS MADE DURING JUNE AND JULY 1984.

8/84	SYSTEM	97.5	744
9/84	SYSTEM	99.0	720
10/84	SYSTEM	98.8	744
11/84	SYSTEM	9.6	720
12/84	SYSTEM	9.8	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED AND/OR UNIT OUTAGES WERE ENCOUNTERED FOR THE MONTHS OF AUGUST THROUGH DECEMBER 1984.

1/85	SYSTEM	99.1	744
2/85	SYSTEM	95.5	672
3/85	SYSTEM	96.6	744
4/85	SYSTEM	98.3	720

MONTANA POWER: COLSTRIP 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 OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY THROUGH APRIL, 1985.

5/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE MOST OF THE MONTH OF MAY DUE TO A SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE.

6/85	SYSTEM	96.8	720
7/85	SYSTEM	94.3	744
8/85	SYSTEM	96.4	744
9/85	SYSTEM	92.5	720
10/85	SYSTEM	97.5	744
11/85	SYSTEM	96.3	720
12/85	SYSTEM	89.4	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JUNE THROUGH DECEMBER, 1985.

1/86	SYSTEM	98.3	744
2/86	SYSTEM	96.1	672
3/86	SYSTEM	92.2	744
4/86	SYSTEM	96.4	720

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD JANUARY THRU APRIL OF 1986.

5/86	SYSTEM		744
6/86	SYSTEM		720
7/86	SYSTEM		744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM WERE OFF-LINE MAY THROUGH JULY FOR SCHEDULED MAINTENANCE WORK. FGD SYSTEM REPAIRS INCLUDED REPLACING THE UNITS IN THE ABSORBER VESSELS, REPAIRING THE REHEATERS, AND CLEANING AND REPLACEMENT OF PORTIONS OF THE ABSORBER MIST ELIMINATOR. THE FRP MIST ELIMINATORS ARE GRADUALLY BEING REPLACED WITH 316 STAINLESS STEEL. ONE VESSEL OUT OF SIX HAS BEEN TOTALLY COMPLETED ON UNIT 1 TO DATE.

8/86	SYSTEM	98.6	744
9/86	SYSTEM	98.4	720
10/86	SYSTEM	96.1	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 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
11/86	SYSTEM	95.2					720			
12/86	SYSTEM	97.3					744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE AUGUST THROUGH DECEMBER 1986 PERIOD.

1/87	SYSTEM	94.4					744			
2/87	SYSTEM	96.4					672			
3/87	SYSTEM	96.7					744			
4/87	SYSTEM	97.5					720			

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH APRIL 1987.

5/87	SYSTEM						744			
6/87	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE IN MAY AND JUNE FOR SCHEDULED BOILER/TURBINE MAINTENANCE WORK. ROUTINE MAINTENANCE WAS PERFORMED ON THE FGD SYSTEM DURING THIS OUTAGE.

7/87	SYSTEM	98.7					744			
8/87	SYSTEM	97.5					744			
9/87	SYSTEM	96.5					720			
10/87	SYSTEM	96.9					744			
11/87	SYSTEM	98.6					720			
12/87	SYSTEM	99.1					744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JULY THROUGH DECEMBER 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA POWER	
PLANT NAME	COLSTRIP	
UNIT NUMBER	2	
CITY	COLSTRIP	
STATE	MONTANA	
REGULATORY CLASSIFICATION	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	664	
GROSS UNIT GENERATING CAPACITY - MW	358	
NET UNIT GENERATING CAPACITY W/FGD - MW	330	
NET UNIT GENERATING CAPACITY WO/FGD - MW	342	
EQUIVALENT SCRUBBED CAPACITY - MW	358	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	674.82	(1430000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	143.9	(291 F)
STACK HEIGHT - M	153.	(503 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.0	(16.5 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20569.	(8843 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8162-8897
AVERAGE ASH CONTENT - %	8.60	
RANGE ASH CONTENT - %	6.1-12.6	
AVERAGE MOISTURE CONTENT - %	23.90	
RANGE MOISTURE CONTENT - %	21.0-25.0	
AVERAGE SULFUR CONTENT - %	0.78	
RANGE SULFUR CONTENT - %	0.4-1.0	
AVERAGE CHLORIDE CONTENT - %	0.01	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	3	
NUMBER OF SPARES	0	
INITIAL START-UP DATE	5/1976	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	15.0 DIA	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
LINER GENERIC MATERIAL	INORGANIC	
LINER SPECIFIC MATERIAL	PREFIRE BRICK/SHAPES	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	415.8	(6600 GPM)
L/G RATIO - LITER/CU.M	1.8	(13.8 GAL/1000ACF)
PH CONTROL ADDITIVE	LIME/ALKALINE FLY ASH	
PRESSURE DROP - KPA	4.2	(17.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0	(200.0 FT/S)

MONTANA POWER: COLSTRIP 2 (CONT.)

INLET GAS FLOW RATE - CU.M/S	225.1	(477000 ACFM)
INLET GAS TEMPERATURE - C	143.9	(291 F)
PARTICLE REMOVAL EFFICIENCY - %	99.5	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	60.00
ENERGY CONSUMPTION - %	3.4
CURRENT STATUS	1
COMMERCIAL START-UP	10/1976
INITIAL START-UP	5/1976
CONTRACT AWARDED	10/1972

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFER CONTENT - %	1.00	
DESIGN COAL HEAT CONTENT - J/G	18984.8	(8162 BTU/LB)
DESIGN COAL ASH CONTENT - %	12.60	
DESIGN MOISTURE CONTENT - %	25.00	
DESIGN CHLORIDE CONTENT - %	0.01	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	152.0	

** QUENCHER/PRESATURATOR

NUMBER	0

** ABSORBER

NUMBER	3	
NUMBER OF SPARES	0	
GENERIC TYPE	COMBINATION TOWER	
SPECIFIC TYPE	VENTURI/SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	35 DIA X 70.5	
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	GLASS FLAKE-FILLED POLYESTER; INERT FLAKE-FILLED	
LINER MATERIAL TRADE NAME/COMMON TYPE	RIGIFLAK 4850; PLASITE 4020 & 4030	
GAS CONTACTING DEVICE TYPE	VENTURI THROAT AND SPRAY ZONE	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	479.	(7600 GPM)
L/G RATIO - L/CU.M	2.4	(17.8 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	4.4	(17.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	2.7	(9.0 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	48.9	(120 F)
SO2 REMOVAL EFFICIENCY - %	80.0	
PARTICLE REMOVAL EFFICIENCY - %	99.5	

** 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	HEIL
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4

MONTANA POWER: COLSTRIP 2 (CONT.)

FREEBOARD DISTANCE - M	3.96	(13.0 FT)
DISTANCE BETWEEN VANES - CM	2.5	(1.00 IN)
VANE ANGLES - DEGREES	120	
PRESSURE DROP - KPA	0.1	(0.3 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	2.7	(8.7 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	BLENDED	
WASH FREQUENCY	CONTINUOUS UNDERSPRAY AND ONCE/DAY OVERSPRAY	
WASH RATE - L/S	51.1	(810 GAL/MIN)
** REHEATER		
NUMBER	3	
NUMBER OF SPARES	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	STEAM	
TRADE NAME/COMMON TYPE	PLATECOIL	
LOCATION	IN DUCT AFTER ABSORBER	
PERCENT GAS BYPASSED - AVG	0.0	
TEMPERATURE INCREASE - C	30.6	(55 F)
INLET FLUE GAS FLOW RATE - CU. M/S	201.31	(426600 ACFM)
INLET FLUE GAS TEMPERATURE - C	48.9	(120 F)
OUTLET FLUE GAS TEMPERATURE - C	79.4	(175 F)
NUMBER OF HEAT EXCHANGER BANKS	12	
NUMBER OF BUNDLES PER BANK	11	
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM; NIC	
** FANS		
NUMBER	3	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	BUFFALO FORGE	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	223.21	(473000 ACFM)
FLUE GAS TEMPERATURE - C	79.4	(175 F)
PRESSURE DROP - KPA	11.0	(36.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; ORGANIC	
** DAMPERS		
NUMBER	3	
FUNCTION	SHUT-OFF	
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
MANUFACTURER	ALLIS-CHALMERS	
MODULATION	OPEN/CLOSED	
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	3	
FUNCTION	SHUT-OFF	
GENERIC TYPE	GUILLotine	
SPECIFIC TYPE	SIDE-ENTRY GUILLotine	
MANUFACTURER	MOSSER	
MODULATION	OPEN/CLOSED	
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	6	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	

MONTANA POWER: COLSTRIP 2 (CONT.)

MANUFACTURER	BUFFALO FORGE
MODULATION	VARIOUS
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
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	OUTLET
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** DUCTWORK	
LOCATION	REHEATER
CONFIGURATION	RECTANGULAR
SHELL GENERIC MATERIAL TYPE	STAINLESS STEEL
SHELL SPECIFIC MATERIAL TYPE	AUSTENITIC
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	PASTE
MANUFACTURER	BIF
NUMBER	2
NUMBER OF SPARES	1
PRODUCT QUALITY - % SOLIDS	10.0
** TANKS	
SERVICE	NUMBER
-----	-----
VENTURI & ABSORBER RECYCLE	3
SLURRY TRANSFER	1
SLURRY STORAGE	1
EFFLUENT BLEED	1
TRAY WASH WATER RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
VENTURI RECIRCULATION	6
ABSORBER RECIRCULATION	6
POND RETURN	3
LIME SYSTEM	****
EFFLUENT BLEED	2
TRAY WASH WATER RECYCLE	2
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 2 (CONT.)

** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING 'BENTONITE!
SITE DIMENSIONS	15 ACRE/20-30 FEET DEEP
SITE CAPACITY - CU.M	550350 (450.0 ACRE-FT)
SITE SERVICE LIFE - YRS	3
** DISPOSAL	
NATURE	INTERIM
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING 'BENTONITE!
SITE DIMENSIONS	15 ACRE/20-30 FEET DEEP
SITE CAPACITY - CU.M	550350 (450.0 ACRE-FT)
SITE SERVICE LIFE - YRS	3
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING 'BENTONITE!
SITE DIMENSIONS	150 ACRE/20-30 FEET DEEP
SITE CAPACITY - CU.M	5503500 (4500.0 ACRE-FT)
SITE SERVICE LIFE - YRS	10
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	RECIRCULATING SLURRY
CHEMICAL PARAMETERS	PH
PHYSICAL VARIABLES	% SOLIDS, FLOW, PRESSURE
CONTROL LEVELS	PH 4.5 TO 5.5
MONITOR LOCATION	RECIRCULATION TANK
PROCESS CONTROL MANNER	MANUAL
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
EVAPORATION WATER LOSS - LITER/S	1.9 (30 GPM)
POND SEEPAGE/RUNOFF WATER LOSS - LITERS/S	0
MAKEUP WATER ADDITION - LITERS/S	18.3 (290 GPM)
SOURCE OF MAKEUP WATER	ME WASH, LIME SLAKER, AND SEAL WATER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIME/FLY ASH
PRINCIPAL CONSTITUENT	90% CAO/16-21% CAO AND 5% MGO
SOURCE/SUPPLIER	PETE LIENE
CONSUMPTION	5 TPD 'LIME!
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
SCRUBBER - %	20.0
ABSORBER - %	20.0
MIST ELIMINATOR - %	0.0
REHEATER - %	50.0
FAN - %	20.0
SLAKER - %	100.0
EFFLUENT HOLD TANK - %	20.0
RECIRCULATION PUMP - %	50.0

MONTANA POWER: COLSTRIP 2 (CONT.)

** FGD SPARE COMPONENT INDICES

SCRUBBER	0.5
ABSORBER	0.5
MIST ELIMINATOR	0.0
REHEATER	0.0
FAN	0.5
SLAKER	1.0
EFFLUENT HOLD TANK	0.5
RECIRCULATION PUMP	1.0

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/76	SYSTEM	100.0						744	72		1.3
6/76	SYSTEM	99.7						720	384		23.2
7/76	SYSTEM	98.7						744	312		19.5
8/76	SYSTEM	95.8						744	240		13.0
9/76	SYSTEM	98.3						720	720		64.6
10/76	SYSTEM	90.3						744	744		77.0
11/76	SYSTEM	94.1						720	720		79.7
12/76	SYSTEM	92.5						744	744		82.3
1/77	SYSTEM	83.4						744	720		68.2
2/77	SYSTEM	93.8						672	648		75.3
3/77	SYSTEM	96.7						744	672		71.3
4/77	SYSTEM	84.5						720	696		68.2
5/77	SYSTEM	63.0						744	312		23.3
6/77	SYSTEM	87.8						720	672		61.4
7/77	SYSTEM	90.6						744	672		57.5
8/77	SYSTEM	81.0						744			
9/77	SYSTEM	89.8						720			
10/77	SYSTEM	77.0						744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE 77% OCTOBER AVAILABILITY FOR THIS SYSTEM INCLUDES NON-AVAILABLE HOURS DURING A BOILER OUTAGE. SCRUBBER MAINTENANCE WAS PERFORMED FOR PART OF THIS OUTAGE TIME. THE FIGURE COMES TO 98.1% WHEN THE BOILER OUTAGE OUTAGE TIME IS EXCLUDED FROM THE AVERAGING PERIOD.

11/77	SYSTEM	98.0					720			
12/77	SYSTEM	98.4					744			
1/78	SYSTEM	97.3					744			
2/78	SYSTEM	94.5					672			
3/78	SYSTEM	89.1					744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 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 BOILER WAS SHUT DOWN FOR AN ANNUAL OVERHAUL ON APRIL 18.

THE UTILITY REPORTED AN AVAILABILITY OF 89.1% FOR MARCH BASED ON 17 DAYS OF OPERATION BEFORE THE UNIT SHUTDOWN FOR THE ANNUAL BOILER OVERHAUL. IF THE SCRUBBING SYSTEM IS ASSUMED TO BE AVAILABLE, I.E. NOT UNDERGOING MAJOR REPAIRS DURING THE BOILER OVERHAUL, THE AVAILABILITY COMES TO 93.8%.

4/78 SYSTEM 86.9 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED AN AVAILABILITY OF 86.9% FOR APRIL BASED ON EIGHT DAYS OF OPERATION AFTER THE UNIT SHUTDOWN FOR THE ANNUAL BOILER OVERHAUL. IF THE SCRUBBING SYSTEM IS ASSUMED TO BE AVAILABLE, I.E. NOT UNDERGOING MAJOR REPAIRS DURING THE BOILER OVERHAUL, THE AVAILABILITY COMES TO 96.5%.

5/78	SYSTEM	99.1		744		
6/78	SYSTEM	97.4		720		
7/78	SYSTEM	96.4		744		
8/78	SYSTEM	99.0	0.0	744	0	0
9/78	SYSTEM	94.0	0.0	720	0	0
10/78	SYSTEM	99.0	0.0	744	0	0
11/78	SYSTEM	99.0	0.0	720	0	0
12/78	SYSTEM	91.2		744		
1/79	SYSTEM	94.3		744		
2/79	SYSTEM	98.3		672		
3/79	SYSTEM	94.3		744		
4/79	SYSTEM	100.0		720		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE UNIT WAS BEING OVERHAULED. THE AVAILABILITY FOR THIS TIME IS BASED UPON OPERATIONS BEFORE AND AFTER THE OVERHAUL.

5/79	SYSTEM	94.4		744		
6/79	SYSTEM	98.4		720		
7/79	SYSTEM	96.4		744		
8/79	SYSTEM	99.3		744		
9/79	SYSTEM	92.3		720		
10/79	SYSTEM	92.9		744		
11/79	SYSTEM	98.4		720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 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 ROUTINE MAINTENANCE CAN BE PERFORMED WHILE THE MODULES ARE ON LINE
 SO THE AVAILABILITY REMAINS HIGH.

12/79	SYSTEM	95.8	744
1/80	SYSTEM	92.7	744
2/80	SYSTEM	98.1	696
3/80	SYSTEM	98.2	744

** PROBLEMS/SOLUTIONS/COMMENTS

TOTAL FGD SYSTEM AVAILABILITY CONTINUES TO BE HIGH WITH NO MAJOR PROBLEMS
 REPORTED FOR THE FIRST QUARTER OF 1980.

4/80	SYSTEM		720

** PROBLEMS/SOLUTIONS/COMMENTS

NO AVAILABILITY DATA WERE REPORTED BY THE UTILITY BECAUSE OF A BOILER AND
 FGD SYSTEM OUTAGE THAT WAS SCHEDULED FOR ROUTINE MAINTENANCE.

5/80	SYSTEM	93.5	744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WITH THE FGD SYSTEM WERE REPORTED BY THE UTILITY DURING
 MAY.

6/80	SYSTEM	96.0	720
7/80	SYSTEM	99.7	744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR PROBLEMS WERE ENCOUNTERED DURING THE JUNE-JULY PERIOD.

8/80	SYSTEM	96.2	744
9/80	SYSTEM	90.5	720

** PROBLEMS/SOLUTIONS/COMMENTS

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

10/80	SYSTEM	96.0	744
11/80	SYSTEM	96.1	720
12/80	SYSTEM	92.4	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO MAJOR FGD PROBLEMS DURING THE FOURTH QUARTER 1980.

1/81	SYSTEM	97.5	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
2/81	SYSTEM	97.4					672		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING JANUARY AND FEBRUARY NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED									
3/81	SYSTEM	98.0					744		
4/81	SYSTEM	94.5					720		
5/81	SYSTEM	0.0					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING MAY THE BOILER WAS OUT OF SERVICE FOR A SCHEDULED OVERHAUL. DURING THIS TIME ROUTINE PATCHING WAS PERFORMED ON THE FGD SYSTEM.									
6/81	SYSTEM	99.3					720		
7/81	SYSTEM	98.4					744		
8/81	SYSTEM	96.7					744		
9/81	SYSTEM	94.2					720		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE THIRD QUARTER NO FGD-RELATED PROBLEMS WERE ENCOUNTERED.									
10/81	SYSTEM	98.0					744		
11/81	SYSTEM	92.6					720		
12/81	SYSTEM	96.1					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE FOURTH QUARTER THE UTILITY REPORTED THAT NO PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.									
1/82	SYSTEM	92.5					744		
2/82	SYSTEM	93.1					672		
3/82	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING MARCH THE UNIT AND THE FGD SYSTEM WERE TAKEN OUT OF SERVICE FOR AN ANNUAL OVERHAUL.									
4/82	SYSTEM	96.7					720		
5/82	SYSTEM	94.9					744		
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING APRIL AND MAY THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE EXPERIENCED.									
6/82	SYSTEM	90.0					720		
7/82	SYSTEM	95.0					744		

MONTANA POWER: COLSTRIP 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/82	SYSTEM	97.8							744		
9/82	SYSTEM	96.0							720		
10/82	SYSTEM	96.2							744		
11/82	SYSTEM	93.4							720		
12/82	SYSTEM	97.0							744		
1/83	SYSTEM	94.8							744		
2/83	SYSTEM	99.9							672		
3/83	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE LAST SEVEN MONTHS OF OPERATION. DURING THIS PERIOD OF TIME THE AVERAGE FGD SYSTEM AVAILABILITY WAS 95.1 PERCENT.											
THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1983. THE UNIT WAS SHUTDOWN IN MARCH FOR A SCHEDULED YEARLY SPRING OVERHAUL.											
4/83	SYSTEM	0.0							720		
5/83	SYSTEM	98.4							744		
6/83	SYSTEM	99.1							720		
** PROBLEMS/SOLUTIONS/COMMENTS											
THE SPRING OVERHAUL ENDED IN APRIL AND THE UNIT AND FGD SYSTEM WERE PLACED BACK INTO SERVICE. THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE REMAINDER OF THE SECOND QUARTER.											
7/83	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE MONTH OF JULY.											
8/83	SYSTEM	97.1							744		
9/83	SYSTEM	97.0							720		
** PROBLEMS/SOLUTIONS/COMMENTS											
NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST AND SEPTEMBER.											
10/83	SYSTEM								744		
11/83	SYSTEM								720		
12/83	SYSTEM								744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE FOURTH QUARTER OF 1983.

1/84	SYSTEM	90.4					744
2/84	SYSTEM	97.0					696
3/84	SYSTEM	95.1					744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE REPORTED DURING THE FIRST QUARTER OF 1984.

4/84	SYSTEM						720
5/84	SYSTEM						744
6/84	SYSTEM						720

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED OVERHAUL WAS MADE DURING THE ENTIRE SECOND QUARTER OF 1984.

7/84	SYSTEM	100.0					744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY.

8/84	SYSTEM	97.9					744
9/84	SYSTEM	93.7					720
10/84	SYSTEM	98.3					744
11/84	SYSTEM	97.1					720
12/84	SYSTEM	94.9	99.9				744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED AND/OR UNIT OUTAGES WERE ENCOUNTERED FOR THE MONTHS OF AUGUST THROUGH DECEMBER 1984.

1/85	SYSTEM	96.7					744
2/85	SYSTEM	94.4					672
3/85	SYSTEM	94.2					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FIRST QUARTER 1985.

4/85	SYSTEM						720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE MOST OF THE MONTH OF APRIL DUE TO A SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE.

5/85	SYSTEM	98.1					744

MONTANA POWER: COLSTRIP 2 (CONT.)

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

6/85	SYSTEM	98.5						720		
7/85	SYSTEM	96.4						744		
8/85	SYSTEM	96.8						744		
9/85	SYSTEM	97.4						720		
10/85	SYSTEM	95.1						744		
11/85	SYSTEM	93.3						720		
12/85	SYSTEM	92.1						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF MAY THROUGH DECEMBER, 1985.

1/86	SYSTEM	98.2						744		
2/86	SYSTEM	93.8						672		

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/86	SYSTEM							744		
4/86	SYSTEM							720		
5/86	SYSTEM							744		
6/86	SYSTEM							720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM WERE OFF-LINE MARCH THROUGH JUNE FOR SCHEDULED MAINTENANCE WORK. FGD SYSTEM REPAIRS INCLUDED REPLACING THE LINES IN THE ABSORBER VESSELS, REPAIRING THE REHEATERS, AND CLEANING AND REPLACEMENT OF PORTIONS OF THE ABSORBER MIST ELIMINATOR. THE FRP MIST ELIMINATORS ARE GRADUALLY BEING REPLACED WITH 316 STAINLESS STEEL. ONE VESSEL OUT OF SIX HAS BEEN TOTALLY COMPLETED ON UNIT 2 TO DATE.

7/86	SYSTEM	95.3						744		
8/86	SYSTEM	95.9						744		
9/86	SYSTEM	99.0						720		
10/86	SYSTEM	97.0						744		
11/86	SYSTEM	96.6						720		
12/86	SYSTEM	98.5						744		

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE LAST HALF OF 1986.

1/87	SYSTEM	96.9						744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 2 (CONT.)

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

2/87	SYSTEM	97.4							672		
3/87	SYSTEM	97.4							744		
4/87	SYSTEM	97.1							720		
5/87	SYSTEM	83.7							744		
6/87	SYSTEM	74.9							720		
7/87	SYSTEM	91.6							744		
8/87	SYSTEM	98.9							744		
9/87	SYSTEM	93.5							720		
10/87	SYSTEM	97.0							744		
11/87	SYSTEM	98.8							720		
12/87	SYSTEM	95.4							744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. THE AVERAGE FGD SYSTEM AVAILABILITY FOR THE YEAR WAS 93.6 PERCENT.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA POWER	
PLANT NAME	COLSTRIP	
UNIT NUMBER	3	
CITY	COLSTRIP	
STATE	MONTANA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	21.	(0.050 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	77.	(0.180 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	778	
GROSS UNIT GENERATING CAPACITY - MW	778	
NET UNIT GENERATING CAPACITY W/FGD - MW	700	
NET UNIT GENERATING CAPACITY WO/FGD - MW	730	
EQUIVALENT SCRUBBED CAPACITY - MW	778	
** 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	211.	(692 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.3	(24.0 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	19771.	(8500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8140-8800
AVERAGE ASH CONTENT - %	8.50	
RANGE ASH CONTENT - %	7-11	
AVERAGE MOISTURE CONTENT - %	25.00	
RANGE MOISTURE CONTENT - %	*****	
AVERAGE SULFUR CONTENT - %	0.70	
RANGE SULFUR CONTENT - %	.4-1.0	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** 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/ALKALINE FLYASH	
SYSTEM SUPPLIER	BECHTEL/MONTANA POWER	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00	
ENERGY CONSUMPTION - %	3.9	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/1984	
INITIAL START-UP	10/1983	
CONTRACT AWARDED	0/1979	

MONTANA POWER: COLSTRIP 3 (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	8
NUMBER OF SPARES	1
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	VENTURI/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	VALVE TRAYS
L/G RATIO - L/CU.M	4.7 (35.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	95.7
PARTICLE REMOVAL EFFICIENCY - %	99.5
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	MESH
TRADE NAME/COMMON TYPE	KNITTED WIRE MESH PAD
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM
TRADE NAME/COMMON TYPE	NR
TEMPERATURE INCREASE - C	27.8 (50 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	CENTRIFUGAL
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; ORGANIC
** 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 3 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NA
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TREATMENT	CLAY LINING
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	DOLOMITIC PROMOTED LIME
PRINCIPAL CONSTITUENT	40% MGC03, 60% CAC03

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

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

10/83	SYSTEM									744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT INITIAL START-UP OF THE FGD SYSTEM AT COLSTRIP 3 OCCURRED DURING OCTOBER 1983. COMMERCIAL START-UP IS SCHEDULED FOR JANUARY 1, 1984.

11/83	SYSTEM									720
12/83	SYSTEM									744
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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 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 MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR JANUARY THROUGH JULY 1984.

8/84	SYSTEM	100.0	744
9/84	SYSTEM	100.0	720
10/84	SYSTEM	100.0	744
11/84	SYSTEM	100.0	720
12/84	SYSTEM	100.0	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE HIGH AVAILABILITIES ON UNIT 3 IS ATTRIBUTED TO HAVING ONE AND SOMETIMES TWO SPARE MODULES. NO MAJOR FGD-RELATED AND/OR UNIT OUTAGES WERE ENCOUNTERED DURING THE FIVE MONTH PERIOD.

1/85	SYSTEM	100.0	744
2/85	SYSTEM	100.0	672
3/85	SYSTEM	100.0	744
4/85	SYSTEM	100.0	720
5/85	SYSTEM		744
6/85	SYSTEM		720
7/85	SYSTEM	100.0	744
8/85	SYSTEM	100.0	744
9/85	SYSTEM	100.0	720
10/85	SYSTEM	100.0	744
11/85	SYSTEM	100.0	720
12/85	SYSTEM	100.0	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1985. FGD SYSTEM AVAILABILITY WAS 100% EVERY MONTH DUE TO FGD SPARE CAPACITY. THE ORIGINAL DESIGN CALLED FOR 8 MODULES WITH 1 SPARE. HOWEVER, ONLY 6 MODULES HAVE BEEN NEEDED FOR FULL LOAD. THE UNIT/FGD SYSTEM WAS OFF-LINE IN MAY AND PART OF JUNE FOR A SCHEDULED SIX WEEK PLANT MAINTENANCE OUTAGE.

1/86	SYSTEM	100.0	744
2/86	SYSTEM	100.0	672
3/86	SYSTEM	100.0	744
4/86	SYSTEM	100.0	720
5/86	SYSTEM	100.0	744
6/86	SYSTEM	100.0	720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 3 (CONT.)

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
7/86	SYSTEM	100.0					744
8/86	SYSTEM	100.0					744
9/86	SYSTEM	100.0					720
10/86	SYSTEM	100.0					744
11/86	SYSTEM	100.0					720
12/86	SYSTEM	100.0					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986. FGD SYSTEM AVAILABILITY WAS 100% EVERY MONTH DUE TO FGD SPARE CAPACITY.

1/87	SYSTEM	100.0					744
2/87	SYSTEM	100.0					672
3/87	SYSTEM	100.0					744
4/87	SYSTEM	100.0					720
5/87	SYSTEM	100.0					744
6/87	SYSTEM	100.0					720
7/87	SYSTEM	100.0					744
8/87	SYSTEM	100.0					744
9/87	SYSTEM	100.0					720
10/87	SYSTEM	100.0					744
11/87	SYSTEM	100.0					720
12/87	SYSTEM	100.0					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. THE UTILITY REPORTED THAT FGD SYSTEM AVAILABILITY FOR THE YEAR FOR FULL LOAD OPERATION WAS ESSENTIALLY 100 PERCENT DUE TO FGD SPARE CAPACITY.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA POWER
PLANT NAME	COLSTRIP
UNIT NUMBER	4
CITY	COLSTRIP
STATE	MONTANA
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	*****
GROSS UNIT GENERATING CAPACITY - MW	778
NET UNIT GENERATING CAPACITY W/FGD - MW	700
NET UNIT GENERATING CAPACITY WO/FGD - MW	730
EQUIVALENT SCRUBBED CAPACITY - MW	778

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	*****
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	***** (**** FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)

** FUEL DATA

FUEL TYPE	COAL
FUEL GRADE	*****
AVERAGE HEAT CONTENT - J/G	20469. (8800 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	8.50
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	0.70
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****

*** PARTICLE CONTROL

** 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/ALKALINE FLYASH
SYSTEM SUPPLIER	BECHTEL/MONTANA POWER
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.60
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.00
ENERGY CONSUMPTION - %	3.9
CURRENT STATUS	1
COMMERCIAL START-UP	4/1986
INITIAL START-UP	12/1985
CONTRACT AWARDED	0/1979

MONTANA POWER: COLSTRIP 4 (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	8
GENERIC TYPE	COMBINATION TOWER
SPECIFIC TYPE	VENTURI/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	VALVE TRAYS
L/G RATIO - L/CU.M	4.7 (35.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	95.7
PARTICLE REMOVAL EFFICIENCY - %	99.5
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	MESH
TRADE NAME/COMMON TYPE	KNITTED WIRE MESH PAD
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** REHEATER	
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM
TRADE NAME/COMMON TYPE	NR
TEMPERATURE INCREASE - C	27.8 (50 F)
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	CENTRIFUGAL
FUNCTION	UNIT
APPLICATION	INDUCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL; ORGANIC
** 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 4 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NA
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	OXIDATION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TREATMENT	CLAY LINING
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	DOLOMITIC PROMOTED LIME
PRINCIPAL CONSTITUENT	40% MGCO ₃ , 60% CaCO ₃

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

12/85	SYSTEM					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATIONS OF THE UNIT 4 FGD SYSTEM BEGAN IN DECEMBER, 1985. THE PLANT IS SCHEDULED TO GO COMMERCIAL IN APRIL OF NEXT YEAR. THE UNIT 4 FGD SYSTEM IS IDENTICAL TO THE SYSTEM USED ON UNIT 3.

1/86	SYSTEM	100.0				744
2/86	SYSTEM	100.0				672
3/86	SYSTEM	100.0				744
4/86	SYSTEM	100.0				720
5/86	SYSTEM	100.0				744
6/86	SYSTEM	100.0				720
7/86	SYSTEM	100.0				744
8/86	SYSTEM	100.0				744
9/86	SYSTEM	100.0				720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA POWER: COLSTRIP 4 (CONT.)

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

10/86	SYSTEM	100.0					744
11/86	SYSTEM	100.0					720
12/86	SYSTEM	100.0					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986. FGD SYSTEM AVAILABILITY WAS 100% EVERY MONTH DUE TO FGD SPARE CAPACITY.

1/87	SYSTEM	100.0					744
2/87	SYSTEM	100.0					672
3/87	SYSTEM	100.0					744
4/87	SYSTEM	100.0					720
5/87	SYSTEM	100.0					744
6/87	SYSTEM	100.0					720
7/87	SYSTEM	100.0					744
8/87	SYSTEM	100.0					744
9/87	SYSTEM	100.0					720
10/87	SYSTEM	100.0					744
11/87	SYSTEM	100.0					720
12/87	SYSTEM	100.0					744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1987. THE UTILITY REPORTED THAT FGD SYSTEM AVAILABILITY FOR THE YEAR FOR FULL LOAD OPERATIONS WAS ESSENTIALLY 100 PERCENT DUE TO FGD SPARE CAPACITY.

SECTION 13
 DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MONTANA-DAKOTA UTILITIES	
PLANT NAME	COYOTE	
UNIT NUMBER	1	
CITY	BEULAH	
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	400	
GROSS UNIT GENERATING CAPACITY - MW	427	
NET UNIT GENERATING CAPACITY W/FGD - MW	400	
NET UNIT GENERATING CAPACITY WO/FGD - MW	405	
EQUIVALENT SCRUBBED CAPACITY - MW	427	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	CYCLONE	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	891.89	(1890000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	*****	(**** FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	LIGNITE	
AVERAGE HEAT CONTENT - J/G	16398.	(7050 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****	
AVERAGE ASH CONTENT - %	6.50	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	35.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.87	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** FABRIC FILTER		
NUMBER	1	
TYPE	SHAKE/DEFLATE	
SUPPLIER	WHEELABRATOR-FRYE	
NUMBER OF COMPARTMENTS	38	
PRESSURE DROP - KPA	0.7	(3.0 IN-H2O)
TYPICAL GAS/CLOTH RATIO - M/MIN	0.9	(2.8 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	SODIUM CARBONATE/SPRAY DRYING	
SYSTEM SUPPLIER	WHEELABRATOR-FRYE/R.I.	
A-E FIRM	BECHTEL	
DEVELOPMENT LEVEL	FULL SCALE	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA-DAKOTA UTILITIES: COYOTE 1 (CONT.)

NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	70.00	
ENERGY CONSUMPTION - %	1.2	
CURRENT STATUS	1	
COMMERCIAL START-UP	5/1981	
INITIAL START-UP	4/1981	
CONTRACT AWARDED	12/1977	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	3437.3	(37000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	72.0	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NR	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR	
** ABSORBER		
NUMBER	4	
NUMBER OF SPARES	0	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	COCURRENT	
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER	
SUPPLIER	ATOMICS INTERNATIONAL	
DIMENSIONS - FT	46 FT DIAMETER	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	NA	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA	
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	3	
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICIENCY - %	75.0	
PARTICLE REMOVAL EFFICIENCY - %	99.0	
** 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	
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	

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

7/81 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA-DAKOTA UTILITIES: COYOTE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
8/81	SYSTEM					744			
9/81	SYSTEM					720			
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE THIRD QUARTER 1981, THIS SPRAY DRYER FGD SYSTEM OPERATED ON A LIMITED BASIS ONLY, PRIMARILY AS A RESULT OF EXCESSIVE ASH BUILDUP IN THE SPRAY DRYER COMPARTMENT. OTHER PROBLEMS REPORTED DURING THE QUARTER INCLUDED FAILURE OF THE GEAR REDUCER ON THE ROTARY ATOMIZER AND POOR GAS DISTRIBUTION AND RETENTION IN THE SPRAY DRYER COMPARTMENT. AS OF YET, THE UTILITY HAS BEEN UNABLE TO OPERATE THE SYSTEM AT A LEVEL SUFFICIENT TO ACHIEVE THE DESIGN SO2 REMOVAL EFFICIENCY.									
10/81	SYSTEM					744			
11/81	SYSTEM					720			
12/81	SYSTEM					744			
** PROBLEMS/SOLUTIONS/COMMENTS									
MODIFICATIONS AND TESTING CONTINUED BY WHEELABRATOR-FRYE TO REMEDY INABILITY OF SYSTEM TO ACHIEVE THE DESIGN SO2 REMOVAL EFFICIENCY.									
1/82	SYSTEM					744			
2/82	SYSTEM					672			
3/82	SYSTEM					744			
** PROBLEMS/SOLUTIONS/COMMENTS									
MODIFICATION AND TESTING OF THE FGD SYSTEM NEARED COMPLETION WITH THE SUPPLIER REPORTING TO HAVE SOLVED MOST PROBLEMS.									
4/82	SYSTEM					720	0		
5/82	SYSTEM					744			
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT THE UNIT WAS DOWN ALL OF APRIL AND MOST OF MAY FOR A SCHEDULED BOILER/TURBINE WARRANTY INSPECTION. NO FGD-RELATED OUTAGES WERE ENCOUNTERED.									
6/82	SYSTEM					720			
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE MONTH OF JUNE, A NUMBER OF OUTAGES WERE ENCOUNTERED DUE TO THE UNIT. ONE SUCH OUTAGE WAS FOR THREE DAYS TO REPLACE SEALS IN THE AIR PREHEATER. NO FGD RELATED OUTAGES WERE ENCOUNTERED. THE FGD SYSTEM PERFORMANCE TEST IS SCHEDULED FOR THE END OF JULY.									
7/82	SYSTEM					744			
** PROBLEMS/SOLUTIONS/COMMENTS									
A PERFORMANCE TEST WAS CONDUCTED ON THE FGD SYSTEM DURING THE MONTH OF JULY. THE UTILITY REPORTED THAT THE SYSTEM MET ALL CONTRACTUAL SUPPLIER SPECIFICATIONS.									
8/82	SYSTEM					744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA-DAKOTA UTILITIES: COYOTE 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
9/82	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE REMAINDER OF THE THIRD QUARTER 1982.									
10/82	SYSTEM						744		
11/82	SYSTEM						720		
12/82	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER 1982.									
1/83	SYSTEM						744		
2/83	SYSTEM						672		
3/83	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1983. THE FGD SYSTEM IS REPORTED TO HAVE AN AVAILABILITY OF BETTER THAN 90%.									
4/83	SYSTEM						720		
5/83	SYSTEM						744		
6/83	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UNIT WAS SHUT DOWN ALL OF APRIL DUE TO A SCHEDULED BOILER/TURBINE OVERHAUL. DURING THE OUTAGE, A LEAKY METAL EXPANSION JOINT LOCATED BETWEEN THE BOILER OUTLET DUCT AND THE ABSORBER INLET WAS REPAIRED.									
THE CONTRACT WITH WHEELABRATOR-FRYE WAS OFFICIALLY CLOSED OUT DURING THE MONTH OF MAY.									
THE UTILITY REPORTED THAT COYOTE 1 IS RUNNING AT FULL CAPACITY AND IS ITS CHEAPEST UNIT TO OPERATE.									
7/83	SYSTEM						744		
8/83	SYSTEM						744		
9/83	SYSTEM				0.0		720	0	0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER. FGD SYSTEM AVAILABILITY FOR THE PERIOD WAS APPROXIMATELY 95%.									
THE UNIT WAS DOWN ALL OF SEPTEMBER FOR SCHEDULED FALL MAINTENANCE. THE UNIT WAS ALSO DOWN 2 ADDITIONAL DAYS EARLIER IN THE PERIOD DUE TO BOILER TUBE REPAIRS.									

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA-DAKOTA UTILITIES: COYOTE 1 (CONT.)

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

10/83	SYSTEM								744	
11/83	SYSTEM								720	
12/83	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE PERIOD. THE FGD SYSTEM WAS AVAILABLE 100 PERCENT DURING THE ENTIRE PERIOD.

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 NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST, SECOND AND THIRD QUARTERS OF 1984. FGD SYSTEM AVAILABILITY WAS REPORTED AS 100% DURING THIS PERIOD.

10/84	SYSTEM								744	
11/84	SYSTEM								720	
12/84	SYSTEM								744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN IN NOVEMBER FOR 2-3 WEEKS DUE TO SCHEDULED MAINTENANCE OUTAGE. NO OTHER FGD-RELATED AND/OR UNIT OUTAGES WERE REPORTED FOR THE FOURTH QUARTER 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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA-DAKOTA UTILITIES: COYOTE 1 (CONT.)

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

INFORMATION WAS UNAVAILABLE FOR THE MONTHS OF JANUARY THROUGH DECEMBER 1985.

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

NO INFORMATION WAS REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH DECEMBER 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			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MONTANA-DAKOTA UTILITIES: COYOTE 1 (CONT.)

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

12/87 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE BOILER HAD 2 MAJOR SCHEDULED OUTAGES FOR TURBINE REPAIRS IN 1987. THE OUTAGES WERE HELD IN THE SPRING AND FALL AND LASTED APPROXIMATELY 4 WEEKS. NO MAJOR DESIGN UPGRADES TO THE FGD SYSTEM WERE MADE DURING THESE PERIODS.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	MUSCATINE POWER & WATER
PLANT NAME	MUSCATINE
UNIT NUMBER	9
CITY	MUSCATINE
STATE	IOWA
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	13. (0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	516. (1.200 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	160
GROSS UNIT GENERATING CAPACITY - MW	172
NET UNIT GENERATING CAPACITY W/FGD - MW	158
NET UNIT GENERATING CAPACITY WO/FGD - MW	166
EQUIVALENT SCRUBBED CAPACITY - MW	172
** 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	131.85 (279400 ACFM)
BOILER FLUE GAS TEMPERATURE - C	148.9 (300 F)
STACK HEIGHT - M	91. (300 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	3.5 (11.5 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	26098. (11220 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	11000-11500
AVERAGE ASH CONTENT - %	6.70
RANGE ASH CONTENT - %	5.0-7.0
AVERAGE MOISTURE CONTENT - %	16.50
RANGE MOISTURE CONTENT - %	14.0-17.0
AVERAGE SULFUR CONTENT - %	3.21
RANGE SULFUR CONTENT - %	2.5-3.5
AVERAGE CHLORIDE CONTENT - %	0.03
RANGE CHLORIDE CONTENT - %	0.02-0.13
*** PARTICLE CONTROL	
** ESP	
NUMBER	1
TYPE	COLD SIDE
SUPPLIER	RESEARCH-COTTRELL
INLET FLUE GAS CAPACITY - CU.M/S	268.9 (569800 ACFM)
INLET FLUE GAS TEMPERATURE - C	158.9 (318 F)
PRESSURE DROP - KPA	0.1 (0. 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	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	RESEARCH-COTTRELL

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

A-E FIRM	STANLEY CONSULTANTS
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.70
UNIT DESIGN SO ₂ REMOVAL EFFICIENCY - %	94.00
ENERGY CONSUMPTION - %	4.7
CURRENT STATUS	1
COMMERCIAL START-UP	8/1983
INITIAL START-UP	4/1983
CONTRACT AWARDED	1/1980
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
SPACE REQUIREMENTS - SQ M	6688.8 (72000 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	48.0
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** 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	34.0 DIA X 92.0
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
SHELL MATERIAL TRADE NAME/Common Type	TYPE 317L
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
INLET GAS FLOW - CU. M/S	254.97 (540300 ACFM)
INLET GAS TEMPERATURE - C	162.8 (325 F)
SO ₂ REMOVAL EFFICIENCY - %	94.0
** 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	HORIZONTAL
NUMBER OF STAGES	2
PRESSURE DROP - KPA	0.0 (0.2 IN-H ₂ O)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPROPYLENE
WASH WATER SOURCE	FRESH
WASH FREQUENCY	INTERMITTENT OVERSPRAY; CONTINUOUS UNDERSPRAY
** REHEATER	
GENERIC TYPE	IN-LINE
SPECIFIC TYPE	STEAM
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	5.43 (11500 ACFM)
INLET FLUE GAS TEMPERATURE - C	185.6 (366 F)
CONSTRUCTION MATERIAL GENERIC TYPE	HIGH ALLOY
CONSTRUCTION MATERIAL SPECIFIC TYPE	NICKEL BASE/CHROMIUM-IRON-COPPER-MOLYBDENUM
** FANS	
NUMBER	2
NUMBER OF SPARES	0
DESIGN	NR
SUPPLIER	AMERICAN STANDARD
FUNCTION	BOOSTER

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

APPLICATION	FORCED DRAFT
SERVICE	WET
FLUE GAS FLOW RATE - CU.M/S	281.96 (597500 ACFM)
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
** 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
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6 (15 TPH)
** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	VACUUM FILTER
NUMBER	2
NUMBER OF SPARES	1
FEED STREAM CHARACTERISTICS	50% SOLIDS
OUTLET STREAM CHARACTERISTICS	90% SOLIDS
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	50% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
FULL LOAD QUANTITY - M T/H	9.80 (10.80 TPH)
DISPOSITION	N/A
NATURE OF END PRODUCT	WALLBOARD
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	NR
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
SITE TREATMENT	NONE
** WATER BALANCE	
WATER LOOP TYPE	CLOSED

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/83	SYSTEM						720			
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM COMMENCED OPERATIONS IN APRIL AND IS CURRENTLY IN THE START UP PHASE OF OPERATION.										
5/83	SYSTEM						744			
6/83	901	97.8	80.1	95.5	47.5					
	902	0.0	0.0		0.0					
	SYSTEM	97.8	80.1	95.5	47.5		720	427	342	38.6
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY HAS OPERATED ONLY ONE OF THE TWO 100 % CAPACITY ABSORBER TOWERS. THE TOWER OPERATED FOR APPROXIMATELY 14 DAYS IN JUNE. SEVERAL OUTAGES OCCURRED DUE TO ELECTRICAL PROBLEMS. PERFORMANCE TESTING IS SCHEDULED TO TAKE PLACE SOMETIME IN AUGUST.										
7/83	T-901	37.4	48.9	100.0	31.0					
	T-902	0.0	0.0		0.0					
	SYSTEM	37.4	48.9	100.0	31.0		744	472	231	
8/83	T-901	37.4	48.9	100.0	31.0					
	T-902	0.0	0.0		0.0					
	SYSTEM	100.0	48.9	100.0	31.0		744	472	231	
9/83	T-901	37.4	48.9	100.0	31.0					
	T-902	0.0	0.0		0.0					
	SYSTEM	37.4	48.9	100.0	31.0		720	457	224	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1983.										
10/83	T-901	57.0	69.4	76.5	48.0					
	T-902	58.3	6.3	7.5	4.4					
	SYSTEM	100.0	75.7	84.0	52.4		744	515	390	
11/83	T-901	57.0	69.4	76.5	48.0					
	T-902	58.3	6.3	7.5	4.4					
	SYSTEM	100.0	75.7	84.0	52.4		48	498	377	
12/83	T-901	57.0	69.4	76.5	48.0					
	T-902	58.3	6.3	7.5	4.4					
	SYSTEM	100.0	75.7	84.0	52.4		744	515	390	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED WETTED FILM CONTACTOR PLUGGING IN MODULE T-901 DURING THE FOURTH QUARTER 1983.										
1/84	T-901	10.9	8.7	79.9	8.0					
	T-902	61.2	40.0	100.0	36.6					
	SYSTEM	72.1	48.8	100.0	44.6		744	681	332	
** PROBLEMS/SOLUTIONS/COMMENTS										
MODULE T-902 WAS OUT OF SERVICE 288.5 HOURS DURING THE MONTH FOR A SCHEDULED MAINTENANCE OUTAGE.										

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

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

THE UTILITY REPORTED THAT 663 HOURS OF FORCED OUTAGE TIME DURING JANUARY WAS DUE TO THE CHANGING OF ABSORBER PACKING AT MODULE T-901.

2/84	T-901	76.6		90.6	69.4		
	T-902	27.6		12.5	3.4		
	SYSTEM	100.0		100.0	72.8	696	507
3/84	T-901	0.0			0.0		
	T-902	0.0					
	SYSTEM	0.0			0.0	744	0
4/84	T-901	0.0			0.0		
	T-902	24.9		100.0	23.2		
	SYSTEM	24.9		100.0	23.2	720	167

** PROBLEMS/SOLUTIONS/COMMENTS

TURBINE PROBLEMS WERE ENCOUNTERED DURING THE MONTH AND FGD SYSTEM MAINTENANCE WAS CONDUCTED DURING THIS TIME.

5/84	T-901	100.0		100.0	62.1		
	T-902	37.0		100.0	28.2		
	SYSTEM	100.0		100.0	90.3	744	672
6/84	T-901	100.0		92.8	92.8		
	T-902	6.7			0.0		
	SYSTEM	100.0		92.8	92.8	720	668
7/84	T-901	67.7		100.0	54.3		
	T-902	0.0			0.0		
	SYSTEM	67.7		100.0	54.3	744	404
8/84	T-901	54.3		100.0	54.3		
	T-902	36.0		100.0	18.5		
	SYSTEM	90.3		100.0	72.8	744	542

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD RELATED PROBLEMS WERE ENCOUNTERED DURING THE PERIOD OF FEBRUARY THROUGH AUGUST 1984.

9/84	SYSTEM					720	

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR SEPTEMBER 1984.

10/84	SYSTEM					744	
11/84	SYSTEM					720	
12/84	SYSTEM					744	

** PROBLEMS/SOLUTIONS/COMMENTS

UTILITY REPORTED THAT THE UNIT WAS DOWN FROM OCTOBER 26 THRU NOVEMBER 29 FOR SCHEDULED MAINTENANCE OF TURBINE AND UNIT. DURING THIS OUTAGE, THE FG SYSTEM TOWERS WERE CLEANED AND THE PACKING REPLACED. GENERAL MAINTENANCE TO THE RECYCLE PUMPS WAS ALSO PERFORMED. THE UNIT WAS GRADUALLY BROUGHT BACK UP TO FULL CAPACITY BY THE END OF DECEMBER.

1/85	T-901	80.4	64.4	100.0	49.2		

MUSCATINE POWER & WATER: MUSCATINE 9 (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
	T-902	23.7	30.9	100.0	23.6					
	SYSTEM	100.0	95.3	100.0	72.8		744	568	542	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FROM JANUARY 12 THROUGH 19 FOR BOILER TURBINE REPAIR/MAINTENANCE. DURING THE TURBINE OUTAGE EXTENSIVE CLEANING OF MODULE 902 WAS PERFORMED. THE PACKING MATERIAL WAS FOUND TO BE APPROXIMATELY 50% PLUGGED. MODULE 902 WAS OFF LINE FROM JANUARY 8 THROUGH THE END OF THE MONTH.

2/85	T-901	2.3	2.3	100.0	2.3					
	T-902	96.1	93.6	97.5	93.3					
	SYSTEM	98.4	95.9	100.0	95.6		672	670	643	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 902 WAS FORCED OUT OF SERVICE 16 HOURS WHEN A BOWL ISOLATION PLUG FROM MODULE 901 FELL INTO A COMMON RECYCLE TANK. THE TANK HAD TO BE DRAINED SO THAT THE PLUG COULD BE RETRIEVED.

APPROXIMATELY 600 MANHOURS WERE REQUIRED TO CLEAN THE PACKING MATERIAL IN MODULE 901.

3/85	T-901	54.6	48.4	100.0	44.2					
	T-902	46.1	50.5	98.8	46.1					
	SYSTEM	100.0	98.9	100.0	90.3		744	679	671	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 902 WAS FORCED OFF LINE FOR FOUR HOURS AS A RESULT OF A MINOR EQUIPMENT MALFUNCTION NOT SPECIFIED BY THE UTILITY. A SCHEDULED OUTAGE BEGAN ON MARCH 15 TO PERFORM PACKING CLEANING. MODULE 901 WAS BROUGHT ON LINE ON MARCH 15 BUT BOTH MODULES WERE SHUT DOWN ON MARCH 29 FOR A SCHEDULED SPRING OUTAGE. THE PACKING MATERIAL IN BOTH ABSORBERS WAS REPLACED DURING THE OUTAGE.

4/85	T-901	0.0	0.0		0.0					
	T-902	14.4	69.1	100.0	4.5					
	SYSTEM	14.4	69.1	100.0	4.5		720	47	33	

** PROBLEMS/SOLUTIONS/COMMENTS

MAJOR DAMAGE WAS DISCOVERED ON THE ABSORBER SECTION PUMP IMPELLERS. ALL IMPELLERS REQUIRED FOR MODULE 902 WERE REPAIRED OR REPLACED. ONE IMPELLER WAS STILL OUT ON MODULE 901 AS THE MONTH CAME TO A CLOSE.

THE FGD SYSTEM WAS OUT OF SERVICE MOST OF THE MONTH AS A RESULT OF A SCHEDULED UNIT OUTAGE. DURING THE OUTAGE THE SCRUBBER PACKING MATERIAL WAS FOUND TO BE SEVERELY PLUGGED AND WAS REPLACED.

5/85	T-901	0.0	0.0		0.0					
	T-902	99.9	96.2	99.8	88.0					
	SYSTEM	99.9	96.2	99.8	88.0		744	681	655	

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 901 WAS OUT OF SERVICE THE ENTIRE MONTH AS A RESULT OF THE LOSS OF A RECYCLE PUMP IMPELLER.

6/85	T-901	61.0	38.2	99.6	38.2					
	T-902	61.5	61.6	100.0	61.5					
	SYSTEM	100.0	99.9	100.0	99.7		720	719	718	100.0

-----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 MODULE 902 PACKING MATERIAL WAS 60% PLUGGED AFTER 1,131 HOURS OF OPERATION. NEW EXPERIMENTAL PVC PACKING WILL BE INSTALLED IN MODULE 902. THE NEW PACKING IS TWICE AS THICK AS THE EXISTING MATERIAL AND HAS A GUARANTEED 2,000 LB WASHABILITY. THE NEW PACKING MATERIAL IS A GLUED PVC RATHER THAN "WELDED" POLYPROPYLENE.

7/85	T-901	78.7	78.6	100.0	78.6			
	T-902	40.3	21.4	100.0	21.4			
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 901 WAS FORCED OUT OF SERVICE ON JULY 9TH FOR LESS THAN AN HOUR AS A RESULT OF A BOILER PROBLEM.

MODULE 901 WAS TAKEN OFF LINE ON JULY 25TH FOR PACKING CLEANING. MODULE 902 HAD BEEN CLEANED EARLIER AND WAS BROUGHT ON LINE ON JULY 19TH.

8/85	T-901	27.4	0.0		0.0			
	T-902	100.0	99.9	100.0	99.6			
	SYSTEM	100.0	99.9	100.0	99.6	744	741	741

** PROBLEMS/SOLUTIONS/COMMENTS

A 3.25 HOUR FGD SYSTEM OUTAGE IN AUGUST RESULTED FROM A BOILER-RELATED PROBLEM.

THE MODULE 901 PACKING CLEANING WORK WAS COMPLETED AND THE MODULE WAS AVAILABLE FOR OPERATION ON AUGUST 23RD.

9/85	T-901	91.1	80.1	100.0	80.1			
	T-902	33.3	19.9	100.0	19.9			
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720

** PROBLEMS/SOLUTIONS/COMMENTS

ACCEPTANCE TESTING BY THE SYSTEM SUPPLIER BEGAN ON MODULE 901 DURING THE MONTH.

MODULE 902 WAS TAKEN OUT OF SERVICE ON SEPTEMBER 3RD WITH PACKING PLUGGING PROBLEMS. THE SULFATE BUILDUP ON THE ABSORBER INTERIORS AS WELL AS THE PACKING WAS WATER BLASTED. THE MODULE WAS PLACED BACK IN SERVICE FOR ACCEPTANCE TESTING ON SEPTEMBER 27TH.

10/85	T-901	0.0	0.0		0.0			
	T-902	35.4	99.8	100.0	35.4			
	SYSTEM	35.4	99.8	100.0	35.4	744	264	263

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED FALL OUTAGE BEGAN ON OCTOBER 11TH. MODULE 902 WAS OFF LINE FOR SCALE CLEANING. BOTH MODULES WERE WATER BLASTED. THE SULFATE HAD ACCUMULATED TO AS MUCH AS 6 INCH THICKNESSES ON ABSORBER TOWER WALLS. THE NEW PCV ABSORBER PACKING WITHSTANDS THE 2000 LB PRESSURE SPRAYS.

11/85	T-901	70.0	97.1	100.0	58.6			
	T-902	0.0	0.0		0.0			
	SYSTEM	70.0	97.1	100.0	58.6	720	435	422

MUSCATINE POWER & WATER: MUSCATINE 9 (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 WAS PLACED BACK IN SERVICE AFTER THE FALL OUTAGE ON NOVEMBER 11TH. THE REAGENT WAS CHANGED FROM A 93% CARBONATE LOW REACTIVE MATERIAL TO A 98% CARBONATE LIMESTONE WITH HIGH REACTIVITY. THE CHEMISTRY BALANCE WAS DIFFERENT THAN EXPECTED BY THE UTILITY. WITH 5% OR LESS UNREACTED CARBONATE IN THE ABSORBER SECTION THE SYSTEM ACHIEVED 94% SO2 REMOVAL EFFICIENCY. THE UTILITY HAD BEEN OPERATING AT A 12% LEVEL OF UNREACTED REAGENT.

12/85	T-901	100.0	99.4	100.0	99.2			
	T-902	100.0	0.0		0.0			
	SYSTEM	100.0	99.4	100.0	99.2	744	743	738

** PROBLEMS/SOLUTIONS/COMMENTS

THE LONGEST CONTINUOUS OPERATION PERIOD FOR A GIVEN ABSORBER HAD BEEN 1000 HOURS. MODULE 901 HAD LOGGED 1140 HOURS BY THE END OF DECEMBER AND WAS BEGINNING TO SHOW SIGNS OF PLUGGING. A SWITCH TO ABSORBER 902 WILL TAKE PLACE SOON. THE SYSTEM SUPPLIER WAS CONTINUING TO INVESTIGATE THE CHEMISTRY BALANCE CHANGE FROM THE EARLIER REAGENT USE.

1/86	T-901	42.9	42.9	99.5	42.9			
	T-902	100.0	56.9	100.0	56.9			
	SYSTEM	100.0	99.8	100.0	99.8	744	744	743

** PROBLEMS/SOLUTIONS/COMMENTS

AFTER 9 WEEKS OF OPERATIONS TOWER-901 WAS TAKEN OUT OF SERVICE FOR PACKING PLUGGING PROBLEMS AT WHICH TIME TOWER-902 WAS PLACED IN SERVICE.

TOWER 901 WAS TAKEN OFF LINE 1.6 HOURS ON 1/9/86 TO REPAIR A REHEATER STEAM VALVE GASKET.

CHEMISTRY PROBLEMS IN THE WASTE PRODUCT WERE NOTED BY THE UTILITY IN JANUARY.

2/86	T-901	38.1	38.1	100.0	38.1			
	T-902	61.9	61.9	100.0	61.9			
	SYSTEM	100.0	100.0	100.0	100.0	672	672	672

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER-902 WAS TAKEN OFF LINE ON 2/8/86 BECAUSE OF ABSORBER PACKING PLUGGING (5 WEEKS OF OPERATION). TOWER-901 WAS BROUGHT ON LINE.

THE WASTE PRODUCT CHEMISTRY WAS WITHIN THE ACCEPTABLE LEVELS DURING THE PERIOD.

3/86	T-901	3.1	61.7	100.0	3.1			
	T-902	9.7	20.3	100.0	1.0			
	SYSTEM	12.8	82.0	100.0	4.1	744	37	30

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 901 WAS REMOVED FROM SERVICE AT 10-45 PM ON 3/1/86 FOR A SCHEDULED SPRING OUTAGE. TOWER 902 WAS ALREADY OFF-LINE.

TOWER 902 WAS BROUGHT ON LINE AT 4:30 PM ON 3/1/86 BRIEFLY. SEVERAL ATTEMPTS TO START THE GENERATOR UNIT RESULTED IN MANY SYSTEM TRIPS. THE SCRUBBING SYSTEM WAS NOT PLACED IN SERVICE UNTIL THE UNIT WAS STABILIZED.

4/86	T-901	0.0	0.0		0.0			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	T-902	99.9	100.0	100.0	99.9				
	SYSTEM	99.9	100.0	100.0	99.9			720 719	719

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF APRIL.
TOWER 901 OPERATION WAS NOT REQUIRED DURING THE MONTH.

5/86	T-901	60.3	11.7	100.0	11.7				
	T-902	87.9	88.1	100.0	87.9				
	SYSTEM	100.0	99.9	100.0	99.7			744 743	741

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 902 WAS REMOVED FROM SERVICE AFTER 58 DAYS OF OPERATION DURING WHICH RESEARCH-COTTRELL PACKING WAS USED. THE R-C MATERIAL PERFORMED BETTER THAN MUNTERS PACKING WHICH HAD BEEN FAILING AFTER 5-7 WEEKS. THE R-C PACKING IS MORE CLEANABLE. IT IS EASIER TO HANDLE AND CAN WITHSTAND 5,000 LB PRESSURE WASHING.

6/86	T-901	89.1	89.1	100.0	89.1				
	T-902	11.4	11.0	100.0	11.0				
	SYSTEM	100.0	100.0	100.0	100.0			720 720	720

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 902 WAS PLACED IN SERVICE ON 6/27/86 WITH 2 FEET OF RESEARCH COTTRELL PACKING (USUALLY 3 FEET IS USED). SO2 REMOVAL EFFICIENCY DROPPED BY ABOUT 0.5%.

7/86	T-901	33.4	35.1	100.0	31.9				
	T-902	64.9	61.8	97.0	56.2				
	SYSTEM	98.3	96.9	100.0	88.2			744 677	656

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 902 WAS FORCED OUT OF SERVICE ON 7/21/86 FOR A BOOSTER FAN BEARING FAILURE. TOWER 901 WAS PLACED IN SERVICE.

8/86	T-901	99.9	99.9	99.9	99.9				
	T-902	0.0	0.0		0.0				
	SYSTEM	99.9	99.9	99.9	99.9			744 744	743

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/86	T-901	25.0	25.0	100.0	25.0				
	T-902	100.0	74.7	100.0	74.7				
	SYSTEM	100.0	99.7	100.0	99.7			720 720	718

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS TAKEN OUT OF SERVICE WHEN THE ESP TRIPPED OFF IN RESPONSE TO EXCESS COMBUSTIBLES. THIS OCCURRED ON 3 OCCASIONS DUE TO BOILER UPSETS.

10/86	A								
	B	76.9	99.6	100.0	76.7				
	SYSTEM	76.9	99.6	100.0	76.7			744 573	571

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT OUTAGE BEGAN IN OCTOBER. NO FGD-SYSTEM PROBLEMS WERE NOTED.

11/86	T-901	74.4	86.1	86.1	16.5			
	T-902	3.2						
	SYSTEM	77.6	86.1	86.1	16.5	720	138	119

** PROBLEMS/SOLUTIONS/COMMENTS

ON START-UP OF TOWER 902 THE BOOSTER FAN OIL COOLING SYSTEM FAILED AND CAUSED BEARING DAMAGE. TOWER 901 WAS QUICKLY MADE AVAILABLE AND PUT ON LINE AS SOON AS WAS POSSIBLE. ROUGHLY 20 HOURS OF FORCED UNIT OUTAGE TIME WERE ATTRIBUTED TO THE FGD SYSTEM.

THE SCHEDULED FALL OUTAGE THAT BEGAN IN OCTOBER CONTINUED THROUGH MOST OF NOVEMBER.

12/86	T-901	100.0	99.9	100.0	89.4			
	T-902	43.1						
	SYSTEM	100.0	99.9	100.0	89.4	744	666	665

** PROBLEMS/SOLUTIONS/COMMENTS

A UNIT OUTAGE ON THE BOILER OCCURRED DURING THE MONTH AS A RESULT OF EXCESSIVE VIBRATION IN THE ECONOMIZER SECTION. THE UNIT WAS CHECKED BY A BOILER REPRESENTATIVE AND OK'D FOR OPERATION.

1/87	T-901	54.0	19.4	100.0	19.4			
	T-902	85.0	80.7	100.0	80.7			
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

2/87	T-901	100.0	100.0	100.0	100.0			
	T-902	37.1	0.0		0.0			
	SYSTEM	100.0	100.0	100.0	100.0	672	672	672

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JANUARY OR FEBRUARY.

3/87	T-901	17.7	99.7	100.0	17.7			
	T-902	100.0	0.0		0.0			
	SYSTEM	100.0	99.7	100.0	17.7	744	132	132

4/87	T-901	67.9	0.0		0.0			
	T-902	99.9	99.1	100.0	81.0			
	SYSTEM	100.0	99.1	100.0	81.0	720	588	583

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 9 WAS OUT OF SERVICE FOR A SCHEDULED OUTAGE DURING MARCH. THE UNIT REMAINED OFF-LINE UNTIL APRIL 6, 1987.

5/87	T-901	100.0	0.0		0.0			
	T-902	100.0	99.4	100.0	97.4			
	SYSTEM	100.0	99.4	100.0	97.4	744	728	724

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

TWO FORCED BOILER OUTAGES OCCURRED DURING MAY.

6/87	T-901	100.0	0.0		0.0			
	T-902	100.0	99.5	100.0	89.2			
	SYSTEM	100.0	99.5	100.0	89.2	720	645	642

** PROBLEMS/SOLUTIONS/COMMENTS

ONE FORCED BOILER OUTAGE OCCURRED DURING JUNE FOR 3 DAYS. TOWER 902 PACKING WAS WASHED DURING THIS PERIOD.

7/87	T-901	100.0	34.4	100.0	34.4			
	T-902	65.7	65.7	100.0	65.7			
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 902 WAS OUT OF SERVICE FROM JULY 21 THROUGH THE END OF THE MONTH FOR CLEANING AFTER APPROXIMATELY 15 WEEKS OF OPERATION. EXCESS SCALE WAS EXPERIENCED DUE TO THE 5 WEEK LONGER OPERATION TIME ON TOWER 902.

8/87	T-901	73.3	73.3	100.0	73.3			
	T-902	29.0	26.7	100.0	26.7			
	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

9/87	T-901	67.8	0.0		0.0			
	T-902	100.0	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	100.0	720	720	720

** PROBLEMS/SOLUTIONS/COMMENTS

TOWER 901 WAS TAKEN OFF-LINE AND TOWER 902 PUT ON-LINE DUE TO POOR SO2 REMOVAL. THE PROBLEM WAS FOUND TO BE A MALFUNCTION OF THE SO2 MONITOR. AN OXIDATION SPARGING LINE HAD COME LOOSE FROM THE MAIN HEADER. THIS PROBLEM CONTINUED INTO SEPTEMBER.

10/87	T-901	100.0	0.0		0.0			
	T-902	100.0	100.0	100.0	100.0			
	SYSTEM	100.0	100.0	100.0	100.0	744	745	744

** PROBLEMS/SOLUTIONS/COMMENTS

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

11/87	T-901	98.5	81.8	100.0	80.0			
	T-902	17.7	18.1	100.0	17.7			
	SYSTEM	100.0	99.9	100.0	97.7	720	704	703

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 9 WAS TAKEN OFF-LINE ON NOVEMBER 30, 1987 FOR A SCHEDULED OUTAGE.

12/87	T-901	100.0	0.0		0.0			
	T-902	61.3	98.4	100.0	48.2			
	SYSTEM	100.0	98.4	100.0	48.2	744	364	359

MUSCATINE POWER & WATER: MUSCATINE 9 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 9 START-UP AFTER SCHEDULED OUTAGE WAS DELAYED DUE TO SEVERAL BOILER
UNIT TRIPS CAUSED BY FLAME FAILURES.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	1	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	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	111	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	110	
NET UNIT GENERATING CAPACITY WO/FGD - MW	117	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	223.21	(473000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.8	(12.6 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28959.	(12450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		11500-12500
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	8.0-10.0	
AVERAGE MOISTURE CONTENT - %	5.50	
RANGE MOISTURE CONTENT - %	5.5-6.0	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	*****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONE	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICIENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	4/1974	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	1.5 DIA X 18.0	
SHELL GENERIC MATERIAL	CARBON STEEL; HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AISI 1110; NICKEL BASE/CHROMIUM-IRON-COPPER-MOLY	
LINER GENERIC MATERIAL	NONE; ORGANIC	
LINER SPECIFIC MATERIAL	N/A; NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	157.5	(2500 GPM)
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	4.6	(18.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	50.3	(165.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	223.2	(473000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
PARTICLE REMOVAL EFFICIENCY - %	97.0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	5.6
CURRENT STATUS	1
COMMERCIAL START-UP	4/1974
INITIAL START-UP	3/1974
CONTRACT AWARDED	7/1971

** DESIGN AND OPERATING PARAMETERS
DESIGN CHLORIDE CONTENT - %

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	THYSSEN/CEA
DIMENSIONS - FT	30.0 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	NATURAL RUBBER
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	38. (600 GPM)
L/G RATIO - L/CU.M	0.2 (1.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7 (3.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.4 (11.0 FT/S)

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
GENERIC TYPE	CENTRIFUGAL
SPECIFIC TYPE	RADIAL VANE
TRADE NAME/COMMON TYPE	NR
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
PRESSURE DROP - KPA	0.1 (0.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
TEMPERATURE INCREASE - C	27.8 (50 F)
INLET FLUE GAS TEMPERATURE - C	48.3 (119 F)
NUMBER OF TUBES PER BUNDLE	24
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110

NEVADA POWER: REID GARDNER 1 (CONT.)

** FANS	
NUMBER	1
DESIGN	CENTRIFUGAL
SUPPLIER	BUFFALO FORGE
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	223.21 (473000 ACFM)
FLUE GAS TEMPERATURE - C	176.7 (350 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	INERT FLAKE-FILLED VINYL ESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** TANKS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

** DISPOSAL			
NATURE	INTERIM		
TYPE	POND		
LOCATION	ON-SITE		
SITE TREATMENT	CLAY LINING		
** DISPOSAL			
NATURE	FINAL		
TYPE	POND		
LOCATION	ON-SITE		
SITE TRANSPORTATION METHOD	GRAVITY FLOW FROM INTERIM SLUDGE POND		
SITE TREATMENT	CLAY LINING		
** WATER BALANCE			
WATER LOOP TYPE	CLOSED		
MAKEUP WATER ADDITION - LITERS/S	9.8	(155 GPM)	
** FGD SPARE CAPACITY INDICES			
ABSORBER - %	0.0		
** FGD SPARE COMPONENT INDICES			
ABSORBER	0.0		

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

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

4/74	SYSTEM						720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS FIRST PLACED IN SERVICE IN APRIL 1974. THE SCRUBBING UNIT DESIGN WAS BASED ON INFORMATION AND DATA OBTAINED FROM AN 8000-ACFM PILOT PLANT PROGRAM CONDUCTED AT REID GARDNER STATION IN 1971 AND 1972.

5/74	SYSTEM						744		
6/74	SYSTEM						720		
7/74	SYSTEM						744		
8/74	SYSTEM						744		
9/74	SYSTEM						720		
10/74	SYSTEM						744		
11/74	SYSTEM						720		
12/74	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM HAS PERFORMED ACCEPTABLY SINCE START UP IN APRIL 1974. SYSTEM AVAILABILITY HAS BEEN GREATER THAN 90% AND OPERATIONS HAVE ONLY BEEN INTERRUPTED BY LACK OF TRONA. SO2 REMOVAL EFFICIENCY HAS BEEN APPROXIMATELY 85%. BECAUSE OF A COAL STRIKE THE BOILER ONLY OPERATED ABOUT TWO WEEKS IN NOVEMBER AND DURING THOSE TWO WEEKS IT OPERATED AT LOW LOAD. DELIVERY OF TRONA WAS SUFFICIENT TO MAINTAIN FGD SYSTEM OPERATION. THERE ARE NO OUTSTANDING MECHANICAL OR PROCESS PROBLEMS.

1/75	SYSTEM	65.0					744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

FROZEN SODIUM CARBONATE FEED LINES ACCOUNTED FOR MOST OF THE JANUARY OUTAGE TIME. THE FGD SYSTEM HAS BEEN OPERATING WITH TRONA SUPPLEMENTED BY SODIUM CARBONATE BRINE.

2/75 SYSTEM 95.0 672

** PROBLEMS/SOLUTIONS/COMMENTS

A 2-DAY LACK OF CHEMICALS RESULTED IN OUTAGE TIME DURING FEBRUARY.

3/75 SYSTEM 100.0 100.0 744

4/75 SYSTEM 100.0 100.0 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUT DOWN APRIL 13 FOR ROUTINE MAINTENANCE. THE UNIT IS SCHEDULED TO BE BACK IN SERVICE IN EARLY MAY.

5/75 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE PLACED BACK IN SERVICE ON MAY 12.

THE UTILITY REPORTED THAT A HIGH ASH CONTENT OF UP TO 20% BY WEIGHT OF THE COAL BURNED RECENTLY HAD NO EFFECT ON EMISSIONS.

THE UTILITY REPORTED PROBLEMS WITH ABRASION OF THE PIPING RUBBER LINING AND ROUTINE MECHANICAL PROBLEMS.

INSTRUMENTATION PROBLEMS WERE ENCOUNTERED OVER THE APRIL-MAY PERIOD.

6/75 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

ROUTINE MECHANICAL PROBLEMS CONTINUED THROUGH JUNE.

MINOR INSTRUMENTATION PROBLEMS CONTINUED THROUGH JUNE.

THE UTILITY HAS REPORTED THAT A SECOND PERFORMANCE TEST WAS RECENTLY COMPLETED AND PASSED.

7/75 SYSTEM 85.0 744

8/75 SYSTEM 744

9/75 SYSTEM 78.1 77.6 720 716 559

** PROBLEMS/SOLUTIONS/COMMENTS

FOUR FORCED OUTAGES OCCURED DURING SEPTEMBER. THREE OF THE FOUR WERE SCRUBBER-RELATED. DETAILS WERE NOT AVAILABLE FROM THE UTILITY.

10/75 SYSTEM 35.0 14.0 744 303 106

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

LOW OPERATING TIME DURING OCTOBER WAS DUE TO SCHEDULED BOILER MAINTENANCE.
ONE OUTAGE WAS DUE TO THE MALFUNCTION OF A SODA ASH BLOWER.

11/75	SYSTEM		60.3		54.7			720	654	394

** PROBLEMS/SOLUTIONS/COMMENTS

OPERABILITY WAS LOW FOR THE MONTH OF NOVEMBER BECAUSE OF DELAYS IN THE
DELIVERY OF REPAIR MATERIALS.

12/75	SYSTEM							744		
1/76	SYSTEM	26.7	30.6	30.6	26.7			744	647	198

** PROBLEMS/SOLUTIONS/COMMENTS

THE COLLAPSE OF A VENTURI STRAINER RESULTED IN FGD SYSTEM OUTAGE DURING
JANUARY.
REHEATER STEAM LEAKS CAUSED AN OUTAGE DURING JANUARY. REPAIRS COULD NOT B
MADE WITH THE BOILER IN SERVICE.
A FROZEN CARBONATE LINE RESULTED IN AN FGD SYSTEM OUTAGE DURING JANUARY.
THE SYSTEM WAS SHUT DOWN FOR 16 DAYS IN JANUARY FOR COMPLETION OF PIPING
CONVERSION. THIS OUTAGE WAS NOT DUE TO A SCRUBBER MALFUNCTION.

2/76	SYSTEM	89.3	74.6	80.7	71.2			696	664	496

** PROBLEMS/SOLUTIONS/COMMENTS

A DEPLETION OF CHEMICALS DURING FEBRUARY ACCOUNTED FOR NEARLY 44 HOURS OF
SCRUBBER OUTAGE TIME.
FIVE SCRUBBER INOPERATIVE PERIODS WERE REPORTED DURING FEBRUARY. THREE OF
THESE OUTAGES WERE NOT RELATED TO THE FGD SYSTEM.
SEAL WATER PROBLEMS WERE REPORTED DURING FEBRUARY.
CHEMICAL LINE PLUGGING PROBLEMS WERE NOTED DURING FEBRUARY.

3/76	SYSTEM	99.2	71.9	99.2	38.5			744	398	287

** PROBLEMS/SOLUTIONS/COMMENTS

ONE FORCED SCRUBBER OUTAGE WAS CAUSED BY A VENTURI LEAK.

4/76	SYSTEM	100.0	91.1	100.0	13.4			720	106	97

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OUT OF SERVICE IN APRIL FOR INSPECTION OF VALVES AND
COAL CONDUITS.

5/76	SYSTEM	100.0			0.0			744	0	0
6/76	SYSTEM	100.0			0.0			720	0	0
7/76	SYSTEM	100.0			0.0			744	0	0

NEVADA POWER: REID GARDNER 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 WAS SHUT DOWN FOR A SCHEDULED TURBINE OVERHAUL AND BURNER LINE
 CONDUIT REPLACEMENT THROUGH MAY, JUNE, AND JULY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/76	SYSTEM	96.6	65.7	93.3	46.9		744	531	349	

** PROBLEMS/SOLUTIONS/COMMENTS

TURBINE VIBRATION CHECKS CONTINUED THROUGH AUGUST 8. THE SCRUBBER WAS NOT
 OPERATED UNTIL AUGUST 12.

PLUGGING IN THE THICKNER CAUSED AN OUTAGE DURING AUGUST.

PLUGGING IN THE TRAY RECYCLE TANK DURING AUGUST RESULTED IN AN FGD OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/76	SYSTEM	96.6	96.4	96.4	91.1		720	681	656	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 40 HOURS OF THE FGD
 SYSTEM DOWNTIME IN SEPTEMBER.

PLUGGING IN THE VENTURI SPRAY HEADERS CAUSED A SCRUBBER OUTAGE.

AN ID FAN MALFUNCTION RESULTED IN SCRUBBER OUTAGE DURING SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/76	SYSTEM	97.9	96.5	97.7	87.9		744	678	654	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR 75 HOURS IN OCTOBER TO REPLACE A BURNER.

SCRUBBER OUTAGE TIME WAS REQUIRED FOR INSTALLATION OF A NEW CARBONATE FEED
 LINE.

A MINOR SCRUBBER TRIP WAS CAUSED BY PLUGGING IN THE SCRUBBER EFFLUENT
 SUCTION LINE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	SYSTEM	86.5	84.2	84.8	75.3		720	644	542	

** PROBLEMS/SOLUTIONS/COMMENTS

ONE 97 HOUR SCRUBBER OUTAGE OCCURED BECAUSE OF A SCREW CONVEYOR FAILURE,
 RESULTING IN AN INABILITY TO MIX THE CHEMICAL ABSORBENT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/76	SYSTEM	92.8	90.6	91.9	82.1		744	675	611	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER RELATED PROBLEMS ACCOUNTED FOR 79 HOURS OF THE DECEMBER OUTAGE TIME

A FORCED FGD OUTAGE RESULTED FROM CHEMICAL DEPLETION.

A PLUGGED SENSING LINE FORCED AN FGD OUTAGE DURING DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/77	SYSTEM	68.4	62.8	63.9	56.0		744	663	416	

** PROBLEMS/SOLUTIONS/COMMENTS

RUBBER LINING REPAIRS WERE INITIATED IN THE SEPARATOR SECTION OF THE
 SCRUBBING MODULE ON JANUARY 22. THE LINING WAS DAMAGED BY A HIGH
 TEMPERATURE EXCURSION RESULTING FROM A MALFUNCTION IN THE BOILER AIR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

PREHEATER.											
2/77	SYSTEM	0.0	0.0	0.0	0.0			672	599	0	
** PROBLEMS/SOLUTIONS/COMMENTS											
RUBBER LINING WORK CONTINUED ON THE SCRUBBER DURING FEBRUARY. THE BOILER WAS DOWN PART OF THE PERIOD BECAUSE OF A STRIKE.											
3/77	SYSTEM	0.0	0.0	0.0	0.0			744	669	0	
** PROBLEMS/SOLUTIONS/COMMENTS											
SCRUBBER RUBBER LINING REPAIRS CONTINUED.											
4/77	SYSTEM	0.0	0.0	0.0	0.0			720	400	0	
** PROBLEMS/SOLUTIONS/COMMENTS											
SCRUBBER RUBBER LINING REPAIRS CONTINUED.											
5/77	SYSTEM	0.0	0.0	0.0	0.0			744	705	0	
** PROBLEMS/SOLUTIONS/COMMENTS											
SCRUBBER RUBBER LINING REPAIRS CONTINUED.											
6/77	SYSTEM	47.1	48.4	48.4	47.1			720	701	339	
** PROBLEMS/SOLUTIONS/COMMENTS											
REPAIRS ON THE DAMAGED RUBBER LINING WERE COMPLETED BY MID-JUNE AND THE SYSTEM REMAINED IN SERVICE THROUGHOUT THE MAJORITY OF THE MONTH.											
A MINOR FORCED OUTAGE RESULTED FROM A HIGH-LOW PRESSURE TRIP CAUSED BY A PLUGGED SENSING LINE.											
7/77	SYSTEM	99.5	99.5	99.5	99.5			744	744	740	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE SYSTEM WAS TAKEN OUT OF THE GAS PATH ONLY ONCE DURING THE MONTH BECAUSE OF A SCHEDULED INSPECTION OF THE NEWLY REPLACED RUBBER LINER IN THE SCRUBBER SEPARATOR SECTION.											
8/77	SYSTEM	13.8	15.5	15.5	13.8			744	662	102	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE SCRUBBER WAS OUT OF SERVICE MOST OF AUGUST FOR ID FAN VIBRATION PROBLEMS.											
INSTALLATION OF ID FAN RELAYS ACCOUNTED FOR SOME DOWNTIME DURING AUGUST.											
9/77	SYSTEM	84.4	73.4	69.3	35.0			720	344	252	
** PROBLEMS/SOLUTIONS/COMMENTS											
THE BOILER WAS OUT OF SERVICE FOR MOST OF SEPTEMBER FOR NON-SCRUBBER RELATED PROBLEMS.											
THE SCRUBBER HAD LIMIT SWITCH PROBLEMS WITH 14 A & B GULLOTINE DAMPERS.											
10/77	SYSTEM	99.3	94.4	99.2	84.7			744	668	630	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (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 DOWN FOR FIVE HOURS DURING OCTOBER TO REPAIR AN ID FAN LEAK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/77	SYSTEM	78.7	81.5	81.5	78.1		720	690	562	

** PROBLEMS/SOLUTIONS/COMMENTS

SCREEN PLUGGING IN THE RECYCLE TANK WAS A PROBLEM DURING NOVEMBER.

SCRUBBER INSTRUMENTATION DIFFICULTY WAS EXPERIENCED DURING NOVEMBER.

THE SYSTEM WAS DOWN FOR THE INSTALLATION OF AN OUTLET NOZZLE IN THE BOOSTER TANK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/77	SYSTEM	85.4	80.6	82.8	70.2		744	648	522	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OFF-LINE FOR APPROXIMATELY 109 HOURS DUE TO HIGH TRAY DIFFERENTIAL PRESSURE AND SOME PLUGGING IN THE ID FAN SENSING LINE.

THE BOILER WAS DOWN ABOUT 113 HOURS IN DECEMBER FOR NON-SCRUBBER RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/78	SYSTEM	67.7	67.5	67.5	55.9		744	616	416	

** PROBLEMS/SOLUTIONS/COMMENTS

TWO OUTAGES WERE CAUSED BY PROBLEMS RELATED TO HIGH TRAY DIFFERENTIAL PRESSURES.

ELECTRICAL PROBLEMS IN THE 1A FORCED DRAFT FAN CAUSED AN FGD SYSTEM OUTAGE

AIR PRESSURE FAILURE TO AN ID FAN DAMPER ACCOUNTED FOR SOME JANUARY DOWNTIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/78	SYSTEM	97.4	74.9	94.3	43.4		672	389	292	

** PROBLEMS/SOLUTIONS/COMMENTS

A DUCT HI-LO PRESSURE TRIP CONTRIBUTED TO THE FEBRUARY OUTAGE TIME.

THE BOILER WENT OUT OF SERVICE ON FEBRUARY 17 FOR A THREE WEEK OUTAGE.

PLUGGED SENSING LINES CONTRIBUTED TO THE OUTAGE TIME DURING FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/78	SYSTEM	76.2	58.3	58.3	27.8		744	355	207	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE UNTIL MARCH 16.

A PROBLEM WAS ENCOUNTERED WITH THE REHEAT STEAM REGULATOR DURING MARCH.

PROBLEMS WITH THE GUILLOTINE SWITCHES DELAYED START-UP OF THE FGD SYSTEM UNTIL MARCH 22.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/78	SYSTEM	100.0	96.7	100.0	75.2		720	560	541	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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

THERE WERE NO FGD SYSTEM FORCED OUTAGES. ALL DOWNTIME WAS BOILER RELATED (179 HOURS).

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
5/78	SYSTEM	97.0	92.4	96.3	78.2		744	630	582

** PROBLEMS/SOLUTIONS/COMMENTS

THE REPAIRS TO THE CONDENSER AND PRODUCTION CONTROL CONTRIBUTED TO THE BOILER OUTAGES.

HIGH TEMPERATURE ON AN ID FAN BEARING CAUSED AN OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
6/78	SYSTEM	91.8	91.8	91.8	91.8		720	720	661

** PROBLEMS/SOLUTIONS/COMMENTS

A 31 HOUR OUTAGE WAS REQUIRED TO CHANGE THE OIL ON THE ID FAN.

A HIGH DUCT PRESSURE TRIP OCCURED DURING JUNE ACCOUNTING FOR SOME DOWNTIME OUTAGE TIME WAS REQUIRED TO CLEAN AN ABSORBER TRAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
7/78	SYSTEM	99.0	99.0	99.0	99.0		744	744	736

** PROBLEMS/SOLUTIONS/COMMENTS

FGD OUTAGE TIME WAS REQUIRED TO RECTIFY A HIGH TRAY DIFFERENTIAL PRESSURE PROBLEM. THE TRAY WAS CLEANED OUT DURING THE OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
8/78	SYSTEM	94.5	93.6	94.2	88.8		744	706	661

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS FORCED OFF LINE ON AUGUST 5 BECAUSE OF A LOSS OF THE ASH PANEL CONTROL POWER. THIS LEFT THE UNIT WITHOUT EMERGENCY SPRAY TO THE SCRUBBERS.

A FORCED OUTAGE OCCURED ON AUGUST 20 WHEN THERE WAS A SCRUBBER VENTURI HIGH TEMPERATURE ALARM. THE EXACT CAUSE WAS NOT KNOWN BUT A BOILER TUBE LEAK WAS SUSPECTED.

THERE WAS ONE SCHEDULED OUTAGE DURING THE MONTH TO CLEAN AN ABSORBER TRAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
9/78	SYSTEM	99.3	97.2	99.2	86.9		720	644	626

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE THREE BOILER RELATED OUTAGES DURING SEPTEMBER. A BOILER TUBE LEAK AND BOILER BURNER WERE REPAIRED.

DURING THE MONTH A BOILER TRIP OCCURRED WHICH WAS CAUSED BY SCRUBBER HIGH DUCT PRESSURE. SCRUBBER PRESSURE SENSING LINES WERE CLEANED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
10/78	SYSTEM	100.0	99.8	100.0	89.6		744	668	667

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE FOR ABOUT 77 HOURS FOR REMOVAL OF AN ASH CLINKER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	FACTOR
11/78	SYSTEM	90.4	88.9	89.9	84.7		720	686	610

NEVADA POWER: REID GARDNER 1 (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 FGD SYSTEM WAS DOWN FOR 9 HOURS TO REPAIR SCRUBBER OUTLET TEMPERATURE PROBES.

OUTAGE TIME RESULTED FROM BOILER BOTTOM HOPPER PROBLEMS. A HIGH TEMPERATURE TRIP AT THE VENTURI GAS OUTLET OCCURRED BECAUSE OF THE BOILER PROBLEMS.

SOME OUTAGE TIME RESULTED FROM A HIGH SCRUBBER EFFLUENT SOLIDS LEVEL.

12/78	SYSTEM	95.6	92.8	95.4	92.0	744	738	685

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS OUT OF SERVICE TO REPAIR A LEAK IN A VENTURI LINE

THE FGD SYSTEM WAS DOWN TO CLEAN THE VENTURI SPRAY COLLAR (RACE TRACK) AND CLEAN PRESSURE SENSING LINES.

THE BOILER WAS OFF LINE APPROXIMATELY ONE DAY FOR PULVERIZER REPAIRS.

1/79	SYSTEM	83.9	73.7	80.8	67.5	744	682	502 73.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN ABOUT FIVE DAYS TO REMOVE A CLINKER FROM THE BOTTOM HOPPER.

A 58 HOUR SCRUBBER OUTAGE WAS CAUSED WHEN A SCRUBBER POWER CIRCUIT TRIPPED RESULTING IN LOSS OF POWER TO TRAY SPRAY PUMP. REPAIRS WERE MADE ON THE TRAY AND SPRAY SYSTEMS.

THE FGD SYSTEM WAS DOWN FOR A SHORT PERIOD TO INSPECT THE ID FAN BEARINGS.

THE FGD SYSTEM WAS DOWN FOR 48 HOURS TO REPAIR A LEAK IN THE VENTURI LINE.

2/79	SYSTEM	85.6	85.9	85.9	85.6	672	670	575 79.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN TO CLEAN THE VENTURI SPRAY COLLAR (RACE TRACK) NOZZLES, CLEAN THE EFFLUENT LINE AND REPAIR A LEAK IN THE VENTURI LINE.

A BREAK IN THE BOTTOM ASH CIRCULATING WATER LINE RESULTING IN LOSS OF EMERGENCY COOLING WATER FORCED THE FGD SYSTEM OFF LINE.

3/79	SYSTEM	97.9	96.5	97.4	78.3	744	604	583 84.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF TO UNPLUG VENTURI NOZZLES AND TO CLEAN SENSING LINES. THE DOWNTIME WAS ABOUT 15 HOURS.

THE FGD SYSTEM WAS OFF FOR ABOUT 146 HOURS FOR REPAIR OF BOILER TUBE LEAKS

4/79	SYSTEM	100.0	98.6	100.0	25.7	720	188	185 86.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE OFF FOR APPROXIMATELY 535 HOURS FOR SCHEDULED MAINTENANCE.

5/79	SYSTEM	99.8	74.4	99.4	27.5	744	275	204 84.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBER WERE RETURNED TO SERVICE MAY 22 AFTER COMPLETING SCHEDULED MAINTENANCE.

THE BOILER WAS FORCED OUT OF SERVICE TO REPAIR A COAL LEAK ON THE #8 BURNER LINE.

THE SCRUBBER WAS OFF LINE APPROXIMATELY ONE HOUR TO CLEAN A RECYCLE TANK RETURN LINE.

6/79	SYSTEM	97.9	95.2	97.6	84.7		720	641	610 86.9

** PROBLEMS/SOLUTIONS/COMMENTS

A 94 HOUR OUTAGE WAS REQUIRED TO REPAIR A BOILER TUBE LEAK.

OUTAGE TIME WAS REQUIRED TO UNPLUG A VENTURI LINE.

TRAY SPRAY VALVES WERE REPLACED DURING JUNE.

7/79	SYSTEM	82.1	80.5	81.0	80.3		744	742	597 85.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WAS FORCED OFF LINE DURING A TURBINE OVERSPEED GOVERNOR TEST. THE DOWNTIME WAS ABOUT SEVEN HOURS.

THE SCRUBBER WAS OFF ABOUT 67 HOURS TO CLEAN THE SCRUBBER TRAYS.

THE LOSS OF INSTRUMENT AIR TO THE SCRUBBER CONTROLS RESULTED FROM A SCRUBBER AIR COMPRESSOR POWER FAILURE. THE SCRUBBER WAS OFF-LINE FOR ABOUT 74 HOURS.

8/79	SYSTEM	96.9	96.9	96.9	96.9		744	744	721 87.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS REMOVED FROM SERVICE TO CLEAN THE SCRUBBER PRESSURE SENSING LINES. THE SCRUBBER WAS DOWN FOR ABOUT 11 HOURS.

THE SCRUBBER WAS DOWN AT THE END OF THE MONTH AGAIN TO CLEAN THE PRESSURE SENSING LINE ON THE SCRUBBER. THE SCRUBBER WAS OFF LINE FOR ABOUT THREE HOURS.

9/79	SYSTEM	100.0	100.0	100.0	53.2		720	383	383 88.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER, TURBINE, AND SCRUBBER WERE SHUT DOWN FOR SCHEDULED MAINTENANCE ON SEPTEMBER 16.

10/79	SYSTEM	79.6	68.2	71.0	49.9		744	545	372 85.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OFF LINE WITH THE BOILER AND TURBINE FOR SCHEDULED MAINTENANCE THROUGH OCTOBER 8.

PLUGGING OF THE VENTURI AND EFFLUENT LINE CAUSED THREE OUTAGES DURING THE MONTH.

THE SCRUBBER WAS SHUT DOWN SO THAT REPAIRS COULD BE MADE TO THE ID FAN

13-1079

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (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 FGD SYSTEM WAS DOWN THREE TIMES IN MAY BECAUSE OF LOW FLOW THROUGH THE VENTURI.

A BOILER TRIP CAUSED THE FGD SYSTEM TO BE OUT APPROXIMATELY 97 HOURS.

6/80	SYSTEM	92.1	92.7	92.7	88.3	720	686	636	95.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE NOZZLES IN THE VENTURI RACE TRACK HAD TO BE CLEANED SEVERAL TIMES THIS MONTH. TOTAL OUTAGE FOR THIS WAS APPROXIMATELY 48 HOURS.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN THE EMERGENCY SPRAY SYSTEM FAILED.

THE FGD SYSTEM WAS OUT OF SERVICE TWICE DURING JUNE DUE TO BOILER OUTAGES.

7/80	SYSTEM	87.1	94.9	86.7	84.0	744	658	625	95.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS RETURNED TO SERVICE ON JULY 3, 1980 AFTER THE BOILER TRIPPED THE SYSTEM OFF LINE. THE GUILLOTINE DAMPER HAD TO BE REPAIRED BEFORE THE FGD SYSTEM COULD RETURN TO SERVICE.

THE FGD SYSTEM WAS OFF LINE FOR SEVERAL HOURS TO UNPLUG THE VENTURI TRAY AND RACETRACK. MAINTENANCE WORK WAS ALSO DONE ON THE VENTURI LINE.

A SCHEDULED BOILER OUTAGE CAUSED THE FGD SYSTEM TO BE OFF LINE FOR ONE DAY.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN THE EMERGENCY SPRAY SYSTEM FAILED. THE ASH SLUICE PUMP SHAFT WAS REPAIRED DURING THIS TIME.

8/80	SYSTEM	86.1	85.5	83.7	71.5	744	622	532	94.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR ALMOST 60 HOURS FOR ROUTINE CLEANING AND MAINTENANCE.

LOSS OF EMERGENCY SPRAY KEPT THE FGD SYSTEM OFF LINE FOR SEVERAL HOURS.

BOILER RELATED OUTAGES CAUSED THE FGD SYSTEM NOT TO OPERATE FOR OVER 100 HOURS.

THE TRAY SPRAY PUMP BELTS WERE REPAIRED.

A DAMPER THAT FAILED TO CLOSE TRIPPED THE FGD SYSTEM OFF LINE DURING THE MONTH.

9/80	SYSTEM	91.3	91.0	91.1	89.6	720	709	645	93.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WENT OFF LINE SEVERAL TIMES IN SEPTEMBER FOR ROUTINE CLEANING AND MAINTENANCE. THIS ROUTINE WORK INCLUDED CLEANING THE TRAYS AND REPAIRING VENTURI, ASH, AND EFFLUENT LINES.

A BOILER OUTAGE KEPT THE FGD SYSTEM OFF LINE FOR SEVERAL HOURS.

10/80	SYSTEM	98.2	97.6	97.9	93.0	744	708	692	

NEVADA POWER: REID GARDNER 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 FGD SYSTEM WAS FORCED OUT OF SERVICE DUE TO A FAILURE OF THE ASH SLUIC
 SYSTEM WHICH LEAVES THE SYSTEM WITH NO FIRE PROTECTION.

REPAIRS TO THE ID FAN EXPANSION JOINT CAUSED APPROXIMATELY SEVEN HOURS
 OF OUTAGE TIME.

THE UNIT WAS FORCED OFF-LINE ONCE DURING THE MONTH FOR APPROXIMATELY TWO
 HOURS.

11/80	SYSTEM	100.0	100.0	100.0	36.3	720	262	262

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AND THE BOILER WERE SHUTDOWN ON NOVEMBER 11 FOR A SCHEDULED
 OVERHAUL.

DURING NOVEMBER THE FGD SYSTEM WAS SHUT DOWN WITH THE BOILER FOR A
 SCHEDULED OUTAGE THAT LASTED SIX HOURS.

12/80	SYSTEM	80.7	77.4	74.8	52.5	744	505	391

** PROBLEMS/SOLUTIONS/COMMENTS

FORCED OUTAGE TIME DURING DECEMBER WAS CAUSED BY A VENTURI LINE LEAK, AND
 A POWER INTERRUPTION.

A SCHEDULED OUTAGE KEPT THE UNIT OFF LINE UNTIL DECEMBER 9. ANOTHER
 OUTAGE WAS SCHEDULED TO RESET THE ID FAN WHICH LASTED APPROXIMATELY TWO
 HOURS.

1/81	SYSTEM	85.1	85.5	85.5	85.1	744	741	633

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE FGD SYSTEM WAS REMOVED FROM SERVICE TO REPAIR LEAKS
 ENCOUNTERED IN THE VENTURI.

2/81	SYSTEM	42.8	54.3	54.2	42.7	672	528	287

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE FGD SYSTEM WAS DOWN FOR APPROXIMATELY 384 HOURS DUE TO
 SCHEDULED MAINTENANCE ON THE VENTURI TANK.

3/81	SYSTEM	76.2	73.1	73.1	60.6	744	617	451

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE BOILER WAS OUT OF SERVICE APPROXIMATELY 91 HOURS DUE TO
 A TUBE LEAK.

ADDITIONAL UNIT OUTAGE TIME WAS DUE TO THE FAILURE OF THE AIR PREHEATER
 DRIVE.

THE FGD SYSTEM WAS OUT OF SERVICE APPROXIMATELY 177 HOURS DUE TO REPAIRS
 TO THE VENTURI TANK.

4/81	SYSTEM	96.2	99.4	99.4	96.2	720	697	693

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 APRIL PROBLEMS WERE ENCOUNTERED WITH THE BYPASS SYSTEM CAUSING APPROXIMATELY 18 HOURS OF OUTAGE TIME.

ADDITIONAL OUTAGE TIME WAS DUE TO THE HIGH EXHAUST LOAD TEMPERATURE.

5/81	SYSTEM	87.9	66.9	67.1	26.7	744	296	198

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE UNIT WAS DOWN PART OF THE TIME FOR A SCHEDULED OVERHAUL.

DURING MAY, LOW VENTURI FLOW CAUSED THE SYSTEM TO SHUT DOWN FOR 97 HOURS.

6/81	SYSTEM	94.2	89.9	93.4	81.2	720	650	584

** PROBLEMS/SOLUTIONS/COMMENTS

THE EFFLUENT LINES WERE CLEANED DURING JUNE ACCOUNTING FOR 42 HOURS OF OUTAGE TIME.

THE BOILER WAS SCHEDULED TO BE OFF-LINE PART OF JUNE TO REPAIR FEEDWATER HEATERS.

7/81	SYSTEM	100.0	99.0	100.0	95.2	744	714	708

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED NO FGD-RELATED OUTAGES FOR THE MONTH OF JULY.

8/81	SYSTEM	98.7	98.5	98.7	92.9	744	702	691

** PROBLEMS/SOLUTIONS/COMMENTS

DOWN TIME WAS REQUIRED TO REPLACE A VALVE IN THE EMERGENCY SPRAY SYSTEM.

THE SYSTEM WAS FORCED OUT OF SERVICE 4 HOURS WITH HIGH DUCT PRESSURE PROBLEMS.

9/81	SYSTEM	96.0	90.5	95.0	76.9	720	612	554

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER OUTAGE TIME WAS ATTRIBUTED TO INSTRUMENTATION PROBLEMS AND BOILER RELATED PROBLEMS. THE INSTRUMENTATION REPAIRS REQUIRED 29 HOURS.

10/81	SYSTEM	0.0			0.0	744	0	0 0.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE FGD SYSTEM WAS DOWN WITH THE BOILER FOR A SCHEDULED OVERHAUL.

11/81	SYSTEM	94.7	78.4	61.3	8.5	720	79	62

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED OVERHAUL CONTINUED UNTIL NOVEMBER 26.

HIGH PRESSURE IN THE DUCTWORK TRIPPED THE SYSTEM CAUSING TWO OUTAGES DURING THE MONTH.

12/81	SYSTEM	100.0	96.3	95.8	99.6	744	554	533

NEVADA POWER: REID GARDNER 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

LOW UTILIZATION OF THE FGD SYSTEM DURING DECEMBER WAS DUE TO BOILER-RELATE PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/82	SYSTEM	96.5	96.0	93.0	92.1		744	714	685	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE VENTURI PUMP PLUGGED CAUSING SYSTEM DOWN TIME.

THE VENTURI PUMP DISC VALVE WAS REPLACED DURING THE MONTH.

THE SYSTEM WAS FORCED OFF-LINE FOR APPROXIMATELY FIVE HOURS DUE TO A HIGH VENTURI OUTLET TEMPERATURE.

2/82	SYSTEM	91.8	64.5	64.5	51.7		672	538	347	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE FGD SYSTEM WAS DOWN FOR APPROXIMATELY 52 HOURS FOR GENERAL MAINTENANCE AND REPAIRS.

3/82	SYSTEM	91.1	91.0	91.1	90.8		744	742	675	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH APPROXIMATELY 65 HOURS OF SYSTEM DOWN TIME WAS DUE TO A HOLE IN THE VENTURI LINE.

4/82	SYSTEM	98.8	98.6	98.5	78.5		720	573	565	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE FGD SYSTEM WAS OFF-LINE PART OF THE TIME TO CLEAN THE ABSORBER TRAYS.

THE UNIT WAS SHUT DOWN ON APRIL 24 FOR A SCHEDULED MAINTENANCE OUTAGE.

5/82	SYSTEM	95.8	90.4	92.6	92.6		744	425	384	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS FORCED OFF-LINE TWICE DURING MAY DUE TO HIGH PRESSURE IN THE ABSORBER DUCT.

6/82	SYSTEM	50.2	77.2	77.2	50.2		720	469	362	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE SYSTEM WAS FORCED OFF-LINE FOR APPROXIMATELY 1 DAY DUE TO A PRESSURE TRIP IN THE ABSORBER DUCT.

THE FGD SYSTEM WAS TAKEN OFF-LINE ON JUNE 17 FOR GENERAL MAINTENANCE. THE OUTAGE LASTED THROUGH THE REST OF THE MONTH.

7/82	SYSTEM	90.1	93.2	89.5	84.4		744	673	628	

** PROBLEMS/SOLUTIONS/COMMENTS

THREE BOILER TRIPS OCCURRED DURING JULY DUE TO HIGH PRESSURE IN THE SCRUBBER DUCT.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

THE REPAIR OF VENTURI PUMPS ACCOUNTED FOR OUTAGE TIME DURING JULY.

AN OUTAGE LASTING 25 HOURS OCCURRED DURING THE MONTH. DURING THE OUTAGE, THE ABSORBER TRAYS REQUIRED CLEANING.

REPAIRS ON A COAL PULVERIZER RESULTED IN APPROXIMATELY 39 HOURS OF OUTAGE TIME FOR THE UNIT.

8/82 SYSTEM 97.3 96.2 96.7 78.2 744 605 581

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER TUBE LEAK OCCURRED DURING AUGUST CAUSING A 121 HOUR OUTAGE.

A LEAK IN THE SPRAY NOZZLE RACE TRACK FLANGE PRODUCED A 20 HOUR OUTAGE DURING THE MONTH.

REPAIR OF A BOILER DOOR CAUSED SOME DOWN TIME FOR THE UNIT DURING AUGUST.

A BOILER TRIP OCCURRED DURING THE MONTH DUE TO HIGH DUCT PRESSURE.

9/82 SYSTEM 93.1 90.8 91.3 71.8 720 570 517

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH DUCT PRESSURE FORCED A UNIT OUTAGE DURING SEPTEMBER.

THE UNIT WAS DOWN 150 HOURS DURING SEPTEMBER FOR AN ACID CLEANING.

THE UNIT WAS DOWN APPROXIMATELY 3 HOURS DURING THE MONTH DUE TO HIGH HOOD TEMPERATURES.

THE FGD SYSTEM WAS DOWN FOR APPROXIMATELY 50 HOURS DUE IN PART TO AN INSPECTION OF THE ABSORBER TRAYS.

PART OF THE 50 HOUR OUTAGE DURING SEPTEMBER WAS ALSO DUE TO REPAIRS BEING MADE ON THE RUBBER ABSORBER LINER.

10/82 SYSTEM 99.5 99.0 99.4 92.1 744 692 685

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER TUBE LEAKS ACCOUNTED FOR APPROXIMATELY 55 HOURS OF DOWN TIME DURING OCTOBER.

A CLEANING OF THE ABSORBER TRAYS FORCED AN OUTAGE LASTING 4 HOURS.

11/82 SYSTEM 96.8 93.8 96.5 86.9 720 668 626

** PROBLEMS/SOLUTIONS/COMMENTS

A REHEATER TUBE LEAK FORCED AN OUTAGE OF APPROXIMATELY 47 HOURS DURING NOVEMBER.

ELECTRICAL PROBLEMS WITH A FAN ACCOUNTED FOR 24 HOURS OF DOWN TIME DURING THE MONTH.

A PLUGGED EFFLUENT SYSTEM RESULTED IN APPROXIMATELY 23 HOURS OF DOWN TIME DURING NOVEMBER.

12/82 SYSTEM 100.0 99.3 100.0 97.3 744 729 724

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (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

APPROXIMATELY 20 HOURS OF DOWN TIME DURING DECEMBER RESULTED FROM BOILER-RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/83	SYSTEM	82.0	96.3	82.0	82.0		744	633	610	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS DOWN FOR ABOUT SIX DAYS DURING JANUARY TO CHANGE THE OIL IN AN ID FAN.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/83	SYSTEM	93.2	93.2	92.6	85.7		672	618	576	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY A VENTURI PUMP MOTOR SHORTED CAUSING A 46 HOUR OUTAGE.

BOILER-RELATED PROBLEMS RESULTED IN A 2 HOUR OUTAGE DURING THE MONTH.

THE UNIT WAS OUT OF SERVICE 48 HOURS DURING FEBRUARY FOR A SCHEDULED OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/83	SYSTEM	100.0	90.5	100.0	27.2		744	223	202	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 23 DAYS DURING MARCH FOR A SCHEDULED OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/83	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/83	SYSTEM	99.0	99.6	99.0	99.0		744	739	736	

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH PRESSURE IN THE SCRUBBER DUCTWORK FORCED AN OUTAGE IN APRIL LASTING APPROXIMATELY 8 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/83	SYSTEM	91.7	96.2	88.3	62.4		720	467	449	

** PROBLEMS/SOLUTIONS/COMMENTS

A SIX-HOUR OUTAGE DURING JUNE WAS REQUIRED TO CLEAN THE ABSORBER TRAYS.

A BOILER OUTAGE LASTING 35 HOURS WAS REQUIRED TO REPAIR A BURNER.

A WATER LEAK IN THE SCRUBBER VENTURI THROAT SPRAY SYSTEM ACCOUNTED FOR APPROXIMATELY 53 HOURS OF DOWN TIME DURING JUNE.

A BOILER TUBE LEAK ACCOUNTED FOR APPROXIMATELY 12 HOURS OF OUTAGE TIME DURING JUNE.

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 165 HOURS DURING JUNE DUE TO A LACK OF POWER DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/83	SYSTEM	79.6	73.2	74.6	59.9		744	609	445	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 70 HOURS DURING JULY BECAUSE OF LOW POWER DEMAND.

THE UNIT WAS DOWN APPROXIMATELY 77 HOURS DURING THE MONTH DUE TO MISCELLANEOUS BOILER-RELATED PROBLEMS.

APPROXIMATELY ONE HOUR OF OUTAGE TIME DURING JULY WAS CAUSED BY ABSORBER DUCT PRESSURE PROBLEMS.

APPROXIMATELY 151 HOURS DURING THE MONTH WERE REQUIRED TO CLEAN THE ABSORBER TRAYS.

8/83	SYSTEM	95.9	94.6	94.9	75.8		744	596	564

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 48 HOURS OF DOWN TIME DURING AUGUST WAS DUE TO A LACK OF POWER DEMAND.

BOILER-RELATED FORCED OUTAGES ACCOUNTED FOR APPROXIMATELY 102 HOURS OF DOWN TIME DURING THE MONTH.

AN ABSORBER TRAY LEAK CAUSED A FORCED OUTAGE LASTING APPROXIMATELY 2 HOURS

A LEAK IN THE VENTURI THROAT SPRAY SYSTEM (RACE TRACK) RESULTED IN APPROXIMATELY 2 HOURS OF DOWN TIME DURING AUGUST.

A VENTURI THROAT LEAK FORCED AN OUTAGE DURING THE MONTH LASTING APPROXIMATELY 26 HOURS.

9/83	SYSTEM	100.0	99.3	100.0	88.1		720	639	634

** PROBLEMS/SOLUTIONS/COMMENTS

A 6 HOUR OUTAGE OCCURRED DURING THE MONTH DUE TO A LACK OF POWER DEMAND.

APPROXIMATELY 80 HOURS OF OUTAGE TIME DURING SEPTEMBER WAS DUE TO BOILER-RELATED PROBLEMS SUCH AS TUBE LEAKS, UNIT TRIPS AND BURNER PROBLEMS.

10/83	SYSTEM	100.0	92.5	100.0	17.2		744	138	128

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER RELATED PROBLEMS ACCOUNTED FOR OUTAGE TIME DURING OCTOBER.

11/83	SYSTEM	95.2	95.2	95.2	95.2		720	720	685

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER WAS DOWN APPROXIMATELY 11 HOURS DURING THE MONTH TO INSPECT THE TRAYS.

PLUGGED ABSORBER TRAYS ACCOUNTED FOR APPROXIMATELY 19 HOURS OF FGD SYSTEM OUTAGE TIME DURING THE MONTH.

A PLUGGED EFFLUENT LINE ACCOUNTED FOR APPROXIMATELY 4 HOURS OF OUTAGE TIME DURING NOVEMBER.

12/83	SYSTEM	98.5	97.3	98.3	87.8		744	671	653

NEVADA POWER: REID GARDNER 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

EXCESS VIBRATION PROBLEMS WITH AN I.D. FAN FORCED AN OUTAGE LASTING APPROXIMATELY 12 HOURS.

BOILER RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 79 HOURS OF OUTAGE TIME DURING DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/84	SYSTEM	100.0	98.4	100.0	94.7		744	716	704	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 40 HOURS DURING JANUARY DUE TO BOILER-RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/84	SYSTEM	96.3	95.3	95.8	84.9		696	620	591	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT DURING FEBRUARY, THE FGD SYSTEM WAS OFF LINE 5.5 HOURS DUE TO THE CLEANING OF AN ABSORBER TRAY.

THE UNIT WAS DOWN APPROXIMATELY 79 HOURS DUE TO BOILER OUTAGES IN FEBRUARY

THE FGD SYSTEM WAS DOWN 12.5 HOURS DURING FEBRUARY FOR DEFUSER CLEANING.

THE FGD SYSTEM WAS DOWN EIGHT HOURS DUE TO HIGH OUTLET DUCT PRESSURE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/84	SYSTEM	96.7	96.6	96.6	93.8		744	723	698	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE 21.4 HOURS IN MARCH DUE TO A BOILER OUTAGE.

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS OFF LINE 8.3 HOURS TO CLEAN AN ABSORBER TRAY.

DUE TO A PROBLEM WITH THE REHEAT FAN, THE FGD SYSTEM WAS SHUT DOWN APPROXIMATELY 6 HOURS DURING MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/84	SYSTEM	91.6	88.6	88.6	64.7		720	526	466	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN 3.3 HOURS DURING APRIL TO REPAIR A VENTURI LINE.

ON APRIL 2ND, 13TH, 18TH AND 19TH THE FGD SYSTEM WAS DOWN A TOTAL OF 37.2 HOURS DUE TO PLUGGED ABSORBER TRAYS.

THE FGD SYSTEM WAS DOWN APPROXIMATELY 13 HOURS DURING APRIL TO REPAIR AN EFFLUENT LINE.

THE FGD SYSTEM WAS OFF LINE 2.4 HOURS DURING APRIL DUE TO A LEAK IN A VENTURI LINE.

DURING APRIL THE FGD SYSTEM WAS DOWN 8 HOURS TO MAKE REPAIRS ON THE VENTURI THROAT SPRAY SYSTEM.

DUE TO A BOILER OUTAGE, THE UNIT WAS SHUT DOWN APPROXIMATELY 194 HOURS IN APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/84	SYSTEM	100.0	100.0	100.0	49.3		744	343	367	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 377 HOURS IN MAY DUE TO BOILER PROBLEMS.

6/84	SYSTEM	100.0	99.8	100.0	93.9		720	677	676

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE APPROXIMATELY 44 HOURS IN JUNE DUE TO BOILER RELATED PROBLEMS.

7/84	SYSTEM	98.9	97.1	98.7	86.1		744	660	641

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF LINE APPROXIMATELY 1 HOUR IN JUNE DUE TO HIGH DUCT PRESSURE.

THE UNIT WAS DOWN FOR APPROXIMATELY 36 HOURS DURING JULY DUE TO BOILER-RELATED PROBLEMS.

THE FGD SYSTEM WAS OFF LINE FOR 7.5 HOURS DURING JULY IN ORDER TO CLEAN THE ABSORBER TRAY.

8/84	SYSTEM	100.0	99.9	100.0	94.8		744	706	706

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FOR 38.5 HOURS IN AUGUST DUE TO BOILER RELATED PROBLEMS.

9/84	SYSTEM	97.5	97.4	97.4	94.7		720	700	682

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER TRAY CLEANING RESULTED IN APPROXIMATELY 16 HOURS OF DOWN TIME DURING SEPTEMBER.

THE UNIT WAS DOWN APPROXIMATELY 20 HOURS IN SEPTEMBER DUE TO BOILER RELATED PROBLEMS.

10/84	SYSTEM	98.0	96.8	97.0	64.7		744	498	482

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS SHUT DOWN APPROXIMATELY ONE HOUR TO CHECK UNIT TWO EMISSION BUS.

A VENTURI HIGH OUTLET TEMPERATURE EXCURSION RESULTED IN APPROXIMATELY 8 HOURS OF DOWN TIME DURING OCTOBER.

THE FGD SYSTEM WAS OFF-LINE FOR APPROXIMATELY 5 HOURS TO CLEAN ABSORBER TRAYS.

HIGH PRESSURE IN THE ABSORBER INLET DUCT FORCED THE SYSTEM OFF-LINE FOR APPROXIMATELY 1 HOUR.

THE FGD SYSTEM AND UNIT WAS SHUT DOWN ON OCTOBER 21 AND REMAINED DOWN FOR THE REMAINDER OF THE MONTH FOR A SCHEDULED MAINTENANCE OUTAGE.

11/84	SYSTEM	100.0	99.9	100.0	71.0		720	512	511

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UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

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

8/85	SYSTEM	100.0	98.7	100.0	95.2		744	717	708

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF JULY.

9/85	SYSTEM	80.1	79.0	79.0	74.8		720	682	538

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER TRAY AND VENTURI PLUGGING CAUSED SEVERAL HOURS OF DOWNTIME DURING THE MONTH.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE THREE TIMES DURING SEPTEMBER FOR HIGH TEMPERATURE READING ON THE FAN BEARINGS. ROUGHLY 70 HOURS OF DOWN TIME WERE ATTRIBUTED TO FAN BEARING INSPECTION/REPAIR WORK.

10/85	SYSTEM	100.0	96.2	100.0	48.3		744	374	360

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF OCTOBER.

11/85	SYSTEM	99.8	99.1	99.8	98.1		720	712	706

** PROBLEMS/SOLUTIONS/COMMENTS

LESS THAN ONE HOUR OF FGD SYSTEM-RELATED OUTAGE TIME WAS LOGGED DURING NOVEMBER. THE OUTAGE TIME WAS REQUIRED FOR ABSORBER RECYCLE LINE CLEANING.

12/85	SYSTEM	93.3	92.9	93.0	89.2		744	714	664

** PROBLEMS/SOLUTIONS/COMMENTS

ROUGHLY 50 HOURS OF FGD SYSTEM DOWNTIME DURING THE MONTH WERE ATTRIBUTED TO ABSORBER TRAY AND SPRAY NOZZLE INSPECTION AND CLEANING WORK. TRAY PLUGGING HAD FORCED THE SYSTEM OUT OF SERVICE.

1/86	SYSTEM	99.9	99.9	99.9	98.8		744	736	735

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS OCCURRED DURING JANUARY.

2/86	SYSTEM	100.0	100.0	100.0	100.0		672	672	672

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS OCCURRED IN FEBRUARY.

3/86	SYSTEM	100.0	99.6	100.0	88.1		744	658	656

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/86	SYSTEM	29.9	99.9	28.0	27.3		720	197	196	

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT/SCRUBBER OVERHAUL SHUTDOWN BEGAN 4/9/86.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/86	SYSTEM	0.0		0.0	0.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT/SCRUBBER OVERHAUL OUTAGE CONTINUED THROUGH MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/86	SYSTEM	59.8	95.5	56.5	52.2		720	394	376	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT/SCRUBBER OUTAGE CONTINUED TO 6/13/86. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/86	SYSTEM	100.0	99.9	100.0	93.9		744	699	699	

** PROBLEMS/SOLUTIONS/COMMENTS

FORCED OUTAGES REPORTED FOR JULY WERE ALL BOILER-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/86	SYSTEM	98.9	98.9	98.9	95.7		744	720	712	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER/ABSORBER TRAY PLUGGING FORCED THE FGD SYSTEM OFF LINE APPROXIMATELY 7 HOURS DURING THE MONTH. OTHER OUTAGES IN AUGUST WERE UNIT-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/86	SYSTEM	98.9	98.8	98.8	92.3		720	673	665	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND SCRUBBER WERE TAKEN OFF-LINE FOR A SCHEDULED OUTAGE ON THE 29TH OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/86	SYSTEM	99.6	99.2	99.4	70.0		744	525	521	

** PROBLEMS/SOLUTIONS/COMMENTS

A FEW HOURS OF OUTAGE TIME WERE REQUIRED AT THE END OF THE MONTH TO REPAIR A CHEMICAL FEED LINE.

LATE IN THE MONTH AN ID FAN CONTROL PROBLEM FORCED THE SYSTEM OFF-LINE FOR A SHORT TIME.

THE FGD SYSTEM CAME BACK ON-LINE WITH THE UNIT AFTER A SCHEDULED OUTAGE ENDED ON THE 10TH OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/86	SYSTEM	98.4	98.2	98.2	91.6		720	672	660	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 SCRUBBING SYSTEM WAS OUT OF SERVICE ROUGHLY 12 HOURS IN NOVEMBER FOR CLEANING AND INSPECTION.

12/86 SYSTEM 91.5 90.7 90.9 84.2 744 690 626

** PROBLEMS/SOLUTIONS/COMMENTS

VENTURI LINE LEAKS OCCURRED ON 3 OCCASIONS IN DECEMBER. A VENTURI WATER BOX LEAK ALSO WAS REPORTED. THE SCRUBBER-RELATED OUTAGES TOTALED 15 HOURS OTHER OUTAGE TIME DURING THE MONTH WAS UNIT-RELATED.

1/87 SYSTEM 99.1 99.1 99.1 99.1 744 744 737

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OUT OF SERVICE FOR ALMOST 7 HOURS DUE TO LEAKS IN THE VENTURI DISCHARGE LINE ON JANUARY 9, 1987.

2/87 SYSTEM 99.2 98.3 98.7 65.5 672 448 440

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS TAKEN OUT OF SERVICE FEBRUARY 20 FOR A SCHEDULED OUTAGE.

THE SCRUBBER/ABSORBER WAS UNAVAILABLE FOR CLOSE TO 6 HOURS FEBRUARY 19 DUE TO ELBOW REPAIRS. ALL OTHER FORCED OUTAGES WERE ATTRIBUTED TO BOILER RELATED PROBLEMS.

3/87 SYSTEM 100.0 100.0 100.0 100.0 744 0 0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT OUTAGE CONTINUED THROUGH MARCH.

4/87 SYSTEM 100.0 100.0 100.0 87.6 720 630 631

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT OUTAGE CONTINUED UNTIL APRIL 4.

5/87 SYSTEM 100.0 99.6 100.0 99.1 744 740 738

** PROBLEMS/SOLUTIONS/COMMENTS

SHORT OUTAGES OCCURRED DUE TO BOILER-RELATED PROBLEMS. NO ABSORBER/ SCRUBBER PROBLEMS OCCURRED DURING MAY.

6/87 SYSTEM 99.9 99.9 99.9 97.4 720 702 701

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY OUTAGES REPORTED FOR JUNE WERE CAUSED BY GENERATOR VIBRATIONS AND OTHER BOILER-RELATED MISHAPS. NO SCRUBBER/ABSORBER PROBLEMS OCCURRED.

7/87 SYSTEM 99.4 99.3 99.3 93.0 744 696 692

NEVADA POWER: REID GARDNER 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MOST OF THE OUTAGE TIME REPORTED FOR JULY WAS BOILER-RELATED. HOWEVER, THERE WAS A 5 HOUR OUTAGE PERIOD ON THE 20TH OF THE MONTH ATTRIBUTED TO THE INSTALLATION OF A VENTURI ORIFICE.

8/87	SYSTEM	99.9	99.9	99.9	99.9	744	744	743

** PROBLEMS/SOLUTIONS/COMMENTS

A SHORT OUTAGE PERIOD OCCURRED ON THE 6TH OF THE MONTH DUE TO FAILURE OF THE VENTURI TANK LEVEL CONTROLLER.

A POWER SUPPLY FAILURE CAUSED A SHORT OUTAGE ON AUGUST 31.

9/87	SYSTEM	100.0	100.0	100.0	43.1	720	310	310

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AND UNIT WERE TAKEN OUT OF SERVICE FOR SCHEDULED OVERHAUL WORK ON SEPTEMBER 13, 1987.

10/87	SYSTEM	99.7	100.0	99.8	100.0	744	466	1230

** PROBLEMS/SOLUTIONS/COMMENTS

MOST OF THE OUTAGE TIME REPORTED FOR OCTOBER WAS BOILER-RELATED. HOWEVER, THERE WAS A SHORT OUTAGE PERIOD ON THE 23RD OF THE MONTH ATTRIBUTED TO INLET CONTROL PROBLEMS.

THE SCRUBBER/ABSORBER WAS BROUGHT BACK IN SERVICE OCTOBER 13 FOLLOWING THE SCHEDULED OUTAGE.

11/87	SYSTEM	100.0	100.0	100.0	96.8	720	697	697

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY OUTAGE REPORTED FOR NOVEMBER WAS DUE TO REPAIRS BEING MADE ON THE #5 BURNER. NO SCRUBBER/ABSORBER PROBLEMS OCCURRED.

12/87	SYSTEM	100.0	99.7	100.0	97.1	744	725	722

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERAL OUTAGES OCCURRED DURING DECEMBER DUE TO BOILER TRIPS. NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	2	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	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	331	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	110	
NET UNIT GENERATING CAPACITY WO/FGD - MW	117	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	223.21	(473000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.8	(12.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28959.	(12450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	8.0-10.0	
AVERAGE MOISTURE CONTENT - %	5.50	
RANGE MOISTURE CONTENT - %	5.0-6.0	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONE	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICIENCY - %	75.0	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	4/1974	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	1.5 DIA X 18.0	
SHELL GENERIC MATERIAL	CARBON STEEL; HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AISI 1110; NICKEL BASE/CHROMIUM-IRON-COPPER-MOLY	
LINER GENERIC MATERIAL	NONE; ORGANIC	
LINER SPECIFIC MATERIAL	N/A; NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	157.5	(2500 GPM)
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	4.6	(18.5 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	50.3	(165.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	223.2	(473000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
PARTICLE REMOVAL EFFICIENCY - %	97.0	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	97.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	5.6
CURRENT STATUS	1
COMMERCIAL START-UP	4/1974
INITIAL START-UP	4/1974
CONTRACT AWARDED	9/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %	*****

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	THYSSEN/CEA
DIMENSIONS - FT	30.0 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	NATURAL RUBBER
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	38. (600 GPM)
L/G RATIO - L/CU.M	0.2 (1.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7 (3.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.4 (11.0 FT/S)
SO2 REMOVAL EFFICIENCY - %	91.2

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
GENERIC TYPE	CENTRIFUGAL
SPECIFIC TYPE	RADIAL VANE
TRADE NAME/COMMON TYPE	NR
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
PRESSURE DROP - KPA	0.1 (0.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
TEMPERATURE INCREASE - C	27.8 (50 F)
INLET FLUE GAS TEMPERATURE - C	48.3 (119 F)
NUMBER OF TUBES PER BUNDLE	24
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110

NEVADA POWER: REID GARDNER 2 (CONT.)

** FANS	
NUMBER	1
DESIGN	CENTRIFUGAL
SUPPLIER	BUFFALO FORGE
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	223.21 (473000 ACFM)
FLUE GAS TEMPERATURE - C	176.7 (350 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	INERT FLAKE-FILLED VINYL ESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** TANKS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

NEVADA POWER: REID GARDNER 2 (CONT.)

** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	GRAVITY FLOW FROM INTERIM SLUDGE POND
SITE TREATMENT	CLAY LINING

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

** WATER BALANCE	
WATER LOOP TYPE	CLOSED
MAKEUP WATER ADDITION - LITERS/S	9.8 (155 GPM)

** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0

** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

4/74	SYSTEM							720	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS PLACED IN SERVICE IN APRIL 1974. THE SCRUBBING SYSTEM DESIGN WAS BASED ON INFORMATION AND DATA OBTAINED FROM AN 8000-ACPM PILOT PLANT PROGRAM CONDUCTED AT REID GARDNER IN 1971 AND 1972.

5/74	SYSTEM							744	

6/74	SYSTEM							720	

7/74	SYSTEM							744	

8/74	SYSTEM							744	

9/74	SYSTEM							720	

10/74	SYSTEM							744	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURED SINCE STARTUP IN APRIL. CURRENT OPERABILITIES ARE GREATER THAN 90% WHEN TRONA IS AVAILABLE. WHEN THE TRONA SUPPLY IS EXHAUSTED THE SCRUBBER IS SHUT DOWN.

11/74	SYSTEM							720	

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OPERATIONS HAVE ONLY BEEN INTERRUPTED BY INSUFFICIENT TRONA SUPPLIES. SO2 REMOVAL EFFICENCIES HAVE BEEN IN THE 85% RANGE. BECAUSE OF A COAL STRIKE THE BOILER ONLY OPERATED TWO WEEKS IN NOVEMBER AND THEN A REDUCED LOAD. THERE ARE NO OUTSTANDING MECHANICAL OR PROCESS PROBLEMS.

12/74	SYSTEM							744	

1/75	SYSTEM	94.0						744	

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE FGD SYSTEM OPERATED WITH A 94% OPERABILITY ON TRONA SUPPLEMENTED WITH SODIUM CARBONATE-BRINE. THE UTILITY REPORTED NO MAJOR PROBLEMS FOR THE DECEMBER-JANUARY PERIOD. THERE WAS, HOWEVER, A MINOR PROBLEM WITH FREEZING SODIUM CARBONATE FEED LINES.

2/75	SYSTEM	90.0					672	

** PROBLEMS/SOLUTIONS/COMMENTS

ROUTINE MECHANICAL PROBLEMS WERE ENCOUNTERED DURING FEBRUARY.

ROUTINE INSTRUMENTAL PROBLEMS WERE EXPERIENCED.

ABRASION OF RUBBER-LINED PIPES ACCOUNTED FOR SOME DOWNTIME.

THE FGD SYSTEM PASSED A SECOND PERFORMANCE TEST DURING THE PERIOD.

SEAL WATER FILTERS WERE REPLACED IN FEBRUARY.

BOILER CONTROLS ACCOUNTED FOR SOME DOWNTIME IN FEBRUARY.

RECYCLE LINE STRAINER PLUGGING WAS A PROBLEM DURING THE PERIOD.

3/75	SYSTEM	100.0		0.0		744	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE THROUGHOUT MARCH FOR A TURBINE OVERHAUL.

4/75	SYSTEM	100.0		0.0		720	0	

5/75	SYSTEM	100.0		0.0		744	0	

6/75	SYSTEM	100.0				720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND SCRUBBER WERE PLACED BACK IN SERVICE IN LATE JUNE AFTER THE TURBINE OVERHAUL. THE FGD SYSTEM ACCEPTANCE TEST HAS BEEN SCHEDULED FOR JULY.

7/75	SYSTEM	85.0				744		

8/75	SYSTEM					744		

** PROBLEMS/SOLUTIONS/COMMENTS

A BROKEN BUCKET ELEVATOR CAUSED A FORCED FGD OUTAGE.

WORN RECIRCULATION PIPING CONTRIBUTED TO THE FORCED FGD OUTAGE TIME.

A FORCED FGD OUTAGE WAS CAUSED BY A PUMP RUBBER LINER FAILURE.

STRAINER PLUGGING CONTRIBUTED TO THE FORCED FGD OUTAGE TIME.

9/75	SYSTEM	76.9		69.0		720	645	496
10/75	SYSTEM	87.4		62.0		744	531	464

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THREE FORCED OUTAGES OCCURED DURING SEPTEMBER AND OCTOBER.

A NECESSARY PUMP REPAIR FORCED THE FGD SYSTEM OUT OF SERVICE DURING THE OCTOBER - NOVEMBER PERIOD.

INSTRUMENT PLUGGING CAUSED AN FGD OUTAGE.

REPAIR OF PIPING LEAKAGE NECESSITATED AN FGD OUTAGE.

11/75	SYSTEM		98.8		82.7		720	603	596
12/75	SYSTEM						744		
1/76	SYSTEM	68.7	66.3	66.3	61.6		744	691	458

** PROBLEMS/SOLUTIONS/COMMENTS

FROZEN CARBONATE LINES CONTRIBUTED TO FGD OUTAGE TIME.

A FGD OUTAGE WAS CAUSED BY A PLUGGED PRESSURE-SENSING LINES.

DUCT PRESSURE TRIPS CONTRIBUTED TO FGD OUTAGE TIME.

AN OVERHAUL OF A TRAY RECYCLE PUMP WAS NECESSARY DURING DECEMBER.

2/76	SYSTEM	90.4	85.6	85.6	83.1		696	675	578

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED FOUR SCRUBBER INACTIVE PERIODS DURING FEBRUARY, THREE OF WHICH WERE SCRUBBER-RELATED OUTAGES.

34 HOURS OF OUTAGE TIME WERE REQUIRED TO UNPLUG A VENTURI PUMP.

CHEMICAL DEPLETION CONTRIBUTED TO FGD OUTAGE TIME.

SEAL WATER PROBLEMS WERE ENCOUNTERED DURING FEBRUARY.

3/76	SYSTEM	68.1	59.9	62.5	53.1		744	660	395

** PROBLEMS/SOLUTIONS/COMMENTS

TWO FGD FORCED OUTAGES OCCURED DURING MARCH.

AN ELECTRICAL FAILURE RESULTED IN A 16 HOUR FGD SYSTEM OUTAGE.

PLUGGING IN THE TRAY SYSTEM RESULTED IN A SUBSEQUENT OVERHAUL OF THE TRAY CYCLE PUMPS, REQUIRING 221 HOURS OF DOWNTIME.

4/76	SYSTEM	86.6	77.5	83.4	67.7		720	630	488

** PROBLEMS/SOLUTIONS/COMMENTS

FOUR FORCED SCRUBBER OUTAGES WERE REPORTED BY THE UTILITY FOR APRIL.

PLUGGED SENSING LINES RESULTED IN FGD OUTAGE TIME.

A REHEATER LEAK DURING APRIL CAUSED DOWN TIME FOR REPAIRS.

A VENTURI RECYCLE PUMP SPOOL REPLACEMENT REQUIRED FGD OUTAGE TIME.

NEVADA POWER: REID GARDNER 2 (CONT.)

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

A VENTURI RECYCLE TANK NEEDED PATCHING DURING THE MONTH.

5/76	SYSTEM	99.0	83.0	98.0	79.0	744		
6/76	SYSTEM	95.3	86.8	87.0	82.2	720	682	592

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGED VENTURI LINES ACCOUNTED FOR 6 HOURS DURING MAY.

A 6 HOUR OUTAGE RESULTED FROM PLUGGED SENSING LINES.

THE SCRUBBING SYSTEM WAS SHUTDOWN FOR 54 HOURS WHILE CEMENT WAS BEING
POURED IN THE SCRUBBER AREA.

7/76	SYSTEM	94.2	82.3	91.2	59.9	744	542	446

** PROBLEMS/SOLUTIONS/COMMENTS

A PROBLEM WITH A HIGH SOLIDS CONCENTRATION IN THE VENTURI SCRUBBING CYCLE
CONTRIBUTED TO FGD OUTAGE TIME.THE REPLACEMENT OF A RUBBER-LINED PIPE IN THE VENTURI SCRUBBER WAS
NECESSARY DURING JULY.

BOILER RELATED OUTAGES ACCOUNTED FOR 256 HOURS OF FGD SYSTEM DOWNTIME.

8/76	SYSTEM	91.7	69.1	70.8	65.8	744	709	490

** PROBLEMS/SOLUTIONS/COMMENTS

DEPLETION OF CHEMICAL ABSORBENT (TRONA) CONTRIBUTED TO FGD OUTAGE
TIME (141 HOURS).

THE FGD SYSTEM WAS OUT OF SERVICE 52 HOURS FOR BOILER RELATED PROBLEMS.

VENTURI RECYCLE LINE LEAKING ACCOUNTED FOR 27 HOURS OF SCRUBBER
OUTAGE TIME.

THE THICKENER PLUGGED CAUSING 34 HOURS OF FGD SYSTEM DOWN TIME.

9/76	SYSTEM	92.4	90.2	91.9	85.2	720	681	614

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING IN THE ID FAN REFERENCE LINES RESULTED IN 36 HOURS OF OUTAGE TIME

A 19 HOUR FGD SYSTEM SHUTDOWN WAS CAUSED BY A FALSE HIGH TEMPERATURE
READING IN THE VENTURI DUE TO WATER IN THE INSTRUMENT.

10/76	SYSTEM	95.2	92.6	94.7	86.4	744	694	643

** PROBLEMS/SOLUTIONS/COMMENTS

FIVE HOURS OF SCRUBBER OUTAGE TIME WAS CAUSED BY VENTURI GAS DAMPER
PROBLEMS.REPLACEMENT OF THE CARBONATE FEED LINE ACCOUNTED FOR 16 HOURS OF FGD
SYSTEM OUTAGE.PLUGGING IN THE SCRUBBER EFFLUENT LINE CONTRIBUTED TO FGD SYSTEM
DOWN TIME.

SCRUBBER OUTAGE TIME DUE TO BOILER-RELATED PROBLEMS AMOUNTED TO

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

APPROXIMATELY 66 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/76	SYSTEM	51.9	60.1	60.1	51.9		720	621	374	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN FOR REPAIR OF A CONDENSER TUBE LEAK AND BOTTOM ASH NOZZLE.

DURING THE BOILER OUTAGE THE SCRUBBER GUILLOTINE DAMPERS WERE BADLY DAMAGED WHEN LIMIT SWITCH ADJUSTMENTS WERE BEING MADE. THE SCRUBBER REMAINED OUT OF SERVICE FROM NOVEMBER 16 THROUGH THE END OF THE MONTH.

12/76	SYSTEM	0.0			0.0		744	275	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS DOWN THE ENTIRE MONTH OF DECEMBER FOR A SCHEDULED OVERHAUL.

THE FGD SYSTEM WAS UNAVAILABLE THROUGH DECEMBER AS DAMPER REPAIRS HAD NOT YET BEEN MADE. FGD SYSTEM SERVICES WERE NOT REQUIRED DURING THE PERIOD.

1/77	SYSTEM	100.0			0.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED BOILER OVERHAUL CONTINUED THROUGH JANUARY.

2/77	SYSTEM	92.7	79.0	89.3	60.8		672	517	409	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS PUT BACK IN SERVICE ON FEBRUARY 7 AFTER COMPLETION OF THE SCHEDULED BOILER OVERHAUL.

A MINOR SCRUBBER OUTAGE RESULTED FROM A VENTURI PIPING LEAK.

DURING THE LAST TWO DAYS OF FEBRUARY SOME FGD SYSTEM ELECTRICAL PROBLEMS OCCURRED.

A MINOR SCRUBBER OUTAGE WAS REQUIRED TO CLEAN THE RECYCLE TANK WASH TRAY.

3/77	SYSTEM	88.5	86.3	86.9	76.4		744	659	569	

** PROBLEMS/SOLUTIONS/COMMENTS

A PLUGGED ABSORBER TRAY CONTRIBUTED TO THE FGD SYSTEM OUTAGE TIME.

ELECTRICAL PROBLEMS IN THE FGD SYSTEM WERE EXPERIENCED DURING MARCH.

DUCT HI/LO PRESSURE SENSORS TRIGGERED A NINE HOUR FGD SYSTEM SHUTDOWN.

ID FAN PRESSURE SENSORS FORCED THE FGD SYSTEM OFF LINE FOR 28 HOURS IN MARCH.

4/77	SYSTEM	94.8	94.8	94.8	94.8		720	720	683	

** PROBLEMS/SOLUTIONS/COMMENTS

37 HOURS OF FORCED FGD SYSTEM OUTAGE TIME RESULTED FROM A LEAK IN THE VENTURI DISCHARGE LINE.

5/77	SYSTEM	98.7	89.8	96.1	63.2		744	524	470	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED OUTAGES ACCOUNTED FOR 255 HOURS OF FGD SYSTEM DOWNTIME IN MAY.

BOILER ASH SLUICE PUMPS WERE OUT OF SERVICE FOR APPROXIMATELY 10 HOURS IN MAY. BECAUSE THE EMERGENCY SPRAY SYSTEM WAS UNAVAILABLE THE FGD SYSTEM WAS FORCED OUT OF SERVICE.

6/77	SYSTEM	95.1	93.3	94.4	82.8	720	639	596

** PROBLEMS/SOLUTIONS/COMMENTS

ID FAN SENSING LINE PLUGGING FORCED THE SYSTEM OUT OF SERVICE FOR SEVEN HOURS IN JUNE.

A BREAKER TRIP RESULTED IN A LOSS OF BOILER CONTROL POWER FOR FIVE HOURS.

THE SPRAY NOZZLES IN THE VENTURI PLUGGED CAUSING 28 HOURS OF FGD SYSTEM OUTAGE.

7/77	SYSTEM	40.0	41.6	40.6	40.0	744	733	298

** PROBLEMS/SOLUTIONS/COMMENTS

SEVEN FORCED FGD OUTAGES WERE DUE TO SCRUBBER DUCT HI/LO PRESSURE TRIPS DURING JULY.

ONE TWO HOUR OUTAGE WAS REQUIRED TO CORRECT A PLUGGING PROBLEM IN THE VENTURI SPRAY NOZZLES DURING JULY.

8/77	SYSTEM	88.0	91.3	86.8	79.4	744	646	591

** PROBLEMS/SOLUTIONS/COMMENTS

A LEAK IN THE VENTURI RECYCLE HEADER RESULTED IN AN FGD SYSTEM OUTAGE.

A SCRUBBER DUCT HIGH/LOW BOILER TRIP OCCURRED RESULTING IN 35 HOURS OF SCRUBBER OUTAGE TIME.

THERE WAS ONE 64 HOUR BOILER-RELATED OUTAGE DURING AUGUST.

9/77	SYSTEM	67.7	64.4	66.5	64.1	720	716	461

** PROBLEMS/SOLUTIONS/COMMENTS

A LEAK IN THE VENTURI RECYCLE LINES RESULTED IN FORCED FGD SYSTEM OUTAGE TIME.

TRAY RECYCLE PUMP REPAIR NECESSITATED NEARLY SIX HOURS OF FGD SYSTEM OUTAGE TIME.

DUCT HI/LO PRESSURE SENSOR LINE PLUGGING PROBLEMS ACCOUNTED FOR 58 HOURS OF FORCED FGD SYSTEM OUTAGE.

26 HOURS OF OUTAGE TIME OCCURRED WHEN THE ASH SLUICE SYSTEM WENT OUT OF SERVICE. THE FGD SYSTEM IS LEFT WITHOUT EMERGENCY SPRAYS WHEN THIS OCCURS SINCE THEY ARE INTEGRATED SYSTEMS.

TRAY PLUGGING RESULTED IN 96 HOURS OF FGD SYSTEM OUTAGE WHICH BEGAN ON SEPTEMBER 27 AND CONTINUED THROUGH THE END OF THE MONTH.

THE FGD SYSTEM WAS TAKEN OFF-LINE TO ALLOW CLEANING OF A SUCTION SCREEN

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

IN THE TRAY RECYCLE TANK.										
10/77	SYSTEM	79.2	83.2	79.1	78.8		744	704	586	
** PROBLEMS/SOLUTIONS/COMMENTS										
FGD SYSTEM OUTAGE TIME WAS NEEDED TO CLEAN A PLUGGED ABSORBER RECYCLE TANK SCREEN.										
A VENTURI TANK SEPARATOR REQUIRED CLEANING CAUSING FGD SYSTEM DOWN TIME.										
A HIGH SOLIDS LEVEL IN THE VENTURI RECYCLE SYSTEM REQUIRED THREE HOURS OF DOWNTIME TO MAKE CORRECTIONS.										
A SCRUBBER DUCT HIGH/LOW PRESSURE TRIP FORCED THE BOILER AND SCRUBBER OUT OF SERVICE FOR 42 HOURS.										
ID FAN LEAKS WERE PATCHED DURING OCTOBER.										
11/77	SYSTEM	80.7	0.0	0.0	0.0		720	98	0	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER WAS OUT OF SERVICE FROM OCTOBER 31 UNTIL NOVEMBER 26 TO INSTALL A NEW PRIMARY AIR FAN.										
THE SCRUBBER WAS OUT OF SERVICE FOR AN ID FAN ROTOR REPAIR.										
12/77	SYSTEM	0.0	0.0	0.0	0.0		744	742	0	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE SCRUBBER MODULE WAS OUT OF SERVICE TO INSTALL NEW WEAR PLATES ON AN ID FAN ROTOR.										
1/78	SYSTEM	71.7	73.9	73.9	67.0		744	675	499	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE SCRUBBER WENT BACK ON LINE JANUARY 4 AFTER THE INSTALLATION OF WEAR PLATES ON AN ID FAN ROTOR.										
REPAIRS ON THE THICKNER OVERFLOW PUMP CONTRIBUTED TO FGD SYSTEM OUTAGE TIME.										
SOME SOLIDS BUILD UP IN THE VENTURI WAS ENCOUNTERED DURING JANUARY.										
2/78	SYSTEM	92.9	91.9	92.5	87.0		672	636	585	
** PROBLEMS/SOLUTIONS/COMMENTS										
A DUCT HIGH/LOW PRESSURE TRIP CONTRIBUTED TO THE FGD SYSTEM OUTAGE TIME.										
THE BOILER WAS OUT OF SERVICE FOR 40 HOURS DURING FEBRUARY.										
3/78	SYSTEM	100.0	88.7	100.0	80.2		744	672	596	
** PROBLEMS/SOLUTIONS/COMMENTS										
THERE WERE NO FORCED FGD SYSTEM OUTAGES DURING MARCH HOWEVER, THE SYSTEM WAS SHUTDOWN FOR 18 HOURS WHEN THE BOILER OPERATED AT LOW LOAD AND STABLE FGD SYSTEM OPERATIONS WERE NOT ATTAINABLE.										
4/78	SYSTEM	100.0	98.7	100.0	44.1		720	321	317	

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO FGD SYSTEM RELATED OUTAGES DURING APRIL. THE BOILER WAS OUT OF SERVICE FOR 403 HOURS IN APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/78	SYSTEM	99.8	99.7	99.8	97.4		744	727	724	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF FOR APPROXIMATELY 18 HOURS FOR REPAIRS ON THE COAL MILL SPOKES.

A SCRUBBER CIRCUIT BREAKER TRIPPED AND CAUSED AN FGD SYSTEM OUTAGE OF ABOUT ONE HOUR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/78	SYSTEM	89.4	89.4	89.4	89.4		720	720	644	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR 76 HOURS FOR REPAIR OF A VENTURI WATER BOX LEAK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/78	SYSTEM	80.1	81.8	78.9	74.3		744	676	553	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR 43 HOURS DUE TO A BOILER TUBE LEAK.

HIGH DUCT PRESSURE WAS THE CAUSE OF A BOILER TRIP. THE HIGH DUCT PRESSURE WAS CAUSED BY A FAULTY POSITIONER ON THE ID FAN CONTROLLER.

THE ID FAN EXPANSION JOINT ON THE SCRUBBER SIDE WAS REPLACED.

AN FGD OUTAGE OCCURRED WHEN A BOLT, WHICH FELL FROM THE FAN, CAUSED VIBRATIONS.

A SECOND BOILER TRIP DURING JULY WAS CAUSED BY AN UNDETERMINED SOURCE.

THE SUCTION LINE FROM THE VENTURI DISCHARGE LINE TO THE EFFLUENT PUMPS HAD TO BE CLEANED BECAUSE OF PLUGGING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/78	SYSTEM	81.4	82.2	82.4	81.1		744	733	403	

** PROBLEMS/SOLUTIONS/COMMENTS

TWO SCHEDULED OUTAGES DURING AUGUST WERE NECESSARY TO CLEAN THE SCRUBBER TRAY.

A SCHEDULED OUTAGE WAS NECESSARY TO CLEAN THE NOZZLES ON THE SCRUBBER SPRAY RACK. THE STAINLESS STEEL PIPE TO THE TRAY SPRAY NOZZLES WAS ALSO REPLACED.

ON AUGUST 1 THE SCRUBBER EXPERIENCED HIGH DUCT PRESSURE. DURING THE SUBSEQUENT OUTAGE A CLINKER WAS REMOVED FROM THE BOILER BOTTOM HOPPER.

ON AUGUST 3 IT WAS NECESSARY TO TAKE THE SCRUBBER OFF LINE TO REPACK THE VENTURI PUMPS.

A THIRD OUTAGE IN AUGUST WAS CAUSED BY A LOSS OF THE BOILER ASH PANEL CONTROL POWER. THIS LEFT THE SCRUBBER WITHOUT EMERGENCY SPRAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/78	SYSTEM	98.5	97.4	98.4	93.8		720	693	675	

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

** PROBLEMS/SOLUTIONS/COMMENTS

A SCRUBBER OUTAGE WAS NECESSARY DURING SEPTEMBER IN ORDER TO CLEAN THE TRAY RECYCLE TANK AS WELL AS THE TRAY AND SOME OF THE LINES.

THREE BOILER RELATED OUTAGES WERE CAUSED BY PROBLEMS WITH A 10-KW GENERATOR. CONTROL POWER SURGES WERE BEING CAUSED BY OVERVOLTAGE MOTOR TRIPS.

10/78	SYSTEM	96.2	95.0	96.0	92.1		744	722	685

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER SCRUBBER INSTRUMENTATION REPAIRS WERE PERFORMED.

THE BOILER WAS FORCED OUT OF SERVICE FOR ABOUT 28 HOURS BECAUSE OF BOILER DRUM WATER LEVEL PROBLEMS.

11/78	SYSTEM	97.5	93.2	93.6	35.9		720	277	259

** PROBLEMS/SOLUTIONS/COMMENTS

A FORCED FGD SYSTEM OUTAGE OCCURRED DUE TO HIGH DUCT PRESSURE.

WORK WAS DONE ON ID FAN CONTROLS DURING NOVEMBER.

THE UNIT WAS SHUTDOWN ON NOVEMBER 12 FOR SCHEDULED BOILER MAINTENANCE. THE UNIT REMAINED OUT OF SERVICE THROUGH THE END OF THE MONTH.

12/78	SYSTEM	95.9	44.9	100.0	13.3		744	221	99

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE UNTIL DECEMBER 26 WHEN A SCHEDULED MAINTENANCE OUTAGE WAS COMPLETED.

THE SCRUBBER WAS TAKEN OUT OF SERVICE FOR 30 HOURS TO UNPLUG AN EFFLUENT LINE.

WHILE THE SCRUBBER WAS DOWN THE BOILER WAS OUT OF SERVICE SO THAT PULVERIZER REPAIRS COULD BE MADE.

1/79	SYSTEM	82.9	81.3	81.3	73.9		744	676	550 81.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO CLEAN A TRAY SCREEN.

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO REPAIR A LEAK IN THE VENTURI RECYCLE LINE.

THE BOILER WAS DOWN 67 HOURS FOR TUBE LEAK REPAIRS.

REPAIRS WERE MADE ON THE TRAY AND SPRAY PUMP SYSTEMS.

A HIGH DUCT PRESSURE TRIP WAS RESPONSIBLE FOR A SIX HOUR OUTAGE. THE PRESSURE SENSING LINES WERE CLEANED.

THE SCRUBBER TRAY PUMP MOTOR SHORTED TO GROUND. THE 2C LOAD TRIPPED AND POWER TO THE VENTURI RECYCLE PUMP WAS LOST. THERE WAS AN ADDITIONAL SCRUBBER TRIP DUE TO HIGH DUCT PRESSURE DURING THIS SAME PERIOD.

2/79	SYSTEM	96.2	93.1	93.2	87.9		672	634	591 87.0

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TO REPAIR A LEAK IN THE VENTURI LINE.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE BY A SCRUBBER POWER FAILURE.

THE SCRUBBER WAS TAKEN OUT OF SERVICE BECAUSE A BREAK IN THE ASH WATER CIRCULATING WATER LINE RESULTED IN A LOSS OF EMERGENCY COOLING WATER.

THE FGD SYSTEM WAS FORCED OUT OF SERVICE BY A LEAK ON THE VENTURI RACE TRACK SPRAY SECTION. THE VENTURI RACE TRACK NOZZLES WERE CLEANED DURING THE OUTAGE.

THE BOILER WAS OUT OF SERVICE 38 HOURS FOR TUBE LEAK REPAIRS.

3/79 SYSTEM 97.9 96.7 100.0 89.4 744 688 665 90.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OUT OF SERVICE 63 HOURS WHILE BOILER TUBE LEAK REPAIRS WERE MADE.

THE BOILER WAS FORCED OUT BY A HIGH FURNACE PRESSURE TRIP. WHILE THE BOILER WAS DOWN, SENSING LINES WERE CLEANED ON THE SCRUBBER.

4/79 SYSTEM 89.1 96.0 98.9 88.8 720 666 639 91.0

** PROBLEMS/SOLUTIONS/COMMENTS

A HIGH PRESSURE ALARM ON THE SCRUBBER DUCT TRIPPED THE SCRUBBER OFF LINE. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED. THIS OCCURRED TWICE DURING THE MONTH OF APRIL AND ACCOUNTED FOR 79 HOURS OF OUTAGE TIME.

A BOILER FURNACE BURNER WAS CLEANED DURING A 71 HOUR SCRUBBER OUTAGE RESULTING FROM A HIGH PRESSURE ALARM.

A CONTROL POWER FAILURE OCCURRED CAUSING A SCRUBBER TRIP WHEN A 10 KW GENERATOR WAS PUT BACK IN SERVICE.

5/79 SYSTEM 99.8 99.5 99.7 83.9 744 627 624 93.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OUT OF SERVICE FOR ABOUT FIVE DAYS TO REPAIR TUBE LEAKS.

PRESSURE SENSING LINES ON THE SCRUBBER CONTROLS WERE CLEANED DURING A TWO HOUR OUTAGE AFTER THE SCRUBBER BEGAN HAVING CONTROL PROBLEMS.

6/79 SYSTEM 91.1 87.1 89.2 73.5 720 607 529 92.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS FORCED OUT OF SERVICE DUE TO A VENTURI PUMP POWER LOSS.

20 HOURS OF SCRUBBER OUTAGE TIME WAS REQUIRED TO REPAIR VENTURI PUMP DISCHARGE VALVES.

THE BOILER WAS OUT OF SERVICE 127 HOURS DURING JUNE TO REPAIR HIGH PRESSURE HEATER TUBE LEAKS, TO WELD A CAP ON THE HIGH PRESSURE HEATER, TO WORK ON PRIMARY AIR FANS, AND TO REPAIR A BOILER TUBE LEAK.

SCRUBBER OUTAGE TIME WAS REQUIRED TO CLEAN PRESSURE SENSING LINES.

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

THE SCRUBBER WAS FORCED OUT OF SERVICE JUNE 30 BY A HIGH VENTURI OUTLET TEMPERATURE TRIP.

7/79	SYSTEM	84.3	90.0	93.4	77.6	744	642	578	92.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER OUTAGE WHICH BEGAN JUNE 30 CONTINUED UNTIL JULY 4. DURING THE OUTAGE A BAD VENTURI TEMPERATURE PROBE WAS REPLACED. SOME BOILER TUBE REPAIRS WERE MADE AT THIS TIME.

THE BOILER AND SCRUBBER WERE OFF FOR 50 HOURS TO REPAIR A BOILER TUBE LEAK

SCRUBBER AND BOILER TRIPPED OFF FOR ABOUT 50 HOURS. THIS OUTAGE WAS CAUSED BY A LOSS OF CONTROL AIR TO THE SCRUBBER AND A POWER LOSS TO THE SCRUBBER AIR COMPRESSOR.

THE SENSING LINES ON THE SCRUBBER WERE CLEANED TO PREVENT HIGH SCRUBBER DUCT PRESSURE. THE SYSTEM WAS OUT FOR ABOUT 33 HOURS.

8/79	SYSTEM	98.5	98.9	98.4	93.2	744	701	693	92.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS SHUTDOWN FOR ABOUT 40 HOURS TO REPAIR A BOILER TUBE LEAK.

THE SCRUBBER WAS OFF TO REPAIR A LEAK IN A VENTURI PUMP DISCHARGE BODY. THE REPAIR REQUIRED ABOUT 9 HOURS.

HIGH PRESSURE IN SCRUBBER DUCT FORCED THE SCRUBBER OUT OF SERVICE. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED.

9/79	SYSTEM	86.0	83.8	82.5	66.2	720	569	477	92.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPAIR BOILER TUBE LEAKS. THIS OCCURRED TWICE CAUSING A TOTAL OF 126 HOURS OF DOWN TIME.

SOME OUTAGE TIME WAS REQUIRED TO UNPLUG EFFLUENT AND VENTURI LINES AND TO CLEAN THE VENTURI RACE TRACK SPRAY SECTIONS.

HIGH PRESSURE WAS ENCOUNTERED TWICE IN THE SCRUBBER DUCT AND ONCE IN THE BOILER FURNACE. THIS CAUSED SOME OUTAGE TIME TO CLEAN THE SCRUBBER PRESSURE SENSING LINES.

THE SCRUBBER WAS DOWN WITH THE BOILER SO REPAIRS TO THE MAIN STEAM DRAIN LINE COULD BE CONDUCTED.

THE SCRUBBER WAS DOWN FOR APPROXIMATELY SEVEN HOURS TO MAKE REPAIRS ON THE CONTROL SYSTEM.

10/79	SYSTEM	100.0	88.3	100.0	31.3	744	263	233	91.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS DOWN FOR 13 HOURS WITH THE BOILER DUE TO A MASTER FUEL TRIP ON THE BOILER AND LATER FOR 41 HOURS FOR BOILER TUBE REPAIRS.

A BOILER TRIP OCCURRED ON OCTOBER 12 BECAUSE OF HIGH FURNACE PRESSURE. AN EXPLOSION BLEW AN EXPANSION JOINT ON THE DISCHARGE OF A PRIMARY AIR FAN. THE BOILER OUTAGE CONTINUED THROUGH THE END OF THE MONTH AS GENERAL MAINTENANCE WAS PERFORMED.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

11/79 SYSTEM 98.8 96.0 97.3 43.3 720 325 312 92.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER AND BOILER DID NOT OPERATE UNTIL NOVEMBER 17 WHEN THE SCHEDULED MAINTENANCE WAS COMPLETED.

THE SCRUBBER WAS FORCED OUT OF SERVICE FOR APPROXIMATELY THREE HOURS TO RECTIFY A VIBRATIONS PROBLEM IN THE REHEATER FAN.

THE SCRUBBER WENT OFF LINE WHEN A TRAY SPRAY PUMP SHORTED TO GROUND TRIPPING A SCRUBBER POWER LOAD CENTER.

12/79 SYSTEM 97.9 97.7 97.9 97.7 744 744 727 92.6

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER/SCRUBBER HIGH DUCT PRESSURE TRIP OCCURRED. THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED. THE TRIP ACCOUNTED FOR A LITTLE OVER AN HOUR OF OUTAGE TIME.

THE CONTROL SYSTEM ON THE VENTURI DAMPER REQUIRED REPAIRS WHICH RESULTED IN APPROXIMATELY THREE HOURS OF DOWN TIME.

THE SCRUBBER WAS SHUT DOWN TO MAKE REPAIRS ON THE EMERGENCY SPRAY SYSTEM AND A REHEATER FAN BEARING.

DURING A MAINTENANCE CHECK FOR D. C. GROUNDING THE BOILER AND SCRUBBER WERE FORCED OUT OF SERVICE FOR TWO HOURS.

1/80 SYSTEM 97.4 94.5 96.9 81.6 744 642 607 94.5

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SCRUBBER WAS TAKEN OFF LINE WITH THE BOILER TO REPLACE THE REBUILT BOILER HIGH PRESSURE HEATER. THIS OUTAGE LASTED APPROXIMATELY 112 HOURS.

REPAIRS WERE NEEDED ON THE LEFT HAND INTERCEPT VALVE ON THE TURBINE CAUSING THE SCRUBBER TO BE TAKEN OFF LINE ONCE AGAIN WITH THE BOILER.

THE CLEANING OF THE VENTURI RACE TRACK NOZZLES ACCOUNTED FOR TWO SCRUBBER OUTAGES TALLING 15 HOURS.

THE SCRUBBER WAS TAKEN OFF LINE FOR FOUR HOURS SO MAINTENANCE COULD BE PERFORMED ON THE ID FAN DAMPER CONTROLS.

2/80 SYSTEM 96.9 96.9 96.9 96.9 696 696 675 95.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS TAKEN OFF-LINE TWICE DURING FEBRUARY DUE TO A MALFUNCTION OF THE ID FAN CONTROLS. THE PRESSURE SENSING LINES WERE CLEANED DURING THE OUTAGE.

THE SCRUBBER RACE TRACK NOZZLES HAD TO BE CLEANED TWICE, REQUIRING APPROXIMATELY FOUR HOURS OF OUTAGE TIME.

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

REPAIRS WERE MADE ON THE SCRUBBER EMERGENCY SPRAY LINE RESULTING IN ABOUT FOUR HOURS OF OUTAGE TIME.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

THE SCRUBBER HAD TO BE SHUT DOWN SO REPAIRS ON THE ID FAN DAMPER CONTROLS COULD BE MADE.										
3/80	SYSTEM	98.4	97.5	97.5	97.5		744	744	725	96.3
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING MARCH THE SCRUBBER WAS TAKEN OFF LINE DUE TO THE UNAVAILABILITY OF THE EMERGENCY SPRAY SYSTEM. DURING THIS TIME MAINTENANCE WAS DONE ON THE A AND B ASH SLUICE PUMPS.										
LATER IN THE MONTH AN OUTAGE WAS CAUSED BY A LEAK IN THE EMERGENCY SPRAY LINE.										
PROBLEMS RELATED TO A LOW VENTURI FLOW CAUSED FOUR HOURS OF OUTAGE TIME IN MARCH. NO CAUSE FOR THE FLOW PROBLEM WAS REPORTED.										
4/80	SYSTEM	99.0	99.0	99.0	93.5		720	680	673	97.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM WAS UNAVAILABLE FOR 7 HOURS TO UNPLUG THE VENTURI RACE TRACK.										
THE BOILER WAS OUT OF SERVICE FOR 40 HOURS DUE TO BOILER TUBE LEAKS.										
5/80	SYSTEM	100.0	86.3	100.0	14.3		744	124	107	96.5
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD OVERHAUL WAS COMPLETED EARLY IN MAY.										
A BOILER OVERHAUL WAS STARTED AND COMPLETED DURING MAY. THIS OUTAGE LASTED ALMOST 23 DAYS.										
6/80	SYSTEM	99.6	97.5	99.5	73.4		720	541	528	96.6
** PROBLEMS/SOLUTIONS/COMMENTS										
THE BOILER WAS OUT OF SERVICE SEVERAL TIMES DURING JUNE. THIS CAUSED THE FGD SYSTEM TO BE OUT APPROXIMATELY 80 HOURS.										
VENTURI RACE TRACK NOZZLES NEEDED TO BE UNPLUGGED CAUSING THE FGD SYSTEM OUT OF SERVICE FOR SEVERAL HOURS.										
7/80	SYSTEM	88.1	77.2	86.2	74.5		744	718	554	93.3
** PROBLEMS/SOLUTIONS/COMMENTS										
BOILER RELATED OUTAGES KEPT THE FGD SYSTEM OUT OF SERVICE FOR OVER 100 HOURS DURING JUNE. OVER HALF OF THIS OUTAGE TIME WAS A RESULT OF CONTROL PROBLEMS WITH THE BOILER AND FGD SYSTEM. THE BOILER WAS RUN WITHOUT THE FGD SYSTEM IN ORDER TO DETERMINE IF THE CONTROL PROBLEMS WERE FGD OR BOILER RELATED. PROBLEMS WERE REPAIRED IN BOTH CONTROL SYSTEMS. THIS ALSO CAUSED OVER 60 HOURS OF FGD SYSTEM RELATED DOWN TIME.										
PROBLEMS WITH THE BOTTOM HOPPER SEALS CAUSED THE FGD SYSTEM TO GO DOWN.										
THE FGD SYSTEM NEEDED TO BE OFF LINE FOR 13 HOURS FOR INSTRUMENT CHECKS AND MAINTENANCE.										
THE FGD SYSTEM WAS FORCED OUT OF SERVICE WHEN THE EMERGENCY SPRAY SYSTEM FAILED. THE ASH SLUICE PUMP SHAFT WAS REPAIRED DURING THIS TIME.										
8/80	SYSTEM	97.0	96.3	96.4	79.7		744	613	591	93.9

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

LOSS OF EMERGENCY SPRAY KEPT THE FGD SYSTEM OFF LINE FOR ALMOST 20 HOURS.
 BOILER RELATED OUTAGES CAUSED THE FGD SYSTEM NOT TO OPERATE FOR OVER 130 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM	100.0			0.0		720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS 100% AVAILABLE DURING A SCHEDULED BOILER OVERHAUL IN SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/80	SYSTEM	100.0	0.0		0.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT OVERHAUL CONTINUED THROUGH THE MONTH OF OCTOBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/80	SYSTEM	94.5	93.6	91.9	62.0		720	273	447	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED OUTAGE CONTINUED UNTIL NOVEMBER 10. THE UNIT WAS BROUGHT ON LINE AND REMAINED ON LINE UNTIL NOVEMBER 26 WHEN THE BOILER AND FGD SYSTEM WERE FORCED OUT OF SERVICE TWICE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/80	SYSTEM	99.5	99.2	99.5	97.8		744	733	728	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE SYSTEM WAS SHUTDOWN APPROXIMATELY 12 HOURS FOR SCHEDULED OUTAGES.

TWO FORCED OUTAGES OCCURRED DURING THE MONTH WHICH CAUSED THE SYSTEM TO SHUT DOWN FOR APPROXIMATELY FOUR HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/81	SYSTEM	97.1	96.4	96.7	84.2		744	649	626	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY A REHEATER FAN TRIPPED CAUSING ABOUT SIX HOURS OF DOWN TIME.

THE SYSTEM WAS TAKEN OFF LINE PART OF THE MONTH TO REPAIR A VENTURI LINE LEAK.

THE UNIT WAS TAKEN OFF LINE THREE TIMES IN JANUARY TO WORK ON THE GENERATOR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/81	SYSTEM	93.0	90.4	89.3	74.7		672	555	502	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY APPROXIMATELY 96 HOURS OF OUTAGE TIME WAS DUE TO SCHEDULED TESTING.

REPAIR OF A BOILER TUBE LEAK CAUSED AN ADDITIONAL 39 HOURS OF OUTAGE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/81	SYSTEM	99.5	98.1	98.1	54.8		744	416	408	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE BOILER WAS OUT OF SERVICE APPROXIMATELY 57 HOURS DUE TO A TUBE LEAK.

THE BOILER WAS TAKEN OFF LINE ON MARCH 22 FOR A SCHEDULED MAINTENANCE OVERHAUL. THE UNIT REMAINED OFF LINE THROUGHOUT THE MONTH.

SEVERAL BOILER TRIPS CAUSED AN ADDITIONAL 56 HOURS OF OUTAGE TIME.

4/81	SYSTEM	100.0	94.6	94.6	7.4	720	56	53

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE BOILER WAS OUT OF SERVICE APPROXIMATELY 664 HOURS DUE TO A SCHEDULED MAINTENANCE OVERHAUL.

5/81	SYSTEM	96.3	96.1	96.2	93.5	744	724	696

** PROBLEMS/SOLUTIONS/COMMENTS

A LEAK IN THE VENTURI DISCHARGE LINE CAUSED ABOUT A DAY OUTAGE DURING MAY.

THE BOILER WAS TAKEN OFF-LINE PART OF THE MONTH TO REMOVE ASH.

6/81	SYSTEM	90.7	88.5	89.2	75.8	720	616	546

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE A VENTURI BOX LEAK CAUSED THE SYSTEM TO BE OFF-LINE FOR ABOUT 55 HOURS.

THE UNIT WAS OFF LINE THREE DIFFERENT TIMES TO REMOVE ASH.

THE SYSTEM WAS TAKE OFF-LINE FOR 12 HOURS DUE TO EMERGENCY SPRAY PROBLEMS.

7/81	SYSTEM	98.8	97.4	98.5	78.4	744	599	584

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 9 HOURS OF OUTAGE TIME WERE REQUIRED DURING THE MONTH TO CLEAN THE TRAY SCREEN AND RECTIFY A SCRUBBER DUCT PRESSURE PROBLEM.

A STACK INSPECTION WAS CONDUCTED DURING THE MONTH.

8/81	SYSTEM	98.4	98.1	98.3	95.5	744	724	710

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS OUT OF SERVICE 6 HOURS TO REPLACE A VALVE IN THE EMERGENCY SPRAY SYSTEM DURING AUGUST.

6 HOURS OF OUTAGE TIME WERE REQUIRED TO REPLACE A VALVE ON A VENTURI PUMP AND TO CLEAN THE VENTURI THROAT SPRAY (RACE TRACK).

9/81	SYSTEM	99.5	99.4	99.5	99.3	720	719	715

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS SHUT DOWN FOR 3 HOURS TO REPAIR THE ID FAN ACCESS DOOR.

10/81	SYSTEM	99.8	99.1	99.1	85.7	744	643	638

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ID FAN PROBLEMS WERE ENCOUNTERED DURING OCTOBER.
 LOW UTILIZATION WAS DUE TO PROBLEMS WITH THE BOILER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
11/81	SYSTEM	100.0	99.9	99.9	46.7		720	336	336

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING NOVEMBER. LOW UTILIZATION WAS CAUSED BY BOILER PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
12/81	SYSTEM	94.8	74.0	69.3	56.4		744	567	419

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER RETURNED TO SERVICE ON DECEMBER 10 FOLLOWING THE OVERHAUL.

DURING DECEMBER TWO OUTAGES OCCURRED DUE TO PROBLEMS WITH THE EMERGENCY
 SPRAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
1/82	SYSTEM	54.0	57.9	52.2	50.3		744	647	374

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SYSTEM WAS OFF-LINE APPROXIMATELY 272 HOURS DUE TO A
 VENTURI BOX LEAK.

THE REHEATER FAN BLOWER REQUIRED REPAIR DURING THE MONTH.

THE BOILER TRIPPED TWICE DURING THE MONTH BECAUSE OF HIGH SCRUBBER DUCT
 PRESSURE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
2/82	SYSTEM	49.9	48.3	48.3	47.1		672	654	316

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY THE BOILER WAS TRIPPED DUE TO HIGH PRESSURE IN THE SCRUBBER
 DUCT.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
3/82	SYSTEM	100.0	100.0	100.0	67.7		744	503	503

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE TAKEN OFF-LINE ON MARCH 21 FOR A SCHEDULED
 OUTAGE. THE UNIT REMAINED OFF-LINE THROUGHOUT THE REST OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
4/82	SYSTEM	99.4	96.5	55.3	47.0		720	350	338

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS OFF-LINE UNTIL APRIL 12 DUE TO THE SCHEDULED OVERHAUL.

FGD OUTAGE TIME DURING THE MONTH WAS DUE TO REPAIRS BEING PERFORMED ON THE
 ABSORBER TRAY LINE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
5/82	SYSTEM	99.8	98.4	98.4	86.5		744	654	644

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE SYSTEM WAS FORCED DOWN FOR APPROXIMATELY TWO HOURS TO CLEAN
 THE SENSING LINES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
6/82	SYSTEM	94.4	97.5	91.8	80.6		720	596	580

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS SHUT DOWN FOR APPROXIMATELY 38 HOURS DUE TO A BLOWN GASKET IN THE DISCHARGE PUMP VALVE.

THE SYSTEM WAS TAKEN OFF-LINE FOR APPROXIMATELY SIX HOURS TO CONNECT THE NEW EMERGENCY SPRAY SYSTEM.

THE UNIT WAS FORCED OFF-LINE APPROXIMATELY 86 HOURS DUE TO TUBE LEAKS.

7/82 SYSTEM 94.5 71.7 92.1 63.4 744 658 472

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER TUBE LEAK RESULTED IN APPROXIMATELY 62 HOURS OF OUTAGE TIME DURING JULY.

OTHER BOILER-RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 52 HOURS OF DOWN TIME DURING THE MONTH.

APPROXIMATELY 41 HOURS OF OUTAGE TIME RESULTED FROM REPAIRS ON THE ABSORBE TRAY TOWER SPRAY MECHANISM.

8/82 SYSTEM 100.0 99.5 100.0 83.3 744 622 619

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER TUBE LEAK OCCURRED DURING AUGUST CAUSING A 97 HOUR OUTAGE.

HIGH DUCT PRESSURE FORCED A BOILER TRIP DURING AUGUST THAT RESULTED IN APPROXIMATELY 2 HOURS OF DOWN TIME.

A HIGH PRESSURE HEATER LEAK ACCOUNTED FOR ABOUT 26 HOURS OF OUTAGE TIME DURING THE MONTH.

9/82 SYSTEM 99.1 85.3 98.8 74.4 720 628 536

** PROBLEMS/SOLUTIONS/COMMENTS

A HIGH PRESSURE HEATER LEAK CAUSED AN OUTAGE LASTING 4 HOURS.

TWO OUTAGES DURING SEPTEMBER WERE DUE TO BOILER TUBE LEAKS AND TOTALLED APPROXIMATELY 174 HOURS.

HIGH DUCT PRESSURE ACCOUNTED FOR AN OUTAGE DURING THE MONTH THAT LASTED A LITTLE OVER ONE HOUR.

A VENTURI LINE LEAK RESULTED IN APPROXIMATELY 5 HOURS OF DOWN TIME DURING SEPTEMBER.

10/82 SYSTEM 98.8 96.4 98.6 81.2 744 626 604

** PROBLEMS/SOLUTIONS/COMMENTS

A FIVE HOUR OUTAGE DURING OCTOBER RESULTED FROM THE LOSS OF AN AIR PREHEATER.

A HIGH PRESSURE HEATER LEAK CAUSED AN OUTAGE LASTING APPROXIMATELY 76 HOURS.

APPROXIMATELY 9 HOURS OF OUTAGE TIME RESULTED FROM A LEAKING ID FAN EXPANSION JOINT.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

ADDITIONAL BOILER-RELATED PROBLEMS ALSO CONTRIBUTED TO DOWN TIME DURING OCTOBER.

11/82 SYSTEM 100.0 95.9 100.0 10.4 720 78 75

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE FROM NOVEMBER 1 TO NOVEMBER 28 FOR A SCHEDULED OVERHAUL.

A BOILER TRIP OCCURRED DURING NOVEMBER DUE TO HIGH DUCT PRESSURE.

12/82 SYSTEM 98.8 97.0 98.6 82.9 744 636 617

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER TUBE LEAKS ACCOUNTED FOR APPROXIMATELY 118 HOURS OF DOWN TIME DURING DECEMBER.

A 9 HOUR OUTAGE RESULTED FROM ID FAN CONTROL PROBLEMS.

1/83 SYSTEM 89.8 84.8 89.3 84.8 744 744 631

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER PROBLEMS DUE TO HIGH DUCT PRESSURE ACCOUNTED FOR APPROXIMATELY 37 HOURS OF DOWN TIME DURING JANUARY.

ELECTRICAL PROBLEMS WITH A REHEATER FAN FORCED AN OUTAGE LASTING ABOUT 14 HOURS.

THE REPAIR OF A LEAK IN AN ID FAN RESULTED IN APPROXIMATELY 62 HOURS OF OUTAGE TIME DURING JANUARY.

2/83 SYSTEM 41.8 33.5 31.8 27.2 672 545 183

** PROBLEMS/SOLUTIONS/COMMENTS

A 98 HOUR OUTAGE OCCURRED DURING FEBRUARY AS A RESULT OF BOILER TUBE LEAKS

AN OVERLOADED ID FAN MOTOR RESULTED IN APPROXIMATELY 16 DAYS OF OUTAGE TIME DURING FEBRUARY.

3/83 SYSTEM 79.6 78.7 78.4 74.1 744 701 551

** PROBLEMS/SOLUTIONS/COMMENTS

LOW FLOW THROUGH THE VENTURI RESULTED IN APPROXIMATELY 4 HOURS OF DOWN TIME DURING THE MONTH.

THE UNIT WAS DOWN APPROXIMATELY 37 HOURS DURING MARCH FOR REPAIR WORK ON BURNERS.

REPAIRS ON AN ID FAN CONTINUED THROUGH MARCH CAUSING AN ADDITIONAL 131 HOURS OF DOWN TIME.

REPAIRS ON A BYPASS DAMPER ACCOUNTED FOR 17 HOURS OF OUTAGE TIME DURING MARCH.

HIGH DUCT PRESSURE ACCOUNTED FOR APPROXIMATELY 3 HOURS OF DOWN TIME FOR THE UNIT.

AN ADDITIONAL HOUR OF DOWN TIME WAS ATTRIBUTED TO OTHER BOILER-RELATED PROBLEMS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

4/83	SYSTEM	99.7	98.4	99.6	72.0		720	527	518	

** PROBLEMS/SOLUTIONS/COMMENTS

A FORCED OUTAGE LASTING APPROXIMATELY 2 HOURS OCCURRED DURING APRIL AND WAS DUE TO HIGH SCRUBBER DUCT PRESSURE.

THE UNIT WAS DOWN FOR APPROXIMATELY 15 HOURS DURING THE MONTH FOR A SCHEDULED OUTAGE TO REPAIR BURNERS.

A BOILER TRIP CAUSED A BRIEF 1-HOUR OUTAGE IN APRIL.

THE UNIT WAS OUT OF SERVICE FOR APPROXIMATELY 184 HOURS DURING APRIL FOR A SCHEDULED OVERHAUL.

5/83	SYSTEM	97.1	74.9	89.1	23.4		744	233	174	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED OVERHAUL WHICH BEGAN IN APRIL CONTINUED UNTIL MAY 23.

A HOT BEARING IN THE SCRUBBER I.D. FAN MOTOR FORCED AN OUTAGE IN MAY LASTING ABOUT 18 HOURS.

A BRIEF TWO-HOUR OUTAGE OCCURRED DURING MAY DUE TO A BOILER TRIP.

6/83	SYSTEM	100.0	94.0	100.0	77.0		720	590	555	

** PROBLEMS/SOLUTIONS/COMMENTS

A TURBINE TRIP FORCED AN OUTAGE IN JUNE LASTING APPROXIMATELY 10 HOURS.

A BOILER TUBE LEAK RESULTED IN ABOUT 70 HOURS OF DOWN TIME DURING THE MONTH.

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 85 HOURS DURING JUNE DUE TO A LACK OF POWER DEMAND.

A ONE HOUR BOILER-RELATED OUTAGE OCCURRED DURING JUNE.

7/83	SYSTEM	98.6	96.5	98.4	84.2		744	649	627	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 53 HOURS DURING JULY DUE TO LACK OF POWER DEMAND.

APPROXIMATELY 55 HOURS OF DOWN TIME DURING THE MONTH RESULTED FROM BOILER-RELATED PROBLEMS.

AN INSPECTION OF THE VENTURI THROAT SPRAY SYSTEM (RACE TRACK) RESULTED IN APPROXIMATELY 8 HOURS OF OUTAGE TIME.

A LOSS OF VENTURI FLOW RESULTED IN APPROXIMATELY 3 HOURS OF DOWN TIME DURING THE MONTH.

8/83	SYSTEM	96.5	97.0	96.0	83.0		744	637	618	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 100 HOURS DURING AUGUST DUE TO A LACK OF POWER DEMAND.

NEVADA POWER: REID GARDNER 2 (CONT.)

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

REPAIRS ON A STOP-VALVE FORCED AN OUTAGE LASTING 10 HOURS.

ABSORBER DUCT PRESSURE PROBLEMS ACCOUNTED FOR APPROXIMATELY 8 HOURS OF DOWNTIME DURING THE MONTH.

VENTURI PUMP REPAIRS FORCED AN OUTAGE DURING AUGUST LASTING APPROXIMATELY 9 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/83	SYSTEM	100.0	99.8	100.0	87.8		720	634	632	

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER TUBE LEAK AND UNIT TRIP ACCOUNTED FOR APPROXIMATELY 88 HOURS OF OUTAGE TIME DURING SEPTEMBER.

10/83	SYSTEM	100.0	99.4	100.0	85.0		744	636	632	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER RELATED PROBLEMS AND A SCHEDULED OUTAGE ACCOUNTED FOR OUTAGE TIME DURING OCTOBER.

11/83	SYSTEM	98.6	97.4	97.7	60.0		720	443	432	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE APPROXIMATELY 273 HOURS DURING NOVEMBER FOR A SCHEDULED OUTAGE.

HIGH ABSORBER DUCT PRESSURE ACCOUNTED FOR 6 HOURS OF FGD SYSTEM OUTAGE TIME DURING THE MONTH.

BOILER RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 5 HOURS OF OUTAGE TIME DURING NOVEMBER.

APPROXIMATELY 4 HOURS OF OUTAGE TIME WAS REQUIRED TO REPAIR A VENTURI PUMP MOTOR.

12/83	SYSTEM	97.5	96.9	97.3	90.9		744	697	676	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 49 HOURS DURING THE MONTH DUE TO BOILER RELATED PROBLEMS.

A BADLY VIBRATING REHEAT BLOWER FORCED AN OUTAGE LASTING APPROXIMATELY 19 HOURS DURING DECEMBER.

1/84	SYSTEM	100.0	96.6	100.0	92.8		744	715	690	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 54 HOURS DUE TO BOILER OUTAGES.

2/84	SYSTEM	100.0	0.0		0.0		696	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN FOR THE ENTIRE MONTH BECAUSE OF A SCHEDULED OUTAGE.

3/84	SYSTEM	99.8	96.4	99.7	50.5		744	390	376	

-----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 DOWN 1.3 HOURS DUE TO PROBLEM WITH A BYPASS DAMPER.

THE UNIT WAS OFF LINE APPROXIMATELY 367 HOURS DUE TO BOILER-RELATED PROBLEMS.

4/84	SYSTEM	99.8	99.7	99.8	97.0	720	701	699

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF LINE FOR 1.3 HOURS DURING APRIL DUE TO ELECTRICAL PROBLEMS.

DURING APRIL THE UNIT WAS OFF LINE FOR 20 HOURS DUE TO BOILER OUTAGES.

THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 114 HOURS DURING APRIL DUE TO BOILER PROBLEMS.

5/84	SYSTEM	100.0	100.0	100.0	99.9	744	743	743

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY, THE UTILITY REPORTED THAT THE UNIT WAS DOWN APPROXIMATELY 1 HOUR DUE TO A BOILER OUTAGE.

6/84	SYSTEM	99.3	99.0	99.2	94.2	720	685	678

** PROBLEMS/SOLUTIONS/COMMENTS

FOR APPROXIMATELY 36 HOURS DURING JUNE, THE UNIT WAS DOWN DUE TO BOILER OUTAGES.

DURING JUNE, THE FGD SYSTEM WAS DOWN APPROXIMATELY 5 HOURS DUE TO MAINTENANCE ON AN INDUCED DRAFT FAN.

7/84	SYSTEM	97.9	82.4	97.1	70.8	744	639	527

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JULY, THE FGD SYSTEM WAS DOWN 1.3 HOURS DUE TO THE CLOSING OF AN INLET DAMPER.

ON JULY 23 AND 24, THE FGD SYSTEM WAS DOWN A TOTAL OF 14.4 HOURS DUE TO ABSORBER DUCT PRESSURE PROBLEMS.

THE UNIT WAS DOWN APPROXIMATELY 202 HOURS IN JULY DUE TO BOILER RELATED PROBLEMS.

8/84	SYSTEM	97.9	97.6	97.9	97.4	744	743	725

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DOWN FOR 16 HOURS IN AUGUST DUE TO A LEAK IN THE I.D. FAN HOUSING.

DURING AUGUST REID GARDNER 2 WAS DOWN FOR 4 HOURS DUE TO BOILER RELATED PROBLEMS.

9/84	SYSTEM	100.0	100.0	100.0	49.7	720	358	358

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN ON SEPTEMBER 15 AND REMAINED OFF-LINE FOR THE REMAINDER OF THE MONTH FOR SCHEDULED MAINTENANCE OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2	BOILER PART.	FGD HOURS	CAP. HOURS	FGD FACTOR
10/84	SYSTEM	98.8	96.8	98.5	78.7		744	605	586		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM REMAINED DOWN APPROXIMATELY 7 DAYS DURING THE BEGINNING OF OCTOBER DUE TO THE SCHEDULED MAINTENANCE OUTAGE.

A PLUGGED TRAY RECYCLE RETURN LINE RESULTED IN A 7 HOUR FGD FORCED OUTAGE.

THE FGD SYSTEM WAS FORCED DOWN APPROXIMATELY 2 HOURS TO REPAIR A HOLE IN THE TRAY RECYCLE TANK.

A VENTURI HIGH OUTLET TEMPERATURE EXCURSION RESULTED IN APPROXIMATELY 1 HOUR OF FGD OUTAGE TIME.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2	BOILER PART.	FGD HOURS	CAP. HOURS	FGD FACTOR
11/84	SYSTEM	98.5	97.6	98.4	92.0		720	679	663		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS FORCED OFF-LINE A TOTAL OF 48 HOURS DURING THE MONTH OF NOVEMBER DUE TO BOILER RELATED PROBLEMS.

HIGH ID FAN VIBRATION ACCOUNTED FOR 10 HOURS OF FGD OUTAGE TIME DURING THE MONTH OF NOVEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2	BOILER PART.	FGD HOURS	CAP. HOURS	FGD FACTOR
12/84	SYSTEM	88.0	87.3	87.5	84.0		744	716	625		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM CAME BACK ON-LINE DECEMBER 2. THE UNIT WAS SHUT DOWN ON NOVEMBER 30 FOR STATIC EXCITER REPAIR.

ABSORBER TRAY AND SPRAY NOZZLE CLEANING RESULTED IN APPROXIMATELY 70 HOURS OF DOWN TIME DURING DECEMBER.

HIGH ID FAN VIBRATIONS AND DAMPER CONTROL PROBLEMS RESULTED IN DOWN TIME OF APPROXIMATELY 7 HOURS.

TWO VENTURI HIGH OUTLET GAS TEMPERATURE EXCURSIONS RESULTED IN A TOTAL OF 6 HOURS OF FORCED OUTAGE TIME IN DECEMBER.

SIX HOURS OF OUTAGE TIME WAS ALSO REQUIRED TO CLEAN THE VENTURI RACE TRACK (THROAT).

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2	BOILER PART.	FGD HOURS	CAP. HOURS	FGD FACTOR
1/85	SYSTEM	87.9	87.4	87.6	85.9		744	731	639		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED MINOR FGD SYSTEM OUTAGES DURING THE MONTH ASSOCIATED WITH VENTURI PLUGGING. A SHORT TERM OUTAGE OCCURRED AS A RESULT OF A LOSS OF VENTURI TANK LEVEL CONTROL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2	BOILER PART.	FGD HOURS	CAP. HOURS	FGD FACTOR
2/85	SYSTEM	99.7	99.1	99.5	55.5		672	377	373		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

AN INSTRUMENT AIR SYSTEM FAILURE CAUSED A SHORT TERM OUTAGE DURING THE MONTH. MOST OF THE DOWNTIME WAS ASSOCIATED WITH A SCHEDULED UNIT OUTAGE.

3/85	SYSTEM	97.7	96.8	97.6	93.1			744	716	692

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGES DURING THE MONTH WERE CAUSED BY VENTURI THROAT SPRAY HEADER AND SPRAY NOZZLE CLEANING.

4/85	SYSTEM	92.0	91.0	91.2	82.9			720	656	597

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR SEVERAL HOURS OVER A TWO-DAY PERIOD FOR ABSORBER TRAY CLEANING.

5/85	SYSTEM	100.0	99.6	100.0	85.4			744	638	635

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF MAY.

6/85	SYSTEM	100.0	100.0	100.0	98.4			720	709	709

** PROBLEMS/SOLUTIONS/COMMENTS

ALL FGD SYSTEM DOWNTIME LOGGED FOR JUNE RESULTED FROM A SCHEDULED BOILER TURBINE OVERHAUL.

7/85	SYSTEM							744		

** PROBLEMS/SOLUTIONS/COMMENTS

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

8/85	SYSTEM	97.6	97.5	97.5	93.6			744	715	697

** PROBLEMS/SOLUTIONS/COMMENTS

PLUGGING PROBLEMS IN THE ABSORBER TRAY SECTION AND VENTURI THROAT SPRAY HEADER CAUSED ROUGHLY 18 HOURS OF FGD SYSTEM DOWNTIME DURING THE MONTH.

9/85	SYSTEM	93.7	85.4	92.5	78.1			720	658	562

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM OUTAGES DURING SEPTEMBER WERE RELATED TO VENTURI THROAT SPRAY HEADER AND NOZZLE CLEANING, ABSORBER TRAY CLEANING, AND VENTURI LEAK REPAIR.

10/85	SYSTEM	95.9	95.0	95.3	82.9			744	649	617

** PROBLEMS/SOLUTIONS/COMMENTS

ABSORBER TRAY CLEANING ACCOUNTED FOR ROUGHLY 21 HOURS OF FGD SYSTEM OUTAGE TIME DURING THE MONTH.

11/85	SYSTEM	99.8	98.8	99.5	47.1			720	344	339

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A BRIEF VENTURI FLOW PROBLEM CAUSED THE FGD SYSTEM TO SHUT DOWN FOR A 45 MINUTE PERIOD DURING NOVEMBER. OTHER OUTAGES WERE BOILER-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/85	SYSTEM	93.0	89.5	91.9	79.7		744	662	593	

** PROBLEMS/SOLUTIONS/COMMENTS

REHEATER FAN PROBLEMS FORCED THE FGD SYSTEM OUT OF SERVICE APPROXIMATELY 18 HOURS IN DECEMBER.

A 34 HOUR FGD SYSTEM OUTAGE WAS REQUIRED TO REPAIR A LEAK IN THE VENTURI TANK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/86	SYSTEM	100.0	99.7	100.0	89.7		744	670	668	

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERAL BOILER OUTAGES OCCURRED DURING THE MONTH. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/86	SYSTEM	99.8	99.8	99.8	99.8		672	672	671	

** PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER/ABSORBER PLUGGING PROBLEMS CAUSED 2 BRIEF SHUTDOWNS IN FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/86	SYSTEM	87.1	100.0	86.1	79.8		744	594	594	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM AND UNIT WERE TAKEN OUT OF SERVICE FOR SCHEDULED OVERHAUL WORK 3/27/86.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/86	SYSTEM	53.9	96.7	53.9	53.9		720	402	388	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER WAS BROUGHT BACK IN SERVICE 4/14/86 AFTER THE SCHEDULED OUTAGE BUT WAS FORCED OUT OF SERVICE BRIEFLY FOR A DAMPER-

THE SCRUBBER/ABSORBER WAS BROUGHT BACK IN SERVICE 4/14/86 AFTER THE SCHEDULED OUTAGE BUT WAS FORCED OUT OF SERVICE BRIEFLY FOR A DAMPER-RELATED PROBLEM.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/86	SYSTEM	99.1	99.0	99.0	93.1		744	700	693	

** PROBLEMS/SOLUTIONS/COMMENTS

AN EXPANSION JOINT REPAIR FORCED THE FGD SYSTEM OUT OF SERVICE BRIEFLY IN MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/86	SYSTEM	100.0	99.9	100.0	91.7		720	661	660	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/86	SYSTEM	99.9	99.1	99.9	92.1		744	692	685	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

MOST OF THE OUTAGE TIME REPORTED FOR JULY WAS BOILER-RELATED. HOWEVER,
 THERE WAS A SHORT OUTAGE PERIOD ON THE 17TH OF THE MONTH ATTRIBUTED TO
 VENTURI FLOW PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/86	SYSTEM	99.8	99.8	99.8	96.8		744	722	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-SYSTEM PROBLEMS OCCURRED IN AUGUST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/86	SYSTEM	95.8	99.1	95.6	90.4		720	657	651	

** PROBLEMS/SOLUTIONS/COMMENTS

A VENTURI LINE LEAK CAUSED ROUGHLY 7 HOURS OF OUTAGE TIME IN SEPTEMBER.

AN ID FAN EXPANSION JOINT WAS REPAIRED DURING A FORCED UNIT OUTAGE. ALL
 OTHER OUTAGES IN THE PERIOD WERE UNIT-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/86	SYSTEM	100.0	99.8	100.0	67.2		744	501	500	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY OUTAGES REPORTED FOR OCTOBER WERE CAUSED BY BOILER TUBE LEAKS AND
 OTHER BOILER-RELATED MISHAPS. NO SCRUBBER/ABSORBER PROBLEMS OCCURRED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/86	SYSTEM	100.0			100.0		720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND SCRUBBING SYSTEM WAS OFF-LINE THE ENTIRE MONTH FOR A
 SCHEDULED OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/86	SYSTEM	87.4	93.2	78.7	46.6		744	372	347	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT AND FGD SYSTEM WERE OFF-LINE FOR SCHEDULED OVERHAUL WORK UNTIL
 THE 13TH OF THE MONTH.

SEVERAL INSTANCES OF SCRUBBER/ABSORBER CONTROL PROBLEMS PLAGUED THE FGD
 SYSTEM CAUSING UP AND DOWN OPERATIONS FROM THE 13TH OF DECEMBER THROUGHOUT
 THE REMAINDER OF THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/87	SYSTEM	99.8	100.0	99.8	85.6		744	619	637	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS OFF-LINE FOR 111 HOURS DUE TO TUBE LEAKS AND OTHER BOILER
 PROBLEMS.

THE SCRUBBER/ABSORBER EXPERIENCED A SHORT OUTAGE DUE TO FAN DAMPER
 PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/87	SYSTEM	100.0	99.9	100.0	99.1		672	667	666	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY OUTAGES REPORTED FOR FEBRUARY WERE FOR REPAIRING OIL PUMPS AND
 OTHER BOILER-RELATED MISHAPS. NO SCRUBBER/ABSORBER PROBLEMS OCCURRED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/87	SYSTEM	98.3	97.9	98.2	93.8		744	713	698	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER WAS OUT OF SERVICE FOR ALMOST 11 HOURS ON MARCH 2
 DUE TO LEAKS IN THE SCRUBBER/ABSORBER BOX AND 2 HOURS ON MARCH 20 DUE TO A
 LOW SCRUBBER/ABSORBER LEVEL. ALL OTHER OUTAGES WERE BOILER-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/87	SYSTEM	100.0	66.6	100.0	6.6		720	72	48	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS TAKEN OUT OF SERVICE APRIL 12 FOR A SCHEDULED OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/87	SYSTEM	100.0	99.9	100.0	91.5		744	681	681	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT OUTAGE CONTINUED UNTIL MAY 2, 1987.

SHORT OUTAGES OCCURRED DURING MAY DUE TO BOILER PROBLEMS. NO SCRUBBER/
 ABSORBER PROBLEMS OCCURRED DURING MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/87	SYSTEM	99.6	99.8	99.5	91.5		720	660	659	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER SYSTEM WAS OUT OF SERVICE FOR 3 HOURS DURING JUNE.
 ALL OTHER PROBLEMS WERE BOILER-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/87	SYSTEM	100.0	100.0	100.0	95.0		744	707	707	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ABSORBER/SCRUBBER SYSTEM WAS OUT OF SERVICE FOR A SHORT PERIOD DUE TO
 CONTROL PROBLEMS. ALL OTHER OUTAGES WERE DUE TO BOILER RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/87	SYSTEM	98.7	98.7	98.6	91.8		744	692	683	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER SYSTEM WAS DOWN FOR APPROXIMATELY 10 HOURS FOR TRAY
 CLEANING. ALL OTHER OUTAGES WERE DUE TO BOILER-RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/87	SYSTEM	100.0	99.9	100.0	99.9		720	720	719	
10/87	SYSTEM	100.0	99.8	100.0	82.4		744	614	613	
11/87	SYSTEM	100.0	99.9	100.0	98.3		720	708	708	

** PROBLEMS/SOLUTIONS/COMMENTS

SHORT OUTAGES OCCURRED DUE TO BOILER TUBE LEAKS AND OTHER BOILER-RELATED
 PROBLEMS. NO ABSORBER/SCRUBBER PROBLEMS OCCURRED DURING THE PERIOD OF
 SEPTEMBER THROUGH NOVEMBER 1987.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/87	SYSTEM	98.8	99.3	98.7	89.0		744	667	663	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER SYSTEM WAS OUT OF SERVICE FOR APPROXIMATELY 9 HOURS
 DUE TO TRAY CLEANING. ALL OTHER OUTAGES IN DECEMBER WERE DUE TO BOILER
 RELATED PROBLEMS.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	3	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	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	105	
GROSS UNIT GENERATING CAPACITY - MW	125	
NET UNIT GENERATING CAPACITY W/FGD - MW	110	
NET UNIT GENERATING CAPACITY WO/FGD - MW	117	
EQUIVALENT SCRUBBED CAPACITY - MW	125	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	223.21	(473000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	61.	(200 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	6.3	(20.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	28959.	(12450 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****	
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	8.0-10.0	
AVERAGE MOISTURE CONTENT - %	9.00	
RANGE MOISTURE CONTENT - %	5.5-6.0	
AVERAGE SULFUR CONTENT - %	0.50	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	0.05	
RANGE CHLORIDE CONTENT - %	*****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
TYPE	MULTICLONE	
SUPPLIER	RESEARCH-COTTRELL	
PARTICLE REMOVAL EFFICIENCY -%	75.0	
** PARTICLE SCRUBBER		
NUMBER	1	
INITIAL START-UP DATE	6/1976	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
TRADE NAME/COMMON NAME	N/A	
SUPPLIER	THYSSEN/CEA	
DIMENSIONS - FT	1.5 DIA X 18.0	
SHELL GENERIC MATERIAL	CARBON STEEL; HIGH ALLOY	
SHELL SPECIFIC MATERIAL	AISI 1110; NICKEL BASE/CHROMIUM-IRON-COPPER-MOLY	
LINER GENERIC MATERIAL	NONE; ORGANIC	
LINER SPECIFIC MATERIAL	N/A; NATURAL RUBBER	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	157.5	(2500 GPM)
L/G RATIO - LITER/CU.M	1.3	(10.0 GAL/1000ACF)
PRESSURE DROP - KPA	0.8	(3.3 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	50.3	(165.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	223.2	(473000 ACFM)
INLET GAS TEMPERATURE - C	176.7	(350 F)
PARTICLE REMOVAL EFFICIENCY - %	97.0	

NEVADA POWER: REID GARDNER 3 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	SODIUM CARBONATE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	5.6
CURRENT STATUS	1
COMMERCIAL START-UP	7/1976
INITIAL START-UP	6/1976
CONTRACT AWARDED	7/1973

** DESIGN AND OPERATING PARAMETERS

DESIGN CHLORIDE CONTENT - %

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	THYSSEN/CEA
DIMENSIONS - FT	30.0 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	NATURAL RUBBER
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER
GAS CONTACTING DEVICE TYPE	PERFORATED TRAYS
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	38. (600 GPM)
L/G RATIO - L/CU.M	0.2 (1.6 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.7 (3.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	3.4 (11.0 FT/S)
SO2 REMOVAL EFFICIENCY - %	91.2

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	1
GENERIC TYPE	CENTRIFUGAL
SPECIFIC TYPE	RADIAL VANE
TRADE NAME/COMMON TYPE	NR
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	1
PRESSURE DROP - KPA	0.1 (0.5 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	STAINLESS STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AUSTENITIC

** REHEATER

GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
TEMPERATURE INCREASE - C	27.8 (50 F)
INLET FLUE GAS TEMPERATURE - C	48.3 (119 F)
NUMBER OF TUBES PER BUNDLE	24
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110

NEVADA POWER: REID GARDNER 3 (CONT.)

** FANS	
NUMBER	1
DESIGN	CENTRIFUGAL
SUPPLIER	BUFFALO FORGE
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	223.21 (473000 ACFM)
FLUE GAS TEMPERATURE - C	176.7 (350 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
FUNCTION	NR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** DUCTWORK	
LOCATION	SCRUBBER INLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	SCRUBBER OUTLET
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	ORGANIC
LINER SPECIFIC MATERIAL TYPE	INERT FLAKE-FILLED VINYL ESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** TANKS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECYCLE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECIRCULATION	3
ABSORBER RECIRCULATION	3
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	BLEED
DEVICE	N/A
PROPRIETARY PROCESS	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

** DISPOSAL
NATURE
TYPE
LOCATION
SITE TREATMENT

INTERIM
POND
ON-SITE
CLAY LINING

** DISPOSAL
NATURE
TYPE
LOCATION
SITE TRANSPORTATION METHOD
SITE TREATMENT

FINAL
POND
ON-SITE
GRAVITY FLOW FROM INTERIM SLUDGE POND
CLAY LINING

** WATER BALANCE
WATER LOOP TYPE
MAKEUP WATER ADDITION - LITERS/S

CLOSED
9.8 (155 GPM)

** 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	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/76	SYSTEM	82.0	45.9	70.4	42.7		744	692	318	

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL BOILER TESTING OPERATIONS BEGAN IN EARLY APRIL 1976. INITIAL FLU GAS SCRUBBING SYSTEM TESTING BEGAN IN LATE JUNE 1976

THE UNIT 3 SCRUBBING SYSTEM WAS PLACED IN OPERATION ON JULY 12, 1976. TH SYSTEM DESIGN WAS BASED ON INFORMATION AND DATA OBTAINED FROM AN 8000-ACF PILOT PLANT PROGRAM CONDUCTED AT THIS STATION IN 1971 AND 1972.

A HIGH SOLIDS CONCENTRATION IN THE VENTURI SCRUBBING SOLUTION CYCLE WAS A PROBLEM DURING JULY.

FOUR OUTAGES WERE REPORTED FOR THE MONTH, THREE OF WHICH WERE FORCED SCRUBBER OUTAGES.

A BUCKET ELEVATOR MALFUNCTION WAS A PROBLEM DURING JULY FORCING THE SYSTE OUT OF SERVICE FOR 109 HOURS.

8/76	SYSTEM	43.2	43.2	43.2	43.2		744	744	321	

** PROBLEMS/SOLUTIONS/COMMENTS

A REHEATER MOTOR BURNOUT OCCURRED IN AUGUST.

THE VENTURI FLOOR WAS EFFECTIVELY DESTROYED DURING AUGUST.

SCRUBBER OUTAGE TIME WAS REQUIRED TO REPAIR AN ID FAN ELECTRICAL MALFUNCTION AND TO INSTALL ID FAN INSULATION.

THICKENER TANK PLUGGING CAUSED FGD DOWN TIME.

SCRUBBER OUTAGES TOTALLED 423 HOURS IN AUGUST.

9/76	SYSTEM	50.6	46.2	46.9	43.6		720	679	314	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 SYSTEM WAS PLACED BACK IN SERVICE ON SEPTEMBER 14 IN FOLLOWING EXTENSIVE REPAIRS AND MODIFICATIONS FROM THE PRECEDING MONTH.

A VENTURI VIBRATION TRIP RESULTED IN NEARLY 14 HOURS OF FGD SYSTEM OUTAGE TIME.

TWO REHEATER FAN TRIPS OCCURRED IN SEPTEMBER ACCOUNTING FOR 14 HOURS OF FGD SYSTEM OUTAGE TIME.

10/76	SYSTEM	21.0	28.4	28.4	20.9		744	548	155

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH SOLIDS CONTENT IN THE VENTURI RECYCLE SOLUTION RESULTED IN 26 HOURS OF SCRUBBER OUTAGE TIME.

A SCRUBBER GAS DAMPER MALFUNCTION FORCED THE FGD SYSTEM OUT OF SERVICE FOR FOUR HOURS.

VENTURI BOX LEAKS WERE ENCOUNTERED FORCING THE SCRUBBER OUT OF SERVICE FROM OCTOBER 8 THROUGH THE END OF THE MONTH.

11/76	SYSTEM	28.5	68.7	68.7	28.5		720	298	205

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBING SYSTEM WAS OUT OF SERVICE THE FIRST HALF OF NOVEMBER AS REPAIRS OF LEAKS IN THE VENTURI SCRUBBER BOX CONTINUED. THE SYSTEM WAS RESTARTED ON NOVEMBER 19.

A SCREW CONVEYOR MALFUNCTION (PREVENTING CHEMICAL MIXING) RESULTING IN 68 HOURS OF SCRUBBER OUTAGE TIME.

12/76	SYSTEM	99.0	97.0	98.9	97.0		744	744	722

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER HIGH TEMPERATURE TRIP FORCED THE SCRUBBER OUT OF SERVICE FOR 14 HOURS EARLY IN DECEMBER.

ONE MINOR EIGHT HOUR SCRUBBER OUTAGE OCCURRED WHEN REPAIRS WERE MADE ON THE ID FAN EXPANSION JOINT.

1/77	SYSTEM	98.3	98.3	98.3	97.1		744	735	723

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE NEARLY NINE HOURS FOR BOILER-RELATED PROBLEMS.

A PLUGGED TRAY OCCURRED IN JANUARY RESULTING IN 3.5 HOURS OF FGD SYSTEM OUTAGE TIME.

A REHEATER STEAM LEAK RESULTED IN A MINOR NINE HOUR FGD SYSTEM FORCED OUTAGE.

2/77	SYSTEM	74.5	69.7	70.0	59.6		672	575	400

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

** PROBLEMS/SOLUTIONS/COMMENTS

THREE FORCED SCRUBBER OUTAGES WERE CAUSED BY HIGH DIFFERENTIAL PRESSURE PROBLEMS IN THE SCRUBBER TRAY AMMOUNTING TO 117 HOURS.

A 54 HOUR OUTAGE WAS REQUIRED TO CLEAN OUT A SODIUM CARBONATE LINE.

3/77	SYSTEM	43.5	51.6	51.6	43.5	744	627	324

** PROBLEMS/SOLUTIONS/COMMENTS

THE RUBBER LINING IN THE SEPARATOR REQUIRED 167 HOURS OF DOWNTIME IN MARCH FOR CURING.

THE SCRUBBER FAN EXPANSION JOINT BLEW OUT CAUSING 225 HOURS OF OUTAGE TIME.

A 25 HOUR OUTAGE WAS REQUIRED TO CLEAN A PLUGGED TRAY.

A SCRUBBER LIMIT SWITCH TRIPPED THE SCRUBBER OFF FOR THREE HOURS DURING MARCH.

4/77	SYSTEM	85.8	84.6	85.5	83.3	720	709	600

** PROBLEMS/SOLUTIONS/COMMENTS

A HIGH TRAY DIFFERENTIAL PRESSURE RESULTED IN 86 HOURS OF FGD SYSTEM DOWN TIME.

A PLUGGED STRAINER IN THE TRAY RECYCLE TANK OCCURRED CAUSING 16 HOURS OF OUTAGE TIME.

THE SCRUBBER WAS OFF LINE 18 HOURS FOR BOILER-RELATED PROBLEMS IN EARLY APRIL.

5/77	SYSTEM	62.8	26.3	97.7	16.6	744	470	124

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE WAS UNAVAILABLE DURING THE FIRST THREE WEEKS OF THE MONTH BECAUSE OF A FORCED OUTAGE REQUIRED FOR THE REPLACEMENT OF THE FRP LINER IN THE SCRUBBER SEPARATOR SECTION. MOST OF THIS SCRUBBER OUTAGE TIME COINCIDED WITH A BOILER OUTAGE.

APPROXIMATELY 1.4 HOURS OF SCRUBBER OUTAGE TIME WERE REQUIRED TO REWIRE A REHEATER FAN CIRCUIT BREAKER.

REPAIR OF VENTURI DAMPER CONTROLS REQUIRED 1.5 HOURS OF SCRUBBER OUTAGE TIME.

6/77	SYSTEM	65.6	64.5	64.8	63.1	720	705	455

** PROBLEMS/SOLUTIONS/COMMENTS

HIGH TRAY DIFFERENTIAL PRESSURE READINGS RESULTED IN 192 HOURS OF SCRUBBER OUTAGE TIME TO MAKE CORRECTIONS.

A VENTURI RECYCLE LINE THROTTLE VALVE MALFUNCTIONED DURING JANUARY FORCING THE SCRUBBER OUT OF SERVICE 56 HOURS.

THE SCRUBBER WAS OUT OF SERVICE 18 HOURS BECAUSE OF BOILER-RELATED PROBLEMS.

7/77	SYSTEM	72.9	72.9	72.9	72.9	744	744	542

★★ PROBLEMS/SOLUTIONS/COMMENTS

SCRUBBER FAN VIBRATION PROBLEMS CAUSED 23 HOURS OF SCRUBBER OUTAGE TIME.

8/77	SYSTEM	69.7	59.7	62.5	50.4	744	629	375

** PROBLEMS/SOLUTIONS/COMMENTS

A SCRUBBER OUTLET HIGH TEMPERATURE FALSE ALARM CAUSED A 19 HOUR SYSTEM SHUTDOWN.

THE BOILER WAS OUT OF SERVICE FOR 144 HOURS DURING AUGUST.

9/77	SYSTEM	89.7	89.7	98.8	89.7	720	720	646

★★ PROBLEMS/SOLUTIONS/COMMENTS

HIGH SOLIDS IN THE VENTURI RECYCLE SYSTEM CAUSED EIGHT HOURS OF SCRUBBER OUTAGE TIME IN SEPTEMBER.

NEW EFFLUENT AND POST NEUTRALIZATION LINES WERE INSTALLED DURING SEPTEMBER REQUIRING 66 HOURS OF SCHEDULED SCRUBBER OUTAGE TIME.

10/77	SYSTEM	99.4	90.0	99.0	61.2	744	506	455

★★ PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS DOWN 284 HOURS DURING OCTOBER BECAUSE OF A SCHEDULED BOILER OUTAGE.

4.5 HOURS OF OUTAGE TIME OCCURRED AS A RESULT OF HIGH VIBRATION PROBLEMS ON A SCRUBBER FAN.

11/77	SYSTEM	88.8	88.0	88.6	86.7	720	710	624

★★ PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS OUT OF SERVICE 80 HOURS FOR THE INSTALLATION OF AN OUTLE NOZZLE IN THE BOOSTER TANK.

THE BOILER WAS OUT OF SERVICE APPROXIMATELY 15 HOURS IN NOVEMBER.

12/77	SYSTEM	84.8	90.1	93.1	83.8	744	692	623

★★ PROBLEMS/SOLUTIONS/COMMENTS

A FAULTY SYSTEM THERMOCOUPLE FORCED THE SCRUBBER OUT OF SERVICE 4.4 HOURS.

BOILER OUTAGE TIME AMOUNTED TO 75 HOURS IN DECEMBER.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
THE INSTALLATION OF TRAY SPRAY STRAINER REQUIRED SOME SCRUBBER OUTAGE TIME.									
THE FGD SYSTEM WAS OFF LINE TO INSTALL NEW SENSING LINES.									
1/78	SYSTEM	99.5	99.5	99.5	99.5		744	744	740
** PROBLEMS/SOLUTIONS/COMMENTS									
A PLUGGED VENTURI NOZZLE RESULTED IN FOUR HOURS OF SCRUBBER OUTAGE TIME DURING JANUARY.									
2/78	SYSTEM	95.5	95.0	95.1	87.5		672	619	588
** PROBLEMS/SOLUTIONS/COMMENTS									
A 16 HOUR FGD SYSTEM OUTAGE DUE TO A HIGH VENTURI TEMPERATURE READING (CAUSED BY FAULTY WIRING) OCCURRED DURING FEBRUARY.									
A MINOR 13 HOUR OUTAGE WAS NECESSARY TO CHECK THE VENTURI TEMPERATURE INDICATOR.									
THE FGD SYSTEM WAS FORCED OUT OF SERVICE BY MIX TANK PLUGGING WHICH MADE IT IMPOSSIBLE TO MIX CHEMICALS IN LATE FEBRUARY.									
3/78	SYSTEM	97.3	96.9	97.2	96.5		744	741	718
** PROBLEMS/SOLUTIONS/COMMENTS									
THE MIX TANK PROBLEM WHICH BEGAN IN LATE FEBRUARY CONTINUED INTO MARCH CAUSING THE ONLY FGD DOWNTIME FOR THE MONTH. THE MIX TANK OUTAGE FOR BOTH MONTHS COMBINED TOTALLED 22 HOURS.									
A FURNACE HIGH/LOW PRESSURE TRIP CAUSED A BOILER OUTAGE OF SIX HOURS.									
4/78	SYSTEM	97.1	89.3	96.8	87.3		720	705	629
** PROBLEMS/SOLUTIONS/COMMENTS									
THE FGD SYSTEM WAS DOWN 21 HOURS FOR REPAIRS ON THE VENTURI EMERGENCY SPRAY SYSTEM.									
THE BOILER WAS DOWN APPROXIMATELY 70 HOURS DURING APRIL FOR NON-SCRUBBER RELATED PROBLEMS.									
5/78	SYSTEM	97.4	76.5	96.2	66.4		744	646	494
** PROBLEMS/SOLUTIONS/COMMENTS									
THERE WAS A SCHEDULED OUTAGE OF 230 HOURS FOR BOILER MAINTENANCE DURING MAY.									
A 20 HOUR SCRUBBER FORCED OUTAGE RESULTED FROM A FAULTY TEMPERATURE PROBE AT THE VENTURI DURING MAY.									
6/78	SYSTEM	95.9	95.6	95.9	95.2		720	715	686
** PROBLEMS/SOLUTIONS/COMMENTS									
A HIGH/LOW FURNACE PRESSURE TRIP RESULTED IN A FIVE HOUR BOILER OUTAGE.									
A 29 HOUR FGD SYSTEM OUTAGE OCCURRED WHEN THE FIRE SPRAY SYSTEM WAS OUT O SERVICE.									
7/78	SYSTEM	81.1	80.3	80.5	78.4		744	726	583

NEVADA POWER: REID GARDNER 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

LOW VENTURI FLOW CAUSED A 16 HOUR FGD OUTAGE. THIS WAS CORRECTED WHEN THE RACE TRACK SPRAY COLLAR AND NOZZLES WERE CLEANED.

A SCHEDULED OUTAGE TO CLEAN THE BOILER TURBINE LUBE OIL COOLERS OCCURRED DURING JULY TAKING THE SCRUBBER AND BOILER OUT OF SERVICE FOR 20 HOURS.

AN OUTAGE WAS REQUIRED FOR INSPECTION OF THE VENTURI TANK AND VENTURI RACE TRACK COLLAR. DURING THE OUTAGE THE TANK AND RACE TRACK NOZZLES WERE CLEANED AND THE RUBBER LINING ON THE VENTURI SPOOL WAS REPLACED.

A 36 HOUR SCRUBBER OUTAGE WAS REQUIRED TO CLEAN THE VENTURI RACE TRACK SPRAY COLLAR.

8/78	SYSTEM	98.2	97.1	98.2	97.1	744	744	722

** PROBLEMS/SOLUTIONS/COMMENTS

ONE EIGHT HOUR FORCED BOILER OUTAGE OCCURRED DUE TO HIGH FURNACE PRESSURE READING.

THE SCRUBBER WAS FORCED OFF LINE ON AUGUST 28 DUE TO HIGH SCRUBBER FAN OUTLET PRESSURE FOR APPROXIMATELY NINE HOURS. THE SCRUBBER PRESSURE SENSING LINE WAS CLEANED.

ON AUGUST 29 THE SCRUBBER EFFLUENT SOLIDS LEVEL WAS HIGH CAUSING AN OUTAGE OF APPROXIMATELY FIVE HOURS. THE SYSTEM WAS FLUSHED TO CORRECT THE PROBLEM.

9/78	SYSTEM	100.0	96.4	100.0	31.6	720	236	228

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS TAKEN OUT OF SERVICE ON SEPTEMBER 10 FOR A TURBINE OVERHAUL WHICH LASTED THROUGH THE END OF THE MONTH.

10/78	SYSTEM	100.0			0.0	744	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN THE ENTIRE MONTH OF OCTOBER AS THE TURBINE OVERHAUL CONTINUED.

11/78	SYSTEM	98.4	92.6	97.6	66.3	720	515	477

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS BROUGHT BACK ON LINE NOVEMBER 10 AFTER COMPLETION OF THE SCHEDULED TURBINE OVERHAUL.

THE FGD SYSTEM WAS OUT OF SERVICE FOR ABOUT 12 HOURS FOR REPAIRING VENTUR TEMPERATURE PROBES.

12/78	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD SYSTEM OUTAGES OCCURRED DURING DECEMBER.

1/79	SYSTEM	66.4	67.2	67.2	66.4	744	735	494 67.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

95 HOURS OF SCRUBBER OUTAGE TIME WAS NECESSARY TO REPAIR A HOLE IN THE VENTURI BOX.

TWO FORCED OUTAGES OCCURRED BECAUSE OF A HIGH EFFLUENT SOLIDS LEVEL. THE RECYCLE SYSTEM WAS CLEANED. PROBLEMS WITH HIGH EFFLUENT SOLIDS ACCOUNTED FOR 154 HOURS OF OUTAGE TIME.

2/79	SYSTEM	48.7	45.7	46.7	44.9		672	661	302 57.0

** PROBLEMS/SOLUTIONS/COMMENTS

A STEAM LEAK IN THE SCRUBBER REHEATER COIL RESULTED IN A 54 HOUR SCRUBBER OUTAGE.

THE FGD SYSTEM WAS OFF FOR A FEW HOURS TO REPAIR A LEAK IN THE VENTURI LINE.

THE SCRUBBER WAS OUT OF SERVICE 139 HOURS TO REPAIR LEAKS IN EFFLUENT AND VENTURI LINES.

THE SCRUBBER WAS OFF WITH THE BOILER BECAUSE OF A HIGH FURNACE PRESSURE BOILER TRIP.

THE VENTURI RACE TRACK NOZZLES WERE CLEANED DURING THE 25 HOUR FEBRUARY BOILER OUTAGE.

REPAIRS RESULTING FROM A REHEATER FAN BURN UP ACCOUNTED FOR 151 HOURS OF THE FEBRUARY SCRUBBER OUTAGE TIME.

3/79	SYSTEM	100.0	97.9	100.0	32.3		744	246	241 63.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE OFF-LINE FOR 39 HOURS SO THAT A BOILER ID FAN COULD BE REPAIRED AND BALANCED.

THE BOILER AND FGD SYSTEM WERE OFF-LINE 465 HOURS FOR SCHEDULED MAINTENANCE.

4/79	SYSTEM	100.0	100.0	100.0	100.0		720	720	720 74.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO SCRUBBER OUTAGES OCCURRED DURING APRIL.

5/79	SYSTEM	98.8	97.7	97.7	97.5		744	742	725 79.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER WAS INADVERTENTLY REMOVED FROM SERVICE. SINCE THE SCRUBBER WAS NOT OPERATING THE UTILITY TOOK THE OPPORTUNITY TO CLEAN THE SCRUBBER PRESSURE SENSING LINES. THE SYSTEM WAS OUT OF SERVICE FOR ABOUT 10 HOURS.

THE SCRUBBER PRESSURE SENSING LINES WERE CLEANED AGAIN AFTER A BOILER TRIP ON HIGH FURNACE PRESSURE. THIS OUTAGE LASTED ABOUT NINE HOURS.

6/79	SYSTEM	94.2	91.3	93.5	83.5		720	659	602 81.9

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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

77 HOURS OF BOILER OUTAGE TIME WAS REQUIRED DURING JUNE TO REPAIR A BOILER TUBE LEAK.

THE SCRUBBER WAS OUT OF SERVICE WHILE REPAIRS WERE MADE ON THE FIRE WATER EMERGENCY SPRAY SYSTEM.

7/79	SYSTEM	93.2	93.2	93.2	93.2	744	744	694	83.8

** PROBLEMS/SOLUTIONS/COMMENTS

THE 3A VENTURI RECYCLE PUMP HAD A BAD PUMP CASING LEAK CAUSING ABOUT 50 HOURS OF OFF TIME.

THE 3B VENTURI PUMP WAS OUT OF SERVICE FOR MAINTENANCE.

8/79	SYSTEM	87.6	93.0	92.6	87.6	744	701	652	84.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER AND BOILER WERE BOTH SHUT DOWN 52 HOURS. THE EXPANSION JOINT ON THE BOILER CIRCULATING WATER PUMPS WERE REPLACED.

THE SCRUBBER WAS OFF TO CLEAN TRAY AND VENTURI RACE TRACK NOZZLES. THE SCRUBBER WAS DOWN FOR ABOUT 31 HOURS.

THE SCRUBBER WAS OFF TO REPAIR BROKEN FIRE LINES. THE SCRUBBER WAS LEFT WITHOUT AN EMERGENCY SPRAY SYSTEM.

9/79	SYSTEM	100.0	98.8	100.0	90.2	720	658	650	86.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING SEPTEMBER THE SCRUBBER WENT OFF LINE WITH THE BOILER TO REPAIR BOILER TUBE LEAKS.

10/79	SYSTEM	97.2	97.2	97.2	97.2	744	744	723	87.4

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER THE SCRUBBER WENT OFF LINE BECAUSE THERE WAS NO EMERGENCY SPRAY TO THE SCRUBBER. THE 2A LOAD CENTER WAS OUT FOR MAINTENANCE AND THERE WAS NO POWER TO OPERATE THE FIRE PUMP.

11/79	SYSTEM	100.0	98.7	100.0	80.4	720	587	579	88.0

** PROBLEMS/SOLUTIONS/COMMENTS

TWO OUTAGES OCCURRED DURING NOVEMBER DUE TO HIGH FURNACE PRESSURE CAUSING A BOILER TRIP. THE BOILER TRIP OUTAGES TOTALLED 32 HOURS.

THE SCRUBBER AND BOILER WERE TAKEN OFF LINE ON NOVEMBER 25 FOR SCHEDULED MAINTENANCE.

12/79	SYSTEM	86.6	72.4	74.8	39.7	744	408	295	87.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF FOR THE FIRST TWO WEEKS OF DECEMBER FOR SCHEDULED MAINTENANCE.

TWO SCRUBBER OUTAGES OCCURRED LATER IN THE MONTH DUE TO THE REHEATER BLOWE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

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

MOTOR BURN OUTS. THESE OUTAGES TOTALLED 100 HOURS.									
1/80	SYSTEM	100.0	99.8	100.0	91.4		744	681	680 99.7
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING JANUARY THE SCRUBBER AND BOILER WERE OFF LINE FOR APPROXIMATELY 64 HOURS SO THAT THE BOILER ID FAN COULD BE REPAIRED AND BALANCED.									
2/80	SYSTEM	100.0	98.1	100.0	77.9		696	552	542 99.0
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING FEBRUARY THE BOILER AND SCRUBBER WERE OFF LINE ONCE AT THE BEGINNING AND ONCE AT THE END OF THE MONTH TO BALANCE THE BOILER ID FAN. BOILER ID FAN BALANCING ACCOUNTED FOR 121 HOURS OF THE SCRUBBER OUTAGE TIME.									
THE SCRUBBER AND BOILER WERE TAKEN OFF LINE SO THAT COAL LEAKS ON THE BURNER LINES COULD BE REPAIRED.									
HIGH FURNACE PRESSURE TRIPPED THE BOILER OFF LINE. THIS CAUSED THE SCRUBBER TO BE OFF LINE FOR SEVEN HOURS.									
3/80	SYSTEM	100.0	99.6	100.0	60.3		744	450	448 99.0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE BOILER AND SCRUBBER WERE TAKEN OFF-LINE TWICE DURING MARCH. THE FIRST OUTAGE WAS TO BALANCE THE BOILER ID FAN. LATER IN THE MONTH THE ID FANS AND THE ESPS HAD TO BE REPAIRED. THE BOILER OUTAGES KEPT THE SCRUBBER OFF-LINE 296 HOURS IN MARCH.									
4/80	SYSTEM	100.0			0.0		720	0	0
** PROBLEMS/SOLUTIONS/COMMENTS									
THE FGD SYSTEM WAS AVAILABLE 100% DURING APRIL, HOWEVER, DID NOT OPERATE DUE TO THE OVERHAUL OF BOTH THE DUST COLLECTOR AND THE ID FAN.									
5/80	SYSTEM	0.0	0.0	0.0	0.0		744	462	0 77.8
** PROBLEMS/SOLUTIONS/COMMENTS									
THE FGD SYSTEM WAS DOWN THE ENTIRE MONTH FOR THE OVERHAUL OF THE FGD ID FANS. BECAUSE OF THIS, THE SYSTEM AVAILABILITY WAS ZERO FOR MAY.									
6/80	SYSTEM	75.2	81.4	81.4	72.2		720	639	520 78.9
** PROBLEMS/SOLUTIONS/COMMENTS									
THE ID FAN OVERHAUL WAS COMPLETED EARLY IN JUNE.									
THE BOILER WAS OUT OF SERVICE FOR 21 HOURS.									
7/80	SYSTEM	95.7	96.4	95.7	95.2		744	735	721 82.6
** PROBLEMS/SOLUTIONS/COMMENTS									
BOILER RELATED OUTAGES KEPT THE FGD SYSTEM OFF LINE FOR SEVERAL HOURS.									
A HIGH VENTURI OUTLET TEMPERATURE FORCED THE FGD SYSTEM OFF LINE DURING PART OF JULY.									
8/80	SYSTEM	100.0	100.0	100.0	100.0		744	744	744 85.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 AVAILABLE DURING ALL OF AUGUST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
9/80	SYSTEM	96.8	96.8	96.8	96.8		720	720	697	87.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE IN SEPTEMBER BECAUSE OF ROUTINE CLEANING AND MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
10/80	SYSTEM	85.0	84.0	84.4	80.7		744	715	600	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OFF-LINE DURING THE BEGINNING OF OCTOBER DUE TO A SCHEDULED UNIT OUTAGE.

DURING THE MONTH TWO OUTAGES AMOUNTING TO 111 HOURS OF OUTAGE TIME WERE CAUSED BY PROBLEMS WITH THE REHEATER FAN MOTOR.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
11/80	SYSTEM	94.8	100.0	94.8	94.8		720	682	682	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER A SHEARED PIN ON THE AIR PREHEATER COUPLING FORCED THE SYSTEM OUT OF SERVICE FOR APPROXIMATELY SEVEN HOURS.

PROBLEMS WITH A TUBE LEAK FORCED THE SYSTEM DOWN SO THAT NECESSARY REPAIRS COULD BE PERFORMED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
12/80	SYSTEM	100.0	95.7	99.5	71.4		744	531	531	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER THE SYSTEM WAS SHUTDOWN FOR A SCHEDULED OUTAGE WHICH LASTED APPROXIMATELY 210 HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
1/81	SYSTEM	98.9	98.9	98.9	98.9		744	744	735	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JANUARY THE SYSTEM WAS SHUT DOWN APPROXIMATELY EIGHT HOURS TO REPAIR THE OUTLET DRAIN LINE AND TO UNPLUG THE VENTURI NOZZLES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
2/81	SYSTEM	100.0	100.0	100.0	100.0		672	672	672	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
3/81	SYSTEM	88.6	67.2	67.2	30.0		744	332	223	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH THE BOILER WAS OUT OF SERVICE APPROXIMATELY 403 HOURS DUE TO MAINTENANCE.

APPROXIMATELY 85 HOURS OF OUTAGE TIME WAS DUE TO THE CLEANING OF THE VENTURI NOZZLES AND THE TRAY SPRAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
4/81	SYSTEM	100.0	99.7	99.7	94.2		720	680	678	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE BOILER WAS OUT OF SERVICE APPROXIMATELY 28 HOURS TO REMOV
BUILD UP ON PENDENTS.

5/81	SYSTEM	97.7	97.5	97.8	96.4			744	735	717	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MAY THE SYSTEM WAS OFF-LINE FOR APPROXIMATELY SEVEN HOURS TO REPAIR
A LEAK IN THE VENTURI LINE.

THE VENTURI PUMP NEEDED REPAIR DURING THE MONTH CAUSING ADDITIONAL DOWN
TIME.

PROBLEMS WERE ENCOUNTERED WITH A TEMPERATURE PROBE.

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.

7/81	SYSTEM	96.8	96.3	96.7	93.0			744	719	692	

** PROBLEMS/SOLUTIONS/COMMENTS

24 HOURS OF OUTAGE TIME WERE REQUIRED TO CLEAN THE VENTURI THROAT SPRAY
HEADER (RACE TRACK). THE RACE TRACK WAS CLEANED TWICE DURING THE MONTH.

THE STACK WAS INSPECTED DURING JULY.

8/81	SYSTEM	97.9	97.9	97.9	97.9			744	744	728	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS OUT OF SERVICE FOR 16 HOURS DURING AUGUST TO CLEAN THE
ABSORBER TRAY.

9/81	SYSTEM	100.0	98.2	100.0	75.0			720	550		

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE NO FGD-RELATED OUTAGES DURING THE MONTH OF SEPTEMBER.

10/81	SYSTEM	99.5	99.3	99.4	93.8			744	702	698	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER PROBLEMS WERE ENCOUNTERED WITH THE VENTURI EXPANSION JOINT.
THIS ACCOUNTED FOR 4 HOURS OF DOWN TIME.

11/81	SYSTEM	97.8	97.8	97.8	97.8			720	720	703	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING NOVEMBER HIGH TEMPERATURE IN THE VENTURI TRIPPED THE SYSTEM.

THE ABSORBER WAS FORCED OFF-LINE DUE TO BUILD-UP. APPROXIMATELY 11 HOURS
OF DOWN TIME WAS NEEDED FOR CLEANING.

12/81	SYSTEM	99.4	97.8	96.6	48.8			744	371	363	

NEVADA POWER: REID GARDNER 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

ON DECEMBER 6 THE UNIT WAS TAKEN OUT OF SERVICE FOR A SCHEDULED OVERHAUL.
 THE UNIT RETURNED TO SERVICE ON DECEMBER 22.

ON DECEMBER 28 THE FGD SYSTEM WAS SHUT DOWN TO REPAIR A VENTURI PUMP. THE
 OUTAGE LASTED APPROXIMATELY FIVE HOURS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
1/82	SYSTEM	98.2	96.3	98.4	86.0		744	664	640	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR APPROXIMATELY 13 HOURS TO CLEAN AN
 ABSORBER TRAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
2/82	SYSTEM	98.6	97.5	98.5	87.1		672	600	585	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING FEBRUARY APPROXIMATELY TWO HOURS OF SYSTEM DOWN TIME WAS DUE TO A
 LEAK IN THE ID FAN LUBE OIL SYSTEM.

HIGH TEMPERATURES IN THE VENTURI OUTLET FORCED THE SYSTEM OFF-LINE FOR
 ABOUT EIGHT HOURS.

THE BOILER WAS TAKEN OFF-LINE ON FEBRUARY 27 FOR A SCHEDULED OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
3/82	SYSTEM	100.0	90.6	90.6	30.9		744	254	230	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED BOILER OVERHAUL CONTINUE UNTIL MARCH 18.

DURING MARCH NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
4/82	SYSTEM	91.1	91.0	91.0	90.9		720	719	655	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING APRIL THE SYSTEM WAS TAKEN OFF-LINE THREE TIMES DUE TO A FAULTY
 TEMPERATURE PROBE.

THE SYSTEM WAS FORCED OFF-LINE ONCE DUE TO A FAN HIGH VIBRATION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
5/82	SYSTEM	85.5	94.3	88.6	88.6		744	699	659	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM WAS TAKEN OFF-LINE TWICE DURING MAY DUE TO HIGH ID FAN VIBRA-
 TION.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
6/82	SYSTEM	100.0	97.5	97.6	95.6		720	706	688	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING JUNE THE FGD SYSTEM WAS OFF-LINE PART OF THE TIME TO CONNECT THE
 SEAL WATER LINES TO THE PUMPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
7/82	SYSTEM	95.0	96.6	94.6	86.9		744	669	646	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER TUBE LEAKS ACCOUNTED FOR APPROXIMATELY 61 HOURS OF DOWN TIME FOR TH FGD SYSTEM DURING JULY.

CONTROL PROBLEMS WITH AN ID FAN RESULTED IN 4 HOURS OF OUTAGE TIME DURING THE MONTH.

A CLEANING OF THE ABSORBER SPRAY NOZZLE RACE TRACK ACCOUNTED FOR 10 HOURS OF DOWN TIME FOR THE SYSTEM.

REPAIRS ON THE ABSORBER TRAY TOWER SPRAY LINE RESULTED IN AN FGD SYSTEM OUTAGE DURING JULY.

A 20 HOUR OUTAGE RESULTED FROM A CLEANING OF THE ABSORBER TRAYS.

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.

9/82	SYSTEM	94.9	97.8	94.9	94.9		720	699	683

** PROBLEMS/SOLUTIONS/COMMENTS

A CLEANING OF THE ABSORBER TRAYS ACCOUNTED FOR APPROXIMATELY 22 HOURS OF DOWN TIME DURING SEPTEMBER.

THE REPLACEMENT OF EFFLUENT SYSTEM VALVES ACCOUNTED FOR A 2 HOUR OUTAGE DURING THE MONTH.

EFFLUENT LINE REPAIRS RESULTED IN APPROXIMATELY 13 HOURS OF DOWN TIME DURING THE MONTH.

10/82	SYSTEM	100.0	98.3	100.0	45.8		744	347	341

** PROBLEMS/SOLUTIONS/COMMENTS

ELECTRICAL PROBLEMS ACCOUNTED FOR APPROXIMATELY 30 HOURS OF DOWN TIME DURING THE MONTH.

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 15 DAYS DURING OCTOBER FOR A SCHEDULED OVERHAUL.

11/82	SYSTEM	96.2	63.9	75.8	12.0		720	135	86

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE FOR 66 HOURS DURING NOVEMBER FOR A SCHEDULED OVERHAUL.

BOILER TUBE LEAKS ACCOUNTED FOR APPROXIMATELY 23 DAYS OF OUTAGE TIME DURING NOVEMBER.

PROBLEMS WITH AN ID FAN CONTROL DAMPER RESULTED IN APPROXIMATELY 28 HOURS OF DOWN TIME FOR THE FGD SYSTEM.

12/82	SYSTEM	97.5	70.6	94.9	46.6		744	491	347

NEVADA POWER: REID GARDNER 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

APPROXIMATELY 16 DAYS OF OUTAGE TIME DURING DECEMBER RESULTED FROM BOILER TUBE LEAKS.

PROBLEMS WITH ID FAN CONTROLS WERE EXPERIENCED DURING DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
1/83	SYSTEM	100.0	98.2	100.0	41.8		744	317	311

** PROBLEMS/SOLUTIONS/COMMENTS

ALL OUTAGE TIME DURING JANUARY WAS DUE TO BOILER TUBE LEAKS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
2/83	SYSTEM	98.1	98.3	98.1	96.5		672	660	649

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 13 HOURS OF DOWN TIME WAS REQUIRED FOR THE BALANCING OF AN ID FAN.

BOILER-RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 11 HOURS OF OUTAGE TIME DURING FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
3/83	SYSTEM	100.0	98.2	100.0	85.5		744	648	636

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 12 HOURS OF DOWN TIME DURING MARCH.

THE UNIT WAS OUT OF SERVICE 4 DAYS DURING MARCH FOR A SCHEDULED OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
4/83	SYSTEM	91.8	86.8	88.0	59.8		720	496	430

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE FOR APPROXIMATELY 202 HOURS DURING THE MONTH FOR A SCHEDULED OVERHAUL.

THE UNIT WAS DOWN FOR 29 HOURS IN APRIL TO CHECK FOR I.D. FAN VIBRATIONS.

MAINTENANCE ON THE SCRUBBER EFFLUENT SYSTEM ACCOUNTED FOR 34 HOURS OF OUTAGE TIME IN APRIL.

A HIGH SOLIDS CONCENTRATION IN THE SCRUBBER FORCED THE UNIT OUT OF SERVICE FOR APPROXIMATELY 25 HOURS DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
5/83	SYSTEM	98.5	97.3	98.4	96.9		744	741	721

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 12 HOURS OF OUTAGE TIME DURING THE MONTH.

A FAULTY VENTURI TEMPERATURE PROBE ACCOUNTED FOR APPROXIMATELY 12 HOURS OF OUTAGE TIME IN MAY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER BOILER	FGD	CAP.
						SO2 PART.	HOURS	HOURS	HOURS FACTOR
6/83	SYSTEM	95.8	94.1	94.3	69.6		720	533	501

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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

A FAULTY TEMPERATURE PROBE ACCOUNTED FOR APPROXIMATELY 16 HOURS OF OUTAGE TIME IN JUNE.

A FAULTY DAMPER FORCED THE UNIT OUT OF SERVICE IN JUNE FOR 30 HOURS.

HIGH FURNACE PRESSURE RESULTED IN 11 HOURS OF UNIT DOWN TIME DURING THE MONTH.

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 163 HOURS DURING JUNE DUE TO A LACK OF POWER DEMAND.

7/83	SYSTEM	96.0	96.7	95.6	87.0	744	670	647

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 64 HOURS OF OUTAGE TIME DURING JULY WAS DUE TO A LACK OF POWER DEMAND.

A LOSS OF VENTURI FLOW ACCOUNTED FOR APPROXIMATELY 18 HOURS OF DOWN TIME DURING THE MONTH.

A 12 HOUR OUTAGE DURING THE MONTH WAS REQUIRED TO CLEAN A VENTURI TANK.

A 3 HOUR OUTAGE OCCURRED DURING JULY DUE TO A BOILER PROBLEM.

8/83	SYSTEM	100.0	99.6	100.0	84.4	744	631	628

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED OUTAGES ACCOUNTED FOR APPROXIMATELY 53 HOURS OF DOWN TIME DURING AUGUST.

THE UNIT WAS DOWN APPROXIMATELY 64 HOURS DURING AUGUST DUE TO A LACK OF POWER DEMAND.

9/83	SYSTEM	100.0	100.0	100.0	62.0	720	447	447

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER TUBE LEAKS ACCOUNTED FOR APPROXIMATELY 175 HOURS OF DOWN TIME DURING SEPTEMBER.

THE UNIT WAS DOWN APPROXIMATELY 79 HOURS DURING SEPTEMBER BECAUSE OF LOW POWER DEMAND.

10/83	SYSTEM	100.0	100.0	100.0	100.0	744	744	744

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING OCTOBER 1983.

11/83	SYSTEM	100.0	100.0	100.0	82.7	720	595	595

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 52 HOURS OF DOWN TIME DURING NOVEMBER.

THE UTILITY REPORTED A SCHEDULED OUTAGE BEGINNING ON NOVEMBER 27 AND CONTINUING THROUGH THE END OF THE MONTH.

12/83	SYSTEM	100.0	100.0	100.0	66.0	744	491	491

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 UNIT WAS DOWN APPROXIMATELY 228 HOURS DURING THE MONTH FOR A SCHEDULED OUTAGE.

BOILER RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 3 HOURS OF OUTAGE TIME DURING THE MONTH.

THE UNIT WAS DOWN APPROXIMATELY 22 HOURS DURING DECEMBER DUE TO LOW DEMAND

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/84	SYSTEM	100.0	99.7	100.0	99.7		744	744	742	

** PROBLEMS/SOLUTIONS/COMMENTS

DUE TO A BOILER OUTAGE, THE FGD SYSTEM WAD DOWN 2.3 HOURS DURING JANUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/84	SYSTEM	100.0	100.0	100.0	100.0		696	696	696	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/84	SYSTEM	100.0	100.0	100.0	98.3		744	731	731	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 13 HOURS DURING MARCH DUE TO A LACK OF POWER DEMAND.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/84	SYSTEM	100.0	99.8	100.0	90.2		720	651	650	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 70 HOURS IN APRIL DUE TO BOILER OUTAGES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/84	SYSTEM	100.0	100.0	100.0	70.1		744	521	521	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE APPROXIMATELY 223 HOURS IN MAY DUE TO A SCHEDULED BOILER OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/84	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/84	SYSTEM	96.1	96.0	96.0	95.6		744	741	711	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS SHUT DOWN APPROXIMATELY 4 HOURS TO INSPECT AN ABSORBER TRAY.

DURING JULY, THE FGD SYSTEM WAS DOWN 5.5 HOURS TO CLEAN THE EFFLUENT SYSTEM.

A 3.1 HOUR FGD SYSTEM OUTAGE OCCURRED IN JULY DUE TO FAN RELATED PROBLEMS.

A FORCED OUTAGE LASTING APPROXIMATELY 7 HOURS OCCURRED DURING JULY DUE TO

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

VENTURI SCRUBBER RELATED PROBLEMS.										
THE FGD SYSTEM WAS OFF LINE 3.7 HOURS DURING JULY TO REPLACE THE 3B VENTURI MOTOR.										
ABSORBER TRAY AND VENTURI SPRAY NOZZLE CLEANING RESULTED IN APPROXIMATELY 7 HOURS OF DOWN TIME DURING JULY.										
THE UNIT WAS DOWN APPROXIMATELY 4 HOURS IN JULY DUE TO BOILER RELATED PROBLEMS.										
8/84	SYSTEM	100.0	99.6	100.0	97.2		744	726	724	
** PROBLEMS/SOLUTIONS/COMMENTS										
UNIT 3 WAS DOWN FOR 21 HOURS IN AUGUST DUE TO BOILER RELATED PROBLEMS.										
9/84	SYSTEM	100.0	99.8	100.0	95.3		720	688	686	
** PROBLEMS/SOLUTIONS/COMMENTS										
UNIT 3 WAS DOWN FOR APPROXIMATELY 34 HOURS IN SEPTEMBER DUE TO BOILER RELATED PROBLEMS. NO FGD - RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH.										
10/84	SYSTEM	100.0	99.8	100.0	77.5		744	578	577	
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS OFF-LINE APPROXIMATELY 7 DAYS IN OCTOBER FOR SCHEDULED BOILER MAINTENANCE. NO FGD - RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTH.										
11/84	SYSTEM	96.7	96.7	96.7	96.7		720	720	696	
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE MONTH OF NOVEMBER, RAIN CAUSED THE FGD FAN TO TRIP FOUR TIMES ACCOUNTING FOR A TOTAL OF 12 HOURS OF FGD OUTAGE TIME.										
APPROXIMATELY 11 HOURS OF OUTAGE TIME WAS DUE TO THE REPAIRING OF A LEAKING ABSORBER RECYCLE TRAY.										
12/84	SYSTEM	97.7	97.1	97.6	91.5		744	701	680	
** PROBLEMS/SOLUTIONS/COMMENTS										
ABSORBER FAN TRIPS ACCOUNTED FOR APPROXIMATELY 17 HOURS OF FORCED OUTAGE TIME DURING THE MONTH OF DECEMBER.										
BOILER RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 20 HOURS OF FGD DOWN TIME DURING THE MONTH.										
1/85	SYSTEM	98.4	98.3	98.3	93.9		744	711	698	
** PROBLEMS/SOLUTIONS/COMMENTS										
ONLY MINOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY DURING JANUARY. PROBLEMS INCLUDED A VENTURI THROAT SPRAY INFLANGE LEAK AND TEMPERATURE PROBE FAILURE.										
2/85	SYSTEM	92.5	95.3	91.4	79.4		672	560	533	

NEVADA POWER: REID GARDNER 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

SOME OUTAGE TIME WAS ATTRIBUTED TO SCRUBBER CLEANING.

REHEATER FAN MOTOR PROBLEMS CAUSED SEVERAL HOURS OF DOWNTIME ON FEBRUARY 9 THROUGH THE 10TH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/85	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED OUTAGES WERE REPORTED BY THE UTILITY FOR MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/85	SYSTEM	100.0			100.0		720	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE THE ENTIRE MONTH FOR A SCHEDULED BOILER OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/85	SYSTEM	100.0			100.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF LINE THE ENTIRE MONTH FOR BOILER-RELATED WORK.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/85	SYSTEM	98.9	100.0	98.8	94.8		720	455	683	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OUT OF SERVICE FOR LESS THAN A DAY DURING THE MONTH FOR FGD SYSTEM PROBLEMS. A FORCED OUTAGE OCCURRED REQUIRING EXPANSION JOINT REPAIR WORK DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/85	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/85	SYSTEM	100.0	99.7	100.0	95.0		744	709	707	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT ALL FGD SYSTEM DOWNTIME IN AUGUST WAS BOILER-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/85	SYSTEM	47.8	64.8	47.8	47.8		720	532	344	

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 6 HOURS OF FGD SYSTEM OUTAGE TIME WERE REQUIRED FOR VENTURI THROAT SPRAY HEADER CLEANING.

THE FGD SYSTEM/UNIT FAN WAS REMOVED FOR REPAIR WORK AS THE UNIT WAS SHUT DOWN FOR A SCHEDULED OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/85	SYSTEM	85.1	84.2	84.3	80.1		744	708	596	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 SYSTEM WAS OUT OF SERVICE FOR NEARLY 13 HOURS SO THAT VENTURI PUMP REPAIRS COULD BE COMPLETED.

SEVERAL FGD SYSTEM FORCED OUTAGES OCCURRED DURING THE MONTH, MOST OF WHICH WERE FAN RELATED. DURING THE MONTH OUTAGE TIME WAS REQUIRED FOR FAN ALIGNMENT, INSPECTION, AND BALANCING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/85	SYSTEM	100.0	99.9	100.0	97.5		720	703	702	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF NOVEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/85	SYSTEM	98.6	96.5	98.6	96.5		744	744	718	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE FOR ROUGHLY 11 HOURS TO CLEAN THE VENTURI THROAT SPRAY HEADER. ALL OTHER OUTAGE TIME WAS ATTRIBUTED TO BOILER-RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/86	SYSTEM	100.0	99.4	100.0	97.2		744	727	723	

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERAL BOILER OUTAGES OCCURRED DURING THE MONTH. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED.

SEVERAL HOURS OF OUTAGE TIME WERE REQUIRED EARLY IN THE MONTH TO CLEAN THE VENTURI RACE TRACK SPRAY AND RECYCLE TANK. OTHER OUTAGES DURING THE MONTH WERE ATTRIBUTED TO BOILER PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/86	SYSTEM	95.5	92.7	92.7	57.3		672	416	385	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/86	SYSTEM	96.8	100.0	100.0	80.1		744	596	596	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER WAS OFF-LINE A LITTLE OVER A DAY TO PERMIT NEW VENTURI BOX RUBBER CURING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/86	SYSTEM	99.5	99.6	99.5	99.5		720	719	716	

** PROBLEMS/SOLUTIONS/COMMENTS

A TRAY RECYCLE RETURN LINE LEAK FORCED THE SYSTEM OUT OF SERVICE FOR ABOUT 4 HOURS IN APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/86	SYSTEM	98.0	97.6	97.9	93.6		744	714	697	

** PROBLEMS/SOLUTIONS/COMMENTS

A 4.5 HOUR OUTAGE OCCURRED DURING THE MONTH FOR VENTURI SPRAY SECTION (RACE TRACK) CLEANING.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/86	SYSTEM	100.0	100.0	100.0	96.3		720	694	694	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
7/86	SYSTEM	100.0	100.0	100.0	95.3		744	709	709	

** PROBLEMS/SOLUTIONS/COMMENTS

ALL FORCED OUTAGES REPORTED FOR JULY WERE BOILER-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
8/86	SYSTEM	96.0	96.0	96.0	96.0		744	744	715	

** PROBLEMS/SOLUTIONS/COMMENTS

INSTRUMENTATION SENSING LINE PLUGGING FORCED THE UNIT OFF LINE ROUGHLY AN HOUR.

THE UTILITY REPORTED A BRIEF FORCED OUTAGE CAUSED BY SCRUBBER/ABSORBER TRAY PLUGGING.

REHEATER FAN PROBLEMS FORCED THE SYSTEM OFF LINE SEVERAL TIMES IN AUGUST.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
9/86	SYSTEM	52.2	100.0	51.0	49.8		720	357	359	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT/SCRUBBER OUTAGE CONTINUED UNTIL THE 14TH OF THE MONTH. OTHER OUTAGES DURING THE MONTH WERE UNIT-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
10/86	SYSTEM	100.0	99.9	100.0	96.9		744	722	721	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM PROBLEMS OCCURRED IN OCTOBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
11/86	SYSTEM	98.9	98.8	98.8	96.5		720	703	695	

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 8 HOURS OF OUTAGE TIME WAS REQUIRED FOR SCRUBBER/ABSORBER TRAY CLEANING IN NOVEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
12/86	SYSTEM	92.4	92.4	92.4	92.4		744	744	687	

** PROBLEMS/SOLUTIONS/COMMENTS

AN FGD SYSTEM INSTRUMENTATION/CONTROL SYSTEM LOGIC CHECK FORCED THE UNIT OFF-LINE FOR 1.5 HOURS.

A VENTURI BOX LEAK CAUSED 55 HOURS OF DOWN TIME IN DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
1/87	SYSTEM	100.0	99.8	100.0	91.1		744	679	678	

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER UNIT WAS OUT OF SERVICE FOR 65 HOURS IN JANUARY DUE TO TUBE LEAKS. NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL	PER SO2 PART.	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
2/87	SYSTEM	100.0	100.0	100.0	53.2		672	357	357	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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

UNIT 3 WAS TAKEN OUT OF SERVICE FEBRUARY 15 FOR A SCHEDULED OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/87	SYSTEM	98.1	97.7	97.7	81.8		744	623	608	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER WAS OUT OF SERVICE OVER 14 HOURS FOR VENTURI RACETRACK CLEANING.

THE SCHEDULED UNIT OUTAGE CONTINUED UNTIL MARCH 6, 1987.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/87	SYSTEM	96.6	96.4	96.2	88.5		720	661	637	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER WAS OUT OF SERVICE FOR ALMOST 25 HOURS DUE TO TRAY CLEANING. ALL OTHER OUTAGES WERE BOILER RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/87	SYSTEM	92.5	91.9	91.9	85.5		744	692	636	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCRUBBER/ABSORBER SYSTEM WAS OUT OF SERVICE FOR 56 HOURS IN MAY TO REPAIR A HOLE IN THE VENTURI BOX.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/87	SYSTEM	100.0	100.0	100.0	98.7		720	711	711	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER PROBLEMS ACCOUNTED FOR SHORT OUTAGES IN JUNE. NO SCRUBBER/ABSORBER PROBLEMS WERE ENCOUNTERED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/87	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/87	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/87	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JULY THROUGH SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/87	SYSTEM	100.0	100.0	100.0	33.0		744	245	245	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS TAKEN OUT OF SERVICE OCTOBER 11 FOR A SCHEDULED OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/87	SYSTEM	100.0	97.4	100.0	5.6		720	41	40	

** PROBLEMS/SOLUTIONS/COMMENTS

BEARING VIBRATIONS CAUSED UNIT 3 TO BE OUT OF SERVICE FOR OVER 400 HOURS IN NOVEMBER. NO SCRUBBER/ABSORBER PROBLEMS WERE ENCOUNTERED.

THE SCHEDULED UNIT OUTAGE CONTINUED THROUGH NOVEMBER 12.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/87	SYSTEM	100.0	97.7	100.0	68.5		744	522	510	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 3 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER PROBLEMS CAUSED OVER 200 HOURS OF DOWNTIME. NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED FOR DECEMBER.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEVADA POWER	
PLANT NAME	REID GARDNER	
UNIT NUMBER	4	
CITY	MOAPA	
STATE	NEVADA	
REGULATORY CLASSIFICATION	B	
PARTICULATE EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	580	
GROSS UNIT GENERATING CAPACITY - MW	285	
NET UNIT GENERATING CAPACITY W/FGD - MW	250	
NET UNIT GENERATING CAPACITY WO/FGD - MW	264	
EQUIVALENT SCRUBBED CAPACITY - MW	242	

** 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	152.	(500 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	****	
AVERAGE HEAT CONTENT - J/G	26749.	(11500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	*****	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.75	
RANGE SULFUR CONTENT - %	0.5-1.0	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** FABRIC FILTER

NUMBER	1
SUPPLIER	CARBORUNDUM

** 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	SODIUM CARBONATE
SYSTEM SUPPLIER	THYSSEN/CEA
A-E FIRM	FLUOR - PIONEER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	85.00
ENERGY CONSUMPTION - %	4.9
CURRENT STATUS	1
COMMERCIAL START-UP	7/1983

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 4 (CONT.)

INITIAL START-UP	6/1983
CONTRACT AWARDED	12/1981
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** ABSORBER	
NUMBER	3
NUMBER OF SPARES	1
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	N/A
SHELL GENERIC MATERIAL	NA
SHELL SPECIFIC MATERIAL	NA
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA
LINER GENERIC MATERIAL	NA
LINER SPECIFIC MATERIAL	NA
LINER MATERIAL TRADE NAME/COMMON TYPE	NA
GAS CONTACTING DEVICE TYPE	NONE
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** REHEATER	
NUMBER	1
GENERIC TYPE	INDIRECT HOT AIR
SPECIFIC TYPE	EXTERNAL HEAT EXCHANGER
TRADE NAME/COMMON TYPE	STEAM TUBE BUNDLE
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** FANS	
DESIGN	NR
FUNCTION	NA
APPLICATION	NR
SERVICE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
** DAMPERS	
FUNCTION	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NA
SHELL SPECIFIC MATERIAL TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	NA
DEVICE	NA
DEVICE TYPE	NA

NEVADA POWER: REID GARDNER 4 (CONT.)

** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NONE
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	BLEED
DEVICE	NA
PROPRIETARY PROCESS	NA
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TREATMENT	CLAY LINING
** WATER BALANCE	
WATER LOOP TYPE	OPEN

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

6/83 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMMENCED OPERATION IN JUNE AND IS CURRENTLY IN THE STARTUP PHASE OF OPERATION.

7/83 SYSTEM 95.8

14.3

73.3

11.6

744

606

87

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 626 HOURS DURING JULY DUE TO BOILER-RELATED PROBLEMS.

BYPASS DAMPER PROBLEMS ACCOUNTED FOR 32 HOURS OF OUTAGE TIME DURING THE MONTH.

8/83 SYSTEM 50.2

56.9

48.5

46.8

744

612

348

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN APPROXIMATELY 15 DAYS DURING AUGUST DUE TO BYPASS DAMPER PROBLEMS.

APPROXIMATELY 25 HOURS OF OUTAGE TIME DURING THE MONTH RESULTED FROM BOILER PROBLEMS.

9/83 SYSTEM 100.0

92.1

100.0

48.9

720

382

352

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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

BOILER RELATED PROBLEMS AND SCHEDULED BOILER OVERHAUL ACCOUNTED FOR APPROXIMATELY 368 HOURS OF DOWN TIME DURING SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/83	SYSTEM	99.6	95.2	98.9	35.4		744	277	264	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OUT OF SERVICE APPROXIMATELY 20 DAYS DURING OCTOBER FOR CONTINUATION OF THE SCHEDULED OUTAGE.

ADDITIONAL BOILER RELATED PROBLEMS ACCOUNTED FOR 14 HOURS OF DOWN TIME DURING THE MONTH.

FAN PROBLEMS ACCOUNTED FOR 3 HOURS OF FGD SYSTEM DOWN TIME DURING THE MONTH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/83	SYSTEM	100.0	98.2	100.0	96.5		720	707	695	

** PROBLEMS/SOLUTIONS/COMMENTS

APPROXIMATELY 26 HOURS OF OUTAGE TIME DURING NOVEMBER WAS DUE TO BOILER-TRIPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/83	SYSTEM	99.9	99.2	99.9	98.2		744	737	731	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER RELATED PROBLEMS ACCOUNTED FOR APPROXIMATELY 12 HOURS OF DOWN TIME DURING DECEMBER.

ELECTRICAL PROBLEMS ACCOUNTED FOR A BRIEF 1 HOUR OUTAGE OF THE ABSORBER DURING DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/84	SYSTEM	100.0	99.1	100.0	97.9		744	735	729	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN 2.3 HOURS DURING JANUARY DUE TO BOILER OUTAGES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/84	SYSTEM	99.6	99.2	99.5	82.7		696	581	576	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN APPROXIMATELY 3 HOURS DUE TO THE HIGH INLET TEMPERATURES OF MODULE A'S ABSORBERS.

THE FGD SYSTEM WAS DOWN APPROXIMATELY 117 HOURS IN FEBRUARY DUE TO BOILER PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/84	SYSTEM	100.0	99.0	99.9	51.0		744	383	380	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN FOR APPROXIMATELY 364 HOURS DURING MARCH DUE TO BOILER OUTAGES.

THE FGD SYSTEM WAS DOWN 0.3 HOURS DURING MARCH DUE TO BYPASS DAMPER PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/84	SYSTEM	99.9	100.0	99.8	84.1		720	606	606	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 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 FGD SYSTEM WAS DOWN 1 HOUR DURING APRIL DUE TO ELECTRICAL PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/84	SYSTEM	99.9	53.9	99.7	47.0		744	648	349	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF LINE FOR 393.5 HOURS DURING MAY DUE TO BOILER-RELATED PROBLEMS.

MODULES B AND C WERE FORCED OFF LINE ONE HOUR DURING MAY DUE TO LACK OF SOOT BLOWERS AND A RESULTING TRIP ON HIGH TEMPERATURES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/84	SYSTEM	99.9	99.5	99.9	95.1		720	688	685	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 35 HOURS DUE TO BOILER RELATED PROBLEMS DURING JUNE.

AN ABSORBER TRIP DUE TO BAGHOUSE PROBLEMS LASTED APPROXIMATELY ONE-HALF HOUR DURING JUNE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/84	SYSTEM	100.0	100.0	100.0	95.7		744	712	712	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DOWN APPROXIMATELY 32 HOURS IN JULY DUE TO BOILER OUTAGES.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/84	SYSTEM	82.5	88.1	82.0	80.0		744	676	595	

** PROBLEMS/SOLUTIONS/COMMENTS

DURING AUGUST, THE UNIT WAS DOWN 13.5 HOURS DUE TO BOILER RELATED PROBLEMS

THE UNIT WAS DOWN 61 HOURS DURING AUGUST FOR MAINTENANCE ON ABSORBERS AND BURNERS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/84	SYSTEM	100.0	99.9	100.0	98.4		720	710	709	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS OFF-LINE APPROXIMATELY 11 HOURS IN SEPTEMBER DUE TO BOILER RELATED PROBLEMS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/84	SYSTEM	95.9	99.5	95.9	95.9		744	717	714	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS FORCED OFF-LINE FOR APPROXIMATELY 30 HOURS IN OCTOBER TO MAKE ABSORBER REPAIRS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/84	SYSTEM	100.0	100.0	100.0	33.8		720	243	243	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS SHUT DOWN ON NOVEMBER 11 AND REMAINED OFF-LINE THE REMAINDER OF THE MONTH FOR A SCHEDULED MAINTENANCE OVERHAUL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/84	SYSTEM	100.0	92.2	100.0	38.9		744	314	290	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 4 (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 AND FGD SYSTEM CAME BACK ON-LINE DECEMBER 19. NO MAJOR FGD -
 RELATED OUTAGES WERE REPORTED FOR THE REMAINDER OF DECEMBER.

1/85 SYSTEM 100.0 99.7 100.0 94.0 744 702 699

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR JANUARY.

2/85 SYSTEM 100.0 100.0 100.0 100.0 672 672 672

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD SYSTEM-RELATED PROBLEMS OCCURRED DURING
 THE MONTH.

3/85 SYSTEM 99.9 99.3 99.9 74.6 744 559 555

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY DURING MARCH.

4/85 SYSTEM 100.0 99.3 100.0 96.4 720 699 694

** PROBLEMS/SOLUTIONS/COMMENTS

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

5/85 SYSTEM 100.0 100.0 100.0 100.0 744 744 744

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH
 OF MAY.

6/85 SYSTEM 97.7 97.4 97.7 95.8 720 708 690

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR JUNE.

7/85 SYSTEM 99.1 99.4 99.1 98.4 744 736 732

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR
 JULY.

8/85 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/85 SYSTEM 100.0 99.5 100.0 97.5 720 706 702

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 4 (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 SYSTEM OUTAGES WERE REPORTED BY THE UTILITY FOR SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/85	SYSTEM	100.0	99.9	100.0	60.8		744	453	452	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/85	SYSTEM	100.0	98.8	100.0	82.0		720	598	591	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF NOVEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/85	SYSTEM	100.0	99.5	100.0	98.1		744	734	730	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR DECEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/86	SYSTEM	100.0	99.9	100.0	99.4		744	740	740	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/86	SYSTEM	100.0	96.0	100.0	7.2		672	50	48	

** PROBLEMS/SOLUTIONS/COMMENTS

ALL OUTAGE TIME LOGGED IN FEBRUARY WAS BOILER-RELATED. SOME OF THE BOILER OFF TIME WAS FOR SCHEDULED MAINTENANCE. SEVERAL DAYS OF OUTAGE WAS DUE TO PRODUCTION CONTROL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/86	SYSTEM	100.0			100.0		744	0	0	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED UNIT OUTAGE CONTINUED THROUGH MARCH.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/86	SYSTEM	100.0	99.6	100.0	95.8		720	693	690	

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR APRIL.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/86	SYSTEM	83.0	100.0	83.0	82.9		744	617	617	

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS SHUT DOWN A FEW DAYS EARLY IN THE MONTH FOR SCHEDULED MAINTENANCE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/86	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/86	SYSTEM	100.0	100.0	100.0	98.9		744	736	736	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEVADA POWER: REID GARDNER 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

A BRIEF BOILER-RELATED OUTAGE OCCURRED LATE IN THE MONTH. NO SCRUBBER/
 ABSORBER PROBLEMS WERE REPORTED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
8/86	SYSTEM	100.0	99.9	100.0	93.9		744	699	699	

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY FORCED OUTAGE REPORTED FOR AUGUST WAS UNIT-RELATED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/86	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO OUTAGES OCCURRED DURING THE MONTH OF SEPTEMBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/86	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

NO UNIT OR FGD SYSTEM OUTAGES OCCURRED IN OCTOBER.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
11/86	SYSTEM	99.5	99.5	99.0	47.2		720	341	340	

** PROBLEMS/SOLUTIONS/COMMENTS

FROM THE 9TH TO THE 25TH OF NOVEMBER, THE UNIT AND SCRUBBING SYSTEM
 WERE OFF-LINE FOR A SCHEDULED FALL OUTAGE.
 PROBLEMS WAS ONLY 3.6 HOURS.

FROM THE 9TH TO THE 25TH OF NOVEMBER, THE UNIT AND SCRUBBING SYSTEM
 WERE OFF-LINE FOR A SCHEDULED FALL OUTAGE.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
12/86	SYSTEM	100.0	99.7	100.0	93.4		744	697	695	

** PROBLEMS/SOLUTIONS/COMMENTS

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/87	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED FOR JANUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/87	SYSTEM	100.0	100.0	100.0	31.9		672	214	214	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 4 WAS DOWN FOR 458 HOURS FOR A SCHEDULED OUTAGE IN FEBRUARY.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/87	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/87	SYSTEM	100.0	100.0	100.0	100.0		720	719	720	

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
5/87	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

** PROBLEMS/SOLUTIONS/COMMENTS

NO SCRUBBER/ABSORBER SYSTEM PROBLEMS WERE REPORTED FOR THE PERIOD MARCH
 THROUGH MAY 1987.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/87	SYSTEM	100.0	100.0	100.0	94.7		720	639	682	

NEVADA POWER: REID GARDNER 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

BOILER REPAIRS FORCED UNIT 4 OFF-LINE FOR 36 HOURS DURING JUNE. NO
 SCRUBBER/ABSORBER PROBLEMS WERE REPORTED.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. HOURS FACTOR
7/87	SYSTEM	99.9	99.9	99.9	99.9		744	744	743	

** PROBLEMS/SOLUTIONS/COMMENTS

A HIGH INLET TEMPERATURE FORCED THE SCRUBBER/ABSORBER TO BE OUT OF SERVICE
 FOR A SHORT PERIOD DURING THE MONTH.

8/87	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	

9/87	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED FOR THE MONTHS OF AUGUST OR
 SEPTEMBER.

10/87	SYSTEM	100.0	99.8	100.0	97.8		744	729	728	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 4 WAS OUT OF SERVICE FOR 16 HOURS DUE TO BOILER RELATED PROBLEMS.
 NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED FOR OCTOBER.

11/87	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	

** PROBLEMS/SOLUTIONS/COMMENTS

NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED FOR THE MONTH OF NOVEMBER.

12/87	SYSTEM	100.0	99.9	100.0	99.6		744	742	741	

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER-RELATED PROBLEMS FORCED UNIT 4 OFF-LINE FOR 2 HOURS DURING
 NOVEMBER. NO SCRUBBER/ABSORBER PROBLEMS WERE REPORTED.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NEW YORK STATE ELEC & GAS	
PLANT NAME	SOMERSET	
UNIT NUMBER	1	
CITY	SOMERSET	
STATE	NEW YORK	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	13.	(0.030 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	301.	(0.700 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	850	
GROSS UNIT GENERATING CAPACITY - MW	680	
NET UNIT GENERATING CAPACITY W/FGD - MW	643	
NET UNIT GENERATING CAPACITY WO/FGD - MW	659	
EQUIVALENT SCRUBBED CAPACITY - MW	680	

** 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	1350.96	(2862800 ACFM)
BOILER FLUE GAS TEMPERATURE - C	156.1	(313 F)
STACK HEIGHT - M	137.	(450 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	7.6	(25.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	30005.	(12900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		10500-12500
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	10.0-22.0	
AVERAGE MOISTURE CONTENT - %	5.80	
RANGE MOISTURE CONTENT - %	6.0-10.0	
AVERAGE SULFUR CONTENT - %	2.50	
RANGE SULFUR CONTENT - %	2.0-3.0	
AVERAGE CHLORIDE CONTENT - %	0.15	
RANGE CHLORIDE CONTENT - %	0.07-0.15	

*** PARTICLE CONTROL

** ESP

NUMBER	2	
TYPE	COLD SIDE	
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

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
PROCESS ADDITIVES	SODIUM THIOSULFATE
SYSTEM SUPPLIER	PEABODY PROCESS SYSTEMS
A-E FIRM	EBASCO SERVICES, INC.
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.77

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEW YORK STATE ELEC & GAS: SOMERSET 1 (CONT.)

UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.4
CURRENT STATUS	1
COMMERCIAL START-UP	8/1984
INITIAL START-UP	7/1984
CONTRACT AWARDED	2/1982
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	-13.60
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** ABSORBER	
NUMBER	6
NUMBER OF SPARES	2
GENERIC TYPE	SPRAY TOWER
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	PEABODY PROCESS SYSTEMS
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 POLYESTER;NATURAL RUBBER 'SPRAY Z
LINER MATERIAL TRADE NAME/COMMON TYPE	CONCRETE 2500 AR; BLACK NATURAL RUBBER
LIQUID RECIRCULATION RATE - LITER/S	2930. (46500 GPM)
L/G RATIO - L/CU.M	8.7 (65.0 GAL/1000 ACF)
INLET GAS FLOW - CU. M/S	337.74 (715700 ACFM)
INLET GAS TEMPERATURE - C	156.1 (313 F)
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** FANS	
NUMBER	4
NUMBER OF SPARES	0
DESIGN	NR
FUNCTION	UNIT
APPLICATION	NR
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	NR
** DAMPERS	
FUNCTION	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NA
SHELL SPECIFIC MATERIAL TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	NR
DEVICE TYPE	NR

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

★★ PROBLEMS/SOLUTIONS/COMMENTS

10/84	SYSTEM	744
11/84	SYSTEM	720
12/84	SYSTEM	744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 NEW YORK STATE ELEC & GAS: SOMERSET 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

DUE TO THEIR SPARE CAPACITY, THE UTILITY REPORTED ACHIEVING HIGH FGD AVAILABILITIES DURING THE FOURTH QUARTER. DURING THE PERIOD, THE REAGENT SLURRY TANK WAS RELINED WITH A CEILCOTE TYPE LINER. THIS MEASURE WAS NECESSARY TO STOP THE CORROSION OF THE CARBON STEEL. THE SOLID WASTE HANDLING RADIAL STACKER WAS ALSO DAMAGED AND REQUIRED REPAIRS. THE BOILER WAS REPORTED TO HAVE OPERATED FOR APPROXIMATELY 80% OF 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 MAJOR FGD-RELATED OUTAGES (GREATER THAN 1 WEEK) WERE ENCOUNTERED DURING THE YEAR 1985. THE LAST SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE OCCURRED IN SEPTEMBER/OCTOBER AND LASTED APPROXIMATELY 2 WEEKS.

TO DATE, THE MOST COMMON RECURRING PROBLEM ENCOUNTERED WITH THE FGD SYSTEM HAS BEEN THE EROSION OF THE MODULE LINING. THE CEILCOTE 103 LINER WHICH WAS TO LAST 5 YEARS ONLY LASTED APPROXIMATELY 1 YEAR. CEILCOTE HAS A NEW PRODUCT WHICH HAS SHOWN GOOD RESULTS. THE UTILITY PLANS TO HAVE CEILCOTE LINE ALL SIX MODULES WITH THE NEW PRODUCT.

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

NEW YORK STATE ELEC & GAS: SOMERSET 1 (CONT.)

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

10/86	SYSTEM						774
11/86	SYSTEM						720
12/86	SYSTEM						774

** PROBLEMS/SOLUTIONS/COMMENTS

ALL SIX ABSORBER MODULES WERE RELINED WITH A NEW CEILCOTE 2500 AR MATERIAL RELINING WAS CONDUCTED OVER A SIX MONTH PERIOD AND DID NOT REQUIRE ANY FGD OR UNIT DOWNTIME DUE TO AVAILABLE MODULE SPARE CAPACITY.

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1986. THE UNIT WAS REPORTED TO HAVE HAD ONLY TWO MINOR OUTAGES. THE FIRST WAS IN FEBRUARY AND LASTED APPROXIMATELY 7 DAYS, AND THE SECOND WAS IN JUNE, WHICH LASTED ONLY 3 DAYS. UNIT AVAILABILITY FOR 1986 WAS REPORTED TO BE 97 PERCENT.

1/87	SYSTEM						744
2/87	SYSTEM						672
3/87	SYSTEM						744
4/87	SYSTEM						720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OR UNIT OUTAGES WERE ENCOUNTERED DURING THE PERIOD JANUARY THROUGH APRIL 1987.

5/87	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF-LINE FOR 2 WEEKS IN MAY FOR SCHEDULED BOILER/TURBINE MAINTENANCE.

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 OR UNIT OUTAGES WERE ENCOUNTERED DURING THE PERIOD MAY THROUGH OCTOBER 1987.

11/87	SYSTEM						720
12/87	SYSTEM						744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED CEILCOTE LINER FAILURES IN THE ABSORBER OUTLET DUCTWORK. THE FAILURES SEEMED TO OCCUR PRIMARILY ON THE TOP AND SIDE WALLS OF THE DUCTWORK. IN ADDITION, THE PENNALT BLOCK MATERIAL USED IN THE DUCTWORK LOCATED DOWN STREAM OF THE BYPASS DAMPER WAS

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NEW YORK STATE ELEC & GAS: SOMERSET 1 (CONT.)

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

REPORTED TO BE FAILING. THE UTILITY IS INVESTIGATING VARIOUS
OPTIONS INCLUDING THE USE OF HIGH ALLOY LINERS TO RESOLVE THE PROBLEM.

THE UTILITY REPORTED THAT THE UNIT EXPERIENCED A 1-WEEK FORCED OUTAGE
DURING THE MONTH OF NOVEMBER FOR BOILER TUBE REPAIRS. NO OTHER UNIT OR
FGD-RELATED OUTAGES WERE ENCOUNTERED FOR THE REMAINDER OF THE YEAR.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN INDIANA PUB SERVICE
PLANT NAME	R.M. SCHAFER
UNIT NUMBER	17
CITY	WHEATFIELD
STATE	INDIANA
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750
GROSS UNIT GENERATING CAPACITY - MW	379
NET UNIT GENERATING CAPACITY W/FGD - MW	344
NET UNIT GENERATING CAPACITY WO/FGD - MW	346
EQUIVALENT SCRUBBED CAPACITY - MW	379
*** 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	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	25353. (10900 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10500-11600
AVERAGE ASH CONTENT - %	10.34
RANGE ASH CONTENT - %	7.8-13.9
AVERAGE MOISTURE CONTENT - %	11.25
RANGE MOISTURE CONTENT - %	9.7-13.1
AVERAGE SULFUR CONTENT - %	3.20
RANGE SULFUR CONTENT - %	2.6-3.6
AVERAGE CHLORIDE CONTENT - %	0.02
RANGE CHLORIDE CONTENT - %	0.01-0.02
*** PARTICLE CONTROL	
** ESP	
NUMBER	1
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	CARBORUNDUM ENVIRONMENTAL SYSTEMS
** 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	DUAL ALKALI
SYSTEM SUPPLIER	FMC
A-E FIRM	SARGENT & LUNDY
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	0.5
CURRENT STATUS	1
COMMERCIAL START-UP	6/1983
INITIAL START-UP	4/1983

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 17 (CONT.)

CONTRACT AWARDED	12/1979
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	4
NUMBER OF SPARES	1
GENERIC TYPE	IMPINGEMENT TOWER
SPECIFIC TYPE	FIXED BAFFLE
TRADE NAME/COMMON TYPE	DISC CONTACTOR
SUPPLIER	FMC
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	FULL DIAMETER CONE-SPLASH RING CASCADES
NUMBER OF CONTACTING ZONES	3
** 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	IN-LINE
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	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
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 17 (CONT.)

DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	STABILIZATION
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	UNDECIDED
SITE TREATMENT	NR

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

4/83	SYSTEM						720			
5/83	SYSTEM						744			
6/83	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM COMMENCED OPERATION IN APRIL AND IS CURRENTLY IN THE STARTUP PHASE OF OPERATION.

7/83	SYSTEM	100.0	100.0	100.0	49.0		744	364	365	28.8
8/83	SYSTEM	100.0	100.0	100.0	31.2		744	232	232	19.4

** PROBLEMS/SOLUTIONS/COMMENTS

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

9/83	SYSTEM	100.0	100.0	100.0	15.1		720	109	109	10.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM EXPERIENCED BOILER-RELATED PROBLEMS DURING SEPTEMBER.

10/83	SYSTEM	100.0			0.0		744	0	0	0.0
11/83	SYSTEM	100.0	100.0	100.0	15.1		720	208	109	12.0
12/83	SYSTEM	100.0	100.0	100.0	75.3		744	560	560	34.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN INDIANA PUB SERVICE: R.M. SCHAHFER 17 (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 FGD SYSTEM AT SCHAHFER 17 EXPERIENCED
 BOILER-RELATED PROBLEMS DURING THE FOURTH QUARTER OF 1983.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
1/84	SYSTEM	100.0			0.0		744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN DURING THE ENTIRE MONTH OF
 JANUARY.

2/84	SYSTEM	99.7	99.6	99.6	57.8		696	404	402	44.1
3/84	SYSTEM	99.9	99.8	99.8	79.7		744	594	593	73.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING FEBRUARY AND MARCH.

4/84	SYSTEM	99.9	99.9	99.9	97.6		720	704	703	91.1
5/84	SYSTEM	100.0	100.0	100.0	98.5		744	733	733	83.2
6/84	SYSTEM	100.0	100.0	100.0	82.5		720	595	594	67.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE SECOND
 QUARTER OF 1984.

7/84	SYSTEM	100.0	100.0	100.0	99.9		744	743	743	79.2
8/84	SYSTEM		100.0	100.0	100.0		744	744	744	75.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED OUTAGES WERE REPORTED DURING JULY AND AUGUST.

NO MAJOR FGD RELATED OUTAGES WERE REPORTED DURING JULY AND AUGUST.

9/84	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR AUGUST AND SEPTEMBER 1984.

9/84	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	57.9
10/84	SYSTEM	99.9	99.9	99.9	99.9		744	744	743	74.7
11/84	SYSTEM	100.0	100.0	100.0	98.4		720	708	708	80.6
12/84	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	71.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE MONTHS OF SEPTEMBER THROUGH DECEMBER 1984.

1/85	SYSTEM	100.0	100.0	100.0	98.5		744	733	733	68.8
2/85	SYSTEM	100.0	100.0	100.0	100.0		672	672	672	75.9

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 17 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
3/85	SYSTEM	100.0	100.0	100.0	51.7		744	384	385	38.2
4/85	SYSTEM	100.0	100.0	100.0	72.1		720	519	519	51.1
5/85	SYSTEM	100.0	100.0	100.0	68.1		744	507	507	5.4
6/85	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	74.4
7/85	SYSTEM	100.0	100.0	100.0	90.3		744	672	672	65.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH JULY.

8/85	SYSTEM	73.4	100.0	100.0	73.4		744	547	546	51.6
9/85	SYSTEM	100.0			0.0		720	0	0	0.0
10/85	SYSTEM	100.0			0.0		744	0	0	0.0
11/85	SYSTEM	100.0	100.0	100.0	28.5		720	205	205	46.8

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED UNIT MAINTENANCE OUTAGE BEGAN ON AUGUST 26. FGD SYSTEM MAINTENANCE WORK WAS UNDERTAKEN THROUGHOUT THE UNIT OUTAGE, WHICH EXTENDED THROUGH THE MONTH OF OCTOBER AND INTO NOVEMBER. THE BOILER AND FGD SYSTEM WERE BROUGHT BACK ON LINE ON NOVEMBER 21.

12/85	SYSTEM	100.0	100.0	100.0	82.5		744	614	614	5.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE CONTINUOUS EMISSION MONITOR (CEM) WAS OUT OF SERVICE DURING NOVEMBER AND PART OF DECEMBER. NO OTHER FGD SYSTEM PROBLEMS WERE REPORTED.

1/86	SYSTEM	100.0	100.0	100.0	82.1		744	611	611	56.4
2/86	SYSTEM	100.0	100.0	100.0	72.9		672	490	490	42.0
3/86	SYSTEM	100.0	100.0	100.0	67.9		744	505	505	45.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE FIRST QUARTER.

4/86	SYSTEM	100.0	100.0	100.0	45.7		720	329	329	30.0
5/86	SYSTEM	100.0	100.0	100.0	78.9		744	494	587	37.3
6/86	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	72.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE SECOND QUARTER.

7/86	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	60.4
8/86	SYSTEM	100.0	100.0	100.0	85.0		744	632	632	41.4

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 17 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/86	SYSTEM	100.0	100.0	100.0	29.4		720	212	212	18.6
** PROBLEMS/SOLUTIONS/COMMENTS										
NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE THIRD QUARTER.										
10/86	SYSTEM	100.0	100.0	100.0	99.9		744	743	743	50.0
11/86	SYSTEM	100.0	100.0	100.0	100.0		720	335	720	27.2
** PROBLEMS/SOLUTIONS/COMMENTS										
A SCHEDULED UNIT OUTAGE BEGAN IN NOVEMBER.										
12/86	SYSTEM	100.0	100.0	100.0	100.0		744	179	744	12.9
** PROBLEMS/SOLUTIONS/COMMENTS										
THE SCHEDULED UNIT OUTAGE THAT BEGAN IN NOVEMBER ENDED IN DECEMBER. NO FGD SYSTEM-RELATED PROBLEMS WERE IDENTIFIED.										
1/87	SYSTEM	100.0	100.0	100.0	100.0		744	541	744	40.0
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF JANUARY.										
2/87	SYSTEM	100.0	100.0	100.0	100.0		672	71	672	6.1
** PROBLEMS/SOLUTIONS/COMMENTS										
ONE OF THE GAS MONITORS WAS OUT OF SERVICE FOR MOST OF UNIT ON-LINE HOURS.										
3/87	SYSTEM	100.0	100.0	100.0	100.0		744	704	744	58.5
4/87	SYSTEM	100.0	100.0	100.0	100.0		720	715	720	62.8
5/87	SYSTEM	100.0	100.0	100.0	100.0		744	662	744	51.9
6/87	SYSTEM	100.0	100.0	100.0	100.0		720	714	720	63.1
7/87	SYSTEM	100.0	100.0	100.0	100.0		744	717	744	56.6
8/87	SYSTEM	100.0	100.0	100.0	100.0		744	564	744	50.8
9/87	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	46.7
10/87	SYSTEM	100.0	100.0	100.0	100.0		744	205	744	14.5
11/87	SYSTEM	100.0	100.0	100.0	100.0		720	557	720	38.8
12/87	SYSTEM	100.0	100.0	100.0	100.0		744	323	744	22.7
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD MARCH THROUGH DECEMBER 1987.										

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN INDIANA PUB SERVICE
PLANT NAME	R.M. SCHAFER
UNIT NUMBER	18
CITY	WHEATFIELD
STATE	INDIANA
REGULATORY CLASSIFICATION	B
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1750
GROSS UNIT GENERATING CAPACITY - MW	376
NET UNIT GENERATING CAPACITY W/FGD - MW	344
NET UNIT GENERATING CAPACITY WO/FGD - MW	346
EQUIVALENT SCRUBBED CAPACITY - MW	376
** 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	25784. (11085 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	10500-11600
AVERAGE ASH CONTENT - %	10.34
RANGE ASH CONTENT - %	7.8-13.9
AVERAGE MOISTURE CONTENT - %	11.25
RANGE MOISTURE CONTENT - %	9.7-13.1
AVERAGE SULFUR CONTENT - %	3.20
RANGE SULFUR CONTENT - %	2.6-3.6
AVERAGE CHLORIDE CONTENT - %	0.02
RANGE CHLORIDE CONTENT - %	0.01-0.02
*** PARTICLE CONTROL	
** ESP	
NUMBER	1
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	CARBORUNDUM ENVIRONMENTAL SYSTEMS
** 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	DUAL ALKALI
SYSTEM SUPPLIER	FMC
A-E FIRM	SARGENT & LUNDY
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	0.5
CURRENT STATUS	1
COMMERCIAL START-UP	6/1986
INITIAL START-UP	12/1985

CONTRACT AWARDED	12/1979
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	4
NUMBER OF SPARES	1
GENERIC TYPE	IMPINGEMENT TOWER
SPECIFIC TYPE	FIXED BAFFLE
TRADE NAME/COMMON TYPE	DISC CONTACTOR
SUPPLIER	FMC
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	FULL DIAMETER CONE-SPLASH RING CASCADES
NUMBER OF CONTACTING ZONES	3
** 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	IN-LINE
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	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
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NR
SHELL SPECIFIC MATERIAL TYPE	NR
LINER GENERIC MATERIAL TYPE	NR
LINER SPECIFIC MATERIAL TYPE	NR
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	NR

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 18 (CONT.)

DEVICE TYPE	NR
** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	STABILIZATION
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	LANDFILL
LOCATION	UNDECIDED
SITE TREATMENT	NR

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

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS	FGD HOURS	CA ² . FACTOR

12/85	SYSTEM						744		

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL FGD OPERATIONS BEGAN AT THIS FACILITY DURING DECEMBER 23, 1985. T
UTILITY REPORTED THAT UNIT 18 ACHIEVED FIRST SYNCHRONIZATION ON DECEMBER
11, 1985. THE UNIT IS SCHEDULED TO BE COMMERCIAL IN FEBRUARY, 1986.

1/86	SYSTEM						774		

2/86	SYSTEM						672		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT BEGAN COMMERCIAL OPERATIONS ON FEBRUARY 14, 1986. NO FGD SYSTEM S
RELATED PROBLEMS WERE REPORTED BY THE FACILITY.

3/86	SYSTEM	100.0	100.0	100.0	100.0		744	744	744 69.5

** PROBLEMS/SOLUTIONS/COMMENTS

4/86	SYSTEM	100.0	100.0	100.0	100.0		720	720	720 65.5

5/86	SYSTEM	100.0	100.0	100.0	51.7		744	385	385 35.7

6/86	SYSTEM	100.0	100.0	100.0	58.2		720	419	419 44.7

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 18 (CONT.)

-----PERFORMANCE DATA-----
 PERIOD MODULE AVAILABILITY OPERABILITY RELIABILITY UTILIZATION % REMOVAL PER BOILER FGD CAP.
 S02 PART. HOURS HOURS HOURS HOURS FACTOR

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY DURING THE MONTHS OF MARCH-JUNE 1986.

7/86	SYSTEM	100.0	100.0	100.0	93.6	744	697	696	64.0
8/86	SYSTEM	100.0	100.0	100.0	93.0	744	692	692	50.1
9/86	SYSTEM	98.9	98.9	98.9	98.9	720	720	712	57.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE THIRD QUARTER.

10/86	SYSTEM	100.0	100.0	100.0	14.9	744	111	111	7.5
11/86	SYSTEM	100.0	100.0	100.0	100.0	720	544	720	37.2
12/86	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	52.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE NOVEMBER-DECEMBER PERIOD.

1/87	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	58.8
2/87	SYSTEM	100.0	100.0	100.0	100.0	672	672	672	68.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF JANUARY OR FEBRUARY 1987.

3/87	SYSTEM	100.0	100.0	100.0	100.0	744	482	744	45.9
4/87	SYSTEM	100.0	100.0	100.0	100.0	720	361	720	35.2

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 18 AND FGD SYSTEM WERE IN A PLANNED OUTAGE FOR A PART OF THIS PERIOD.

5/87	SYSTEM	100.0	100.0	100.0	100.0	744	744	744	70.6
6/87	SYSTEM	100.0	100.0	100.0	100.0	720	717	720	70.6
7/87	SYSTEM	100.0	100.0	100.0	100.0	744	674	744	62.5
8/87	SYSTEM	100.0	100.0	100.0	100.0	744	737	744	59.3
9/87	SYSTEM	100.0	100.0	100.0	100.0	720	720	720	58.0
10/87	SYSTEM	100.0	100.0	100.0	100.0	744	380	744	32.0
11/87	SYSTEM	100.0	100.0	100.0	100.0	720	677	720	58.9
12/87	SYSTEM	100.0	100.0	100.0	100.0	744	743	744	55.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN INDIANA PUB SERVICE: R.M. SCHAFER 18 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD MAY
THROUGH DECEMBER 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	RIVERSIDE	
UNIT NUMBER	6-7	
CITY	MINNEAPOLIS	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	E	
PARTICULATE EMISSION LIMITATION - NG/J	172.	(0.400 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	172.	(0.400 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	350	
GROSS UNIT GENERATING CAPACITY - MW	150	
NET UNIT GENERATING CAPACITY W/FGD - MW	140	
NET UNIT GENERATING CAPACITY WO/FGD - MW	144	
EQUIVALENT SCRUBBED CAPACITY - MW	150	

** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	PEAK	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	320.89	(680000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	176.7	(350 F)
STACK HEIGHT - M	84.	(275 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	3.7	(12.0 FT)

** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	21632.	(9300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		9100-9500
AVERAGE ASH CONTENT - %	8.00	
RANGE ASH CONTENT - %	7.9-8.1	
AVERAGE MOISTURE CONTENT - %	22.00	
RANGE MOISTURE CONTENT - %	20.0-24.0	
AVERAGE SULFUR CONTENT - %	1.20	
RANGE SULFUR CONTENT - %	0.9-1.5	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

** FABRIC FILTER

NUMBER	1	
TYPE	REVERSE AIR	
SUPPLIER	JOY MANUFACTURING	
INLET FLUE GAS CAPACITY - CU.M/S	320.9	(680000 ACFM)
PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	99.5	
TYPICAL GAS/CLOTH RATIO - M/MIN	0.5	(1.8 FT/MIN)

** ESP

NUMBER	0
TYPE	NONE

** PARTICLE SCRUBBER

NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON NAME	N/A
SHELL GENERIC MATERIAL	N/A
SHELL SPECIFIC MATERIAL	N/A
LINER GENERIC MATERIAL	N/A
LINER SPECIFIC MATERIAL	N/A
GAS CONTACTING DEVICE TYPE	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	SPRAY DRYING
PROCESS TYPE	LIME/SPRAY DRYING
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	DEMONSTRATION
NEW/RETROFIT	RETROFIT
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.50
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.7
CURRENT STATUS	1
COMMERCIAL START-UP	12/1980
INITIAL START-UP	11/1980
CONTRACT AWARDED	10/1979

** DESIGN AND OPERATING PARAMETERS
 DESIGN CHLORIDE CONTENT - %

** QUENCHER/PRESATURATOR

CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR

** ABSORBER

NUMBER	1
GENERIC TYPE	SPRAY DRYER
SPECIFIC TYPE	CROSSFLOW
TRADE NAME/COMMON TYPE	ROTARY ATOMIZER
SUPPLIER	NIRO ATOMIZER
DIMENSIONS - FT	46.0 HIGH X 40.0 DIA
SHELL GENERIC MATERIAL	STAINLESS STEEL
SHELL SPECIFIC MATERIAL	AUSTENITIC
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
GAS-SIDE PRESSURE DROP - KPA	0.5 (2.0 IN-H2O)
INLET GAS FLOW - CU. M/S	320.89 (680000 ACFM)
INLET GAS TEMPERATURE - C	176.7 (350 F)
SO2 REMOVAL EFFICIENCY - %	90.0
PARTICLE REMOVAL EFFICIENCY - %	99.7

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	NONE
NUMBER PER SYSTEM	0
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	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
SUPPLIER	WESTINGHOUSE
FUNCTION	BOOSTER
APPLICATION	INDUCED DRAFT
SERVICE	DRY
FLUE GAS FLOW RATE - CU.M/S	160.45 (340000 ACFM)

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

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
MANUFACTURER	JOY/DENVER
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	9.1 (10 TPH)
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	JOY/DENVER
NUMBER	1
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	4.5 (5 TPH)
PRODUCT QUALITY - % SOLIDS	35.0
** TANKS	
SERVICE	NUMBER
-----	-----
NR	2
** PUMPS	
SERVICE	NUMBER
-----	-----
SLURRY TRANSFER	5
** 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	TRUCK
SITE TREATMENT	NONE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

** PROCESS CONTROL AND INSTRUMENTATION
 CHEMICAL PARAMETERS
 MONITOR LOCATION
 PROCESS CONTROL MANNER
 PROCESS CHEMISTRY MODE

OUTLET TEMP
 DRYER OUTLET
 AUTOMATIC
 FEEDBACK

** 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 HOURS FACTOR

11/80 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

OPERATIONS AT THE RIVERSIDE UNIT COMMENCED IN NOVEMBER 1980. BY THE END OF NOVEMBER SUFFICIENT CHECKOUT HAD BEEN ACCOMPLISHED TO PERMIT PRELIMINARY FGD AND ESP OPERATION AND TEST WORK.

12/80 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

IN DECEMBER THE FGD SYSTEM WAS IN A PRELIMINARY OPERATION MODE AND THE NEW ID FANS AND BAGHOUSE WERE IN FINAL CHECKOUT.

1/81 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

BY MID-JANUARY THE PRELIMINARY CHECKOUT WAS COMPLETED AND THE NEW ID FANS AND BAGHOUSE WERE BROUGHT INTO SERVICE WITHOUT THE FGD SYSTEM IN OPERATION.

2/81 SYSTEM

672

** PROBLEMS/SOLUTIONS/COMMENTS

THE NEW ID FANS AND BAGHOUSE OPERATED WITHOUT THE FGD SYSTEM UNTIL LATE FEBRUARY SO THAT THE BOILER DRAFT CONTROL SYSTEM COULD BE ADJUSTED. AT THE CONCLUSION OF THE PERIOD, FULL LOAD BAGHOUSE PERFORMANCE TESTING WAS ACCOMPLISHED. RESULTS OF THE TESTS SHOWED NEGLIGIBLE TEMPERATURE CHANGES ACROSS THE FGD MODULE (WHICH WAS ACTING ONLY AS A BYPASS DUCT), A SMALL TEMPERATURE CHANGE ACROSS THE BAGHOUSE, STACK OPACITIES OF LESS THAN 5% FOR THE RIVERSIDE STACK DIAMETER, AND AN OUTLET MASS LOADING OF LESS THAN 0.03 LB/MMBTU.

BEGINNING IN LATE FEBRUARY AND CARRYING THROUGH EARLY MARCH, THE FGD SYSTEM OPERATED TO PERFORM THE FINAL TUNING OF THE ANALOG AND COMPUTER CONTROL SYSTEM.

3/81 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

ON MARCH 12, THE ENTIRE NEW SYSTEM WAS OPERATED FOR THE FIRST TIME. A WEEK LATER THE BOILER AND TURBINE EXPERIENCED PROBLEMS LIMITING OPERATION. BUT, BY MARCH 19, THE ENTIRE SYSTEM WAS OPERATING WITH THE LOAD INCREASING AS THE PLANT REPAIR WORK WAS BEING COMPLETED. BY MARCH 21, THE SYSTEM WAS INTO FGD AND BAGHOUSE PARAMETRIC TESTING AT FULL LOAD. SINCE THAT TIME, NEARLY ALL THE KEY TEST PARAMETERS HAVE DEMONSTRATED AT SEVERAL LEVELS.

4/81 SYSTEM

720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: RIVERSIDE 6-7 (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 PROBLEM WITH THE START-UP OF THE MATERIAL DISCHARGE SYSTEM HAS BEEN CAUSED BY A FAULTY MATERIAL SPECIFICATION ON THE CHAIN CONVEYOR AND SEVERAL LEGS OF TEMPORARY DENSE PHASE PNEUMATIC PIPING. AS OF APRIL, A NEW CONVEYOR OF HARDER MATERIAL HAD BEEN INSTALLED AND ALL TEMPORARY DISCHARGE PIPING REMOVED.

5/81 SYSTEM 744

6/81 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

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

7/81 SYSTEM 744

8/81 SYSTEM 744

9/81 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1981.

10/81 SYSTEM 744

11/81 SYSTEM 720

12/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1981.

1/82 SYSTEM 744

2/82 SYSTEM 672

3/82 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1982.

4/82 SYSTEM 720 0 0.0

5/82 SYSTEM 744 0 0.0

6/82 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS DOWN ALL OF APRIL AND MAY FOR A SCHEDULED TURBINE OUTAGE. THE FGD SYSTEM WAS AVAILABLE APPROXIMATELY 90% DURING JUNE.

7/82 SYSTEM 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

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

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			
4/83	SYSTEM							720			
5/83	SYSTEM							744			
6/83	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE FGD SYSTEM OPERATED CONTINUOUSLY THROUGHOUT THE PERIOD AND THAT NO MAJOR SCHEDULED OR FORCED OUTAGES WERE ENCOUNTERED. FGD SYSTEM AVAILABILITY FOR THE PERIOD OF JULY 1982 THROUGH JUNE 1983 WAS APPROXIMATELY 80 %.

7/83	SYSTEM							744			
8/83	SYSTEM							744			
9/83	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FGD SYSTEM AVAILABILITY WAS APPROXIMATELY 80 TO 90% DURING THE THIRD QUARTER OF 1983.

THE UTILITY REPORTED PROBLEMS MAINTAINING AN ADEQUATE PERCENTAGE OF SOLIDS IN THE SLURRY DUE TO A RECYCLE ASH CONVEYOR TRIP AND FAILING DOUBLE FLAP VALVES ON THE BAGHOUSE.

THE UTILITY REPORTED SLURRY PUMP PROBLEMS DURING THE THIRD QUARTER.

10/83	SYSTEM							744			
11/83	SYSTEM							720			
12/83	SYSTEM							744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FGD SYSTEM AVAILABILITY WAS APPROXIMATELY 75 PER CENT DURING THE FOURTH QUARTER OF 1983.

A THREE-WEEK FORCED OUTAGE OCCURRED DURING THE FOURTH QUARTER DUE TO BEARING FAILURES ON A BAGHOUSE REVERSE AIR FAN. BOTH THE MOTOR AND FAN EXPERIENCED BEARING FAILURES.

THE UTILITY SWITCHED FROM BELT-DRIVE TO DIRECT-DRIVE BAGHOUSE REVERSE AIR FANS DURING THE FOURTH QUARTER OF 1983 TO ELIMINATE PROBLEMS WITH MAINTAIN

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

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

ING PROPER BELT TENSION.

THE UTILITY REPORTED A FOUR-DAY FGD SYSTEM OUTAGE DURING THE FOURTH QUARTER DUE TO THE REMOVAL OF BUILD-UP FROM THE ABSORBER BOTTOM ASH OUTLET. THE UTILITY WAS TESTING THE USE OF PULVERIZED LIMESTONE WITH CALCIUM CHLORIDE AS AN ADDITIVE TO INCREASE REMOVAL EFFICIENCY. A BUILD UP ON THE ABSORBER WALLS RESULTED WHICH SUBSEQUENTLY DROPPED OFF AND FELL TO THE BOTTOM ASH OUTLET. A CREW HAD TO BE SENT IN TO REMOVE THE MATERIAL.

THE UTILITY REPORTED SEVERAL SLURRY PUMP SEAL PROBLEMS DURING THE FOURTH QUARTER OF 1983. CONSIDERABLE MAINTENANCE TIME WAS REQUIRED TO MAKE INDIVIDUAL REPAIRS, HOWEVER, THE FGD SYSTEM AS A WHOLE WAS NOT AFFECTED.

THE UTILITY REPORTED AN ATOMIZER FAILURE DURING THE FOURTH QUARTER THAT WAS DUE TO A LACK OF LUBRICATING OIL.

1/84	SYSTEM	744
2/84	SYSTEM	696
3/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

FGD SYSTEM AVAILABILITY FOR THE FIRST QUARTER WAS ESTIMATED AT 85%.

PLUGGED SLURRY PUMPS RESULTED IN FGD OUTAGE TIME DURING THE FIRST QUARTER.

DURING THE FIRST QUARTER OF 1984, THE LOSS OF A REVERSE AIR FAN FOR THE BAGHOUSE CONTRIBUTED TO LOWERED AVAILABILITY FOR THE FGD SYSTEM.

4/84	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT OPERATED ONLY 50 HOURS DURING APRIL DUE TO LOW POWER DEMAND. THE FGD SYSTEM ONLY OPERATED 17 HOURS DURING THE MONTH.

5/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FGD SYSTEM AVAILABILITY DURING MAY WAS APPROXIMATELY 84%. 321 OPERATING HOURS WERE REPORTED.

6/84	SYSTEM	720
7/84	SYSTEM	744
8/84	SYSTEM	744

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED OUTAGE WAS REPORTED FOR THE PERIOD OF JUNE 2 TO AUGUST 1, 1984

9/84	SYSTEM	720

** PROBLEMS/SOLUTIONS/COMMENTS

THROUGHOUT THE FIRST THREE QUARTERS OF 1984, THE UTILITY EXPERIENCED PROBLEMS WITH PLUGGED LINES TO THE ATOMIZER FEED SYSTEM. THE RESULTING FLOW LIMITATION LOWERED REMOVAL EFFICIENCIES.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

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

BAGHOUSE PROBLEMS CONTINUED THROUGH THE FIRST THREE QUARTERS OF 1984.

10/84	SYSTEM	93.0		744		
11/84	SYSTEM	93.0		720		
12/84	SYSTEM	94.0		744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984.

THE UTILITY ALSO ANNOUNCED PLANS TO REPLACE THE TURBINE BEING POWERED BY UNITS 6 & 7. THE BOILERS WILL ALSO BE REFITTED WITH NEW ECONOMIZERS AIR PREHEATERS. AFTER CONVERSION THE RATED CAPACITY OF THE FACILITY WILL BE APPROXIMATELY 158 MW AND IS EXPECTED TO OPERATE APPROXIMATELY 6500 HRS/YEAR. NO MAJOR MODIFICATIONS TO THE DRY SCRUBBER ARE PLANNED. THE WORK IS SCHEDULED TO COMMENCE IN SEPTEMBER OF 1985 AND CONTINUE THRU APRIL 1987

1/85	SYSTEM	92.0		744		
2/85	SYSTEM	91.0		672		
3/85	SYSTEM	85.0		744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY THROUGH AUGUST OF 1985.

4/85	SYSTEM			672		
5/85	SYSTEM			744		
6/85	SYSTEM			720		
7/85	SYSTEM			744		
8/85	SYSTEM			744		
9/85	SYSTEM			720		
10/85	SYSTEM			744	0	0.0
11/85	SYSTEM			720	0	0.0
12/85	SYSTEM			744	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTS THAT THE UNIT WENT OFF-LINE ON SEPTEMBER 30 FOR AN EXTENDED TURBINE OUTAGE. A NEW TURBINE IS TO BE INSTALLED. TURBINE REPLACEMENT WORK BEGAN OCTOBER 1, 1985, AND IS SCHEDULED TO LAST UNTIL APRIL, 1987.

DURING THE 18 MONTH TURBINE OUTAGE, THE UTILITY PLANS TO INVESTIGATE THE POSSIBLE REPLACEMENT OF THE CONVENTIONAL PASTE SLAKERS WITH A VERTICAL TOWER MILL TO HELP IMPROVE RELIABILITY/AVAILABILITY OF THE REAGENT PREPARATION SYSTEM. THE UTILITY IS PRESENTLY RUNNING TESTS.

1/86	SYSTEM			774		
2/86	SYSTEM			672		

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. 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 UNIT REMAINED OFF-LINE ALL OF 1986 DUE TO TURBINE REPLACEMENT WORK. THE NEW TURBINE SHOULD BE INSTALLED BY THE SPRING OF 1987. THE NEW TURBINE IS EXPECTED TO INCREASE THE OUTPUT FROM UNITS 6 AND 7 FROM A GROSS RATING OF 110MW TO 150MW.

1/87	SYSTEM							744			
2/87	SYSTEM							672			
3/87	SYSTEM							744			
4/87	SYSTEM							720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT REMAINED OFF-LINE THE FIRST 4 MONTHS OF 1987 DUE TO TURBINE REPLACEMENT WORK.

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

TESTING OF THE NEW NUMBER 7 TURBINE COMMENCED DURING THE MONTH OF MAY AND WAS SCHEDULED TO LAST APPROXIMATELY 3 MONTHS. DURING THIS PERIOD THE FGD SYSTEM WAS NOT OPERATED AND BOTH BOILERS (I.E., 6 AND 7) BURNED LOW-SULFUR COMPLIANCE COAL. HOWEVER, DUE TO OPERATIONAL PROBLEMS WITH THE BOILERS AND TURBINE, PERFORMANCE TESTING CONTINUED FOR THE REMAINDER OF THE YEAR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: RIVERSIDE 6-7 (CONT.)

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

AND IS EXPECTED TO LAST UNTIL THE FALL OF 1988. DURING ALL THIS PERIOD,
THE UNITS WILL CONTINUE TO USE COMPLIANCE COAL AND THE FGD SYSTEM WILL NOT
BE OPERATED.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE CO.	
UNIT NUMBER	1	
CITY	BECKER	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	37.	(0.087 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	413.	(0.960 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1420	
GROSS UNIT GENERATING CAPACITY - MW	750	
NET UNIT GENERATING CAPACITY W/FGD - MW	705	
NET UNIT GENERATING CAPACITY WO/FGD - MW	735	
EQUIVALENT SCRUBBED CAPACITY - MW	750	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1349.16	(2859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	198.	(650 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	9.9	(32.6 FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8300-8500
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	25.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.80	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	12	
NUMBER OF SPARES	2	
INITIAL START-UP DATE	3/1976	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
TRADE NAME/COMMON NAME	ROD SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	3.0 X 25.5	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	TYPE 304 STAINLESS STEEL RODS	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	223.0	(3540 GPM)
L/G RATIO - LITER/CU.M	1.8	(13.6 GAL/1000ACF)
PRESSURE DROP - KPA	3.5	(14.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	24.4	(80.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	122.6	(259900 ACFM)

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

INLET GAS TEMPERATURE - C	154.4	(310 F)
PARTICLE REMOVAL EFFICIENCY - %	99.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00
ENERGY CONSUMPTION - %	4.0
CURRENT STATUS	1
COMMERCIAL START-UP	5/1976
INITIAL START-UP	3/1976
CONTRACT AWARDED	0/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	0.70	
DESIGN COAL HEAT CONTENT - J/G	19305.8	(8300 BTU/LB)
DESIGN COAL ASH CONTENT - %	9.00	
DESIGN MOISTURE CONTENT - %	28.00	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	1312.0	(14123 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	212.0	

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	12	
NUMBER OF SPARES	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18 X 26.5 X 60	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 151	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	378.	(6000 GPM)
L/G RATIO - L/CU.M	2.9	(21.8 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	129.77	(275000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	50.0	
PARTICLE REMOVAL EFFICIENCY - %	99.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	12
NUMBER OF SPARES PER SYSTEM	2
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	3
FREEBOARD DISTANCE - M	3.20 (10.5 FT)

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

DISTANCE BETWEEN STAGES - CM	25.40	(10.0 IN)
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
PRESSURE DROP - KPA	0.1	(0.5 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	MAKE-UP WATER	
WASH FREQUENCY	ONCE PER 24 HRS	
WASH RATE - L/S	126.2	(2000 GAL/MIN)
** REHEATER		
NUMBER	12	
NUMBER OF SPARES	2	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	FIN TUBE	
LOCATION	10 FT ABOVE ME	
TEMPERATURE INCREASE - C	22.2	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	94.38	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	76.7	(170 F)
NUMBER OF HEAT EXCHANGER BANKS	4	
NUMBER OF TUBES PER BUNDLE	45	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
** FANS		
NUMBER	4	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	94.38	(200000 ACFM)
FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
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	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	

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

** DUCTWORK	
LOCATION	REHEATER 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
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	ALLIS CHALMERS
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	21.8 (24 TPH)
PRODUCT QUALITY - % SOLIDS	65.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	12
MAKEUP WATER	2
REAGENT PREP PRODUCT	4
** PUMPS	
SERVICE	NUMBER
-----	-----
POND RETURN	1
THICKENER UNDERFLOW	1
MAKEUP WATER	1
REHEAT WATER	2
ABSORBER RECIRCULATION	2
LIMESTONE CLASSIFIER RECYCLE	****
LIMESTONE DILUTION	****
LIMESTONE SLURRY TRANSFER	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	1
DIMENSIONS - FT	160.0 DIA X 10.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	28% SOLIDS
OUTLET STREAM DISPOSITION	POND
OVERFLOW STREAM DISPOSITION	LIMESTONE SLURRY TRANSFER TANK
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	REACTION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	62 ACRES X 50 FT
SITE CAPACITY - CU.M	3791300 (3100.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SLURRY PH, SO2
PHYSICAL VARIABLES	PRESSURE DROP, PERCENT SOLIDS, TANK LEVELS
CONTROL LEVELS	PRESSURE DROP 12 IN H2O, 10% SOLIDS, PH=5-5.5
MONITOR TYPE	DUPONT 'SO2!
MONITOR LOCATION	BOILER OUTLET & ON MODULES 'SO2!
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN
RECEIVING WATER STREAM	MISSISSIPPI RIVER
SOURCE OF MAKEUP WATER	RIVER WATER & COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	95% CaCO3
CONSUMPTION	3.0-3.5 TPH
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	9.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

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

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

3/76	SYSTEM							744		
4/76	SYSTEM							720		

**** PROBLEMS/SOLUTIONS/COMMENTS**

DURING JANUARY A PRELIMINARY SYSTEM CHECKOUT WAS SUCCESSFULLY COMPLETED BY PASSING AIR AND WATER THROUGH THE SYSTEM. THE SCRUBBING SYSTEM BEGAN FGD OPERATIONS ON MARCH 16. THE SHAKEDOWN PHASE OF OPERATIONS CONTINUED THROUGH APRIL.

5/76	101	62.0	55.0							
	102	83.0	73.0							
	103	81.0	72.0							
	104	59.0	52.0							
	105	72.0	64.0							
	106	90.0	80.0							
	107	57.0	50.0							
	108	69.0	61.0							
	109	60.0	53.0							
	110	75.0	66.0							
	111	72.0	64.0							
	112	67.0	59.0							
	SYSTEM	86.0	77.0	68.1			744	657	506	57.8

**** PROBLEMS/SOLUTIONS/COMMENTS**

FIRST COMMERCIAL OPERATION COMMENCED MAY 1, 1976. THIS IS AN INTERMEDIATE LOAD UNIT OPERATING NEAR FULL CAPACITY DURING THE DAY AND 35% CAPACITY AT NIGHT.

6/76	SYSTEM	84.0					720	688		69.9

NORTHERN STATES POWER: SHERBURNE CO. 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

MODIFICATIONS ARE CONTINUING ON THE SPRAY SYSTEM, SPRAY NOZZLES AND STRAINER SYSTEM.

SINCE APRIL THE UTILITY AND SYSTEM SUPPLIER HAVE BEEN MAKING CONTINUAL SYSTEM MODIFICATIONS, REQUIRING THE UNIT TO OPERATE AT NO GREATER THAN 80% CAPACITY.

7/76	101		80.0		55.0				
	102		62.0		43.0				
	103		71.0		49.0				
	104		81.0		56.0				
	105		80.0		55.0				
	106		68.0		47.0				
	107		81.0		56.0				
	108		75.0		52.0				
	109		79.0		54.0				
	110		63.0		43.0				
	111		91.0		63.0				
	112		69.0		48.0				
	SYSTEM	84.0	81.8		56.5		744	512	419 49.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE SLURRY NOZZLES ARE FREQUENTLY PLUGGED BY PARTICLES ABOVE QUARTER INCH SIZE. STRAINER MODIFICATIONS ARE PLANNED TO ALLEVIATE THIS PROBLEM.

HARD SCALE GYPSUM FORMATION ON THE VESSEL WALLS HAS LEVELED OFF. THE CLEANING PROCESS CALLS FOR THREE TO FOUR MODULES TO BE TAKEN OUT OF SERVICE EACH NIGHT. THUS, EACH MODULE IS CLEANED ONCE EVERY THREE DAYS.

A 70-MAN CREW IS REQUIRED TO MAINTAIN SCRUBBER OPERATIONS.

THE DEPOSITION OF SOFT SOLIDS IS STILL CONTINUING IN THE REHEATERS.

SOFT SOLIDS ACCUMULATION IN THE MIST ELIMINATORS IS STILL CAUSING PROBLEMS.

8/76	101		46.0		44.0				
	102		93.0		88.0				
	103		51.0		48.0				
	104		84.0		80.0				
	105		83.0		79.0				
	106		76.0		72.0				
	107		71.0		67.0				
	108		84.0		80.0				
	109		81.0		77.0				
	110		76.0		72.0				
	111		87.0		82.0				
	112		91.0		86.0				
	SYSTEM	94.0	83.9		79.6		744	705	592 76.5

9/76	101		87.0		68.0				
	102		90.0		71.0				
	103		93.0		73.0				
	104		76.0		60.0				
	105		76.0		60.0				
	106		79.0		62.0				
	107		85.0		69.0				
	108		79.0		62.0				
	109		85.0		67.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	110		80.0		63.0						
	111		92.0		72.0						
	112		96.0		76.0						
	SYSTEM	95.0	92.6		73.0			720	566	524	65.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE STRAINER SYSTEM IS BEING MODIFIED. THE DUPLEX UNITS ARE TO BE REPLACED BY IN-TANK SCREENS AND SOOT BLOWERS. BOTH ARE LOCATED AT THE SUCTION SIDE OF THE SPRAY WATER PUMP.

CARBON STEEL FIN TUBE REHEAT BUNDLES ARE AN AREA OF CONCERN. MULTIPLE FAILURES IN FOUR UNITS HAVE BEEN EXPERIENCED.

10/76	101		97.0		79.0						
	102		84.0		68.0						
	103		96.0		78.0						
	104		96.0		78.0						
	105		95.0		77.0						
	106		30.0		24.0						
	107		74.0		60.0						
	108		76.0		62.0						
	109		91.0		74.0						
	110		81.0		66.0						
	111		100.0		81.0						
	112		87.0		71.0						
	SYSTEM	92.9	91.6		74.4			744	606	554	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS CONSIDERING MODIFYING THE DESIGN OF THE SHERBURNE 1 AND 2 FGD SYSTEMS FROM MARBLE BED TO SPRAY TOWER ABSORBERS. AT PRESENT ONE MODULE AT SHERBURNE 1 HAS BEEN CONVERTED TO A SPRAY TOWER ON AN EXPERIMENTAL BASIS.

11/76	101		83.0		83.0						
	102		80.0		80.0						
	103		87.0		87.0						
	104		79.0		79.0						
	105		92.0		92.0						
	106		80.0		80.0						
	107		93.0		93.0						
	108		89.0		89.0						
	109		69.0		69.0						
	110		78.0		78.0						
	111		73.0		73.0						
	112		93.0		93.0						
	SYSTEM	93.0	90.6		90.6			720	720	652	88.4

12/76	101		88.0		85.0						
	102		84.0		82.0						
	103		87.0		84.0						
	104		80.0		78.0						
	105		71.0		69.0						
	106		97.0		94.0						
	107		91.0		88.0						
	108		95.0		92.0						
	109		94.0		91.0						
	110		88.0		85.0						
	111		73.0		71.0						
	112		75.0		73.0						
	SYSTEM	94.7	93.0		90.2			744	722	671	87.4

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS NOW CONDUCTING A FULL-LOAD EVALUATION STUDY, ANALYZING SYSTEM OPERATION ON 10 MODULES VS. THE DESIGNED 11 MODULES.

APPROXIMATELY ONE-THIRD OF THE STRAINER MODIFICATIONS ON MODULE 101 ARE COMPLETED.

THE UNIT IS CURRENTLY HAVING DIFFICULTY COMPLYING WITH THE 20% OPACITY REGULATION DUE TO THE EXTREMELY FINE FLY ASH BEING EMITTED (70% LESS THAN 1 MICRON).

1/77	101		94.0		77.0				
	102		75.0		61.0				
	103		99.0		81.0				
	104		76.0		62.0				
	105		96.0		78.0				
	106		77.0		63.0				
	107		70.0		57.0				
	108		92.0		75.0				
	109		81.0		66.0				
	110		40.0		33.0				
	111		75.0		61.0				
	112		95.0		76.0				
	SYSTEM	90.0	88.2		71.8	744	607	535	70.1

[illegible][illegible]

**** PROBLEMS/SOLUTIONS/COMMENTS**

ALL MODULES ARE NOW FITTED WITH IN-TANK STRAINERS. LOW JANUARY-MARCH OPERABILITIES RESULTED FROM COMPLETION OF STRAINER MODIFICATIONS.

4/77	101	84.4	84.2
	102	65.3	65.1
	103	92.5	92.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	104		95.4		95.1					
	105		96.2		96.0					
	106		62.2		62.1					
	107		72.8		72.6					
	108		91.4		91.1					
	109		58.5		58.3					
	110		92.9		92.6					
	111		90.4		90.1					
	112		87.9		87.6					
	SYSTEM	95.0	90.0		89.7		720	718	646	86.4
5/77	101		96.5		40.5					
	102		48.1		20.2					
	103		92.3		38.7					
	104		87.2		36.6					
	105		94.9		39.8					
	106		96.5		40.5					
	107		81.4		34.1					
	108		97.8		41.0					
	109		95.8		40.2					
	110		77.9		32.7					
	111		34.9		14.7					
	112		86.9		36.4					
	SYSTEM	92.0	90.0		37.8		744	312	281	35.6
6/77	101		76.0		26.0					
	102		77.0		27.0					
	103		75.0		26.0					
	104		75.0		26.0					
	105		30.0		10.0					
	106		87.0		30.0					
	107		58.0		20.0					
	108		44.0		15.0					
	109		61.0		21.0					
	110		80.0		28.0					
	111		0.0		0.0					
	112		83.0		29.0					
	SYSTEM	92.0	67.8		23.4		720	248	168	23.9

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED TURBINE OVERHAUL LASTED FROM MAY 14 TO JUNE 18.

THE EVALUATION STUDY INITIATED DURING THE NOVEMBER-DECEMBER PERIOD WAS TEMPORARILY TERMINATED SO THAT STRAINER MODIFICATIONS COULD BE COMPLETED. THE STUDY SHOULD BEGIN AGAIN IN THE NEAR FUTURE.

7/77	101		93.0		92.0					
	102		66.0		65.0					
	103		92.0		91.0					
	104		90.0		89.0					
	105		92.0		91.0					
	106		94.0		93.0					
	107		91.0		90.0					
	108		17.0		17.0					
	109		94.0		93.0					
	110		83.0		82.0					
	111		78.0		77.0					
	112		83.0		82.0					
	SYSTEM	97.0	88.5		87.5		744	736	651	86.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 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

SOME STAINLESS STEEL MODIFICATIONS TOOK PLACE.

WHILE THE UNIT WAS OUT IN JUNE THE FGD SYSTEM WAS CLEANED. THIS CLEANING WAS CREDITED FOR ONE OF THE HIGHEST AVAILABILITIES EVER DEMONSTRATED ON THIS UNIT.

8/77	101		85.0		73.0				
	102		89.0		77.0				
	103		66.0		57.0				
	104		55.0		47.0				
	105		81.0		70.0				
	106		90.0		77.0				
	107		83.0		71.0				
	108		79.0		68.0				
	109		72.0		62.0				
	110		85.0		73.0				
	111		90.0		77.0				
	112		66.0		57.0				
	SYSTEM	95.0	85.6		73.6		744	640	548 64.9

** PROBLEMS/SOLUTIONS/COMMENTS

ONLY REGULAR MAINTENANCE WAS REQUIRED ON THE FGD SYSTEM IN AUGUST.

9/77	101		86.0		82.0				
	102		85.0		81.0				
	103		88.0		84.0				
	104		92.0		88.0				
	105		88.0		84.0				
	106		44.0		42.0				
	107		83.0		79.0				
	108		90.0		86.0				
	109		84.0		80.0				
	110		77.0		73.0				
	111		77.0		73.0				
	112		82.0		78.0				
	SYSTEM	95.0	88.7		84.6		720	686	609 78.2

** PROBLEMS/SOLUTIONS/COMMENTS

TWENTY-FOUR PUMPS ARE BEING COMPLETELY OVERHAULED.

THE MODULE 106 SPRAY WATER PUMP WAS OVERHAULED IN SEPTEMBER.

SOME ANGES WERE INSTALLED ON THE PRIMARY CONTACTOR RODS TO RESIST EROSION.

10/77	101		70.0		57.0				
	102		81.0		66.0				
	103		95.0		78.0				
	104		97.0		79.0				
	105		63.0		52.0				
	106		35.0		29.0				
	107		87.0		71.0				
	108		99.0		81.0				
	109		96.0		79.0				
	110		39.0		32.0				
	111		58.0		47.0				
	112		96.0		79.0				
	SYSTEM	88.0	83.3		68.2		744	609	507 65.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 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

STRAINER/WASHER SCREEN EROSION HAS BEEN A PROBLEM. REPAIR AND REPLACEMENT HAS BEEN CONTINUALLY NECESSARY. 316L SS MATERIAL WILL BE USED IN THE FUTURE.

11/77	101		77.0	76.0				
	102		91.0	89.0				
	103		42.0	41.0				
	104		86.0	84.0				
	105		79.0	77.0				
	106		82.0	80.0				
	107		87.0	85.0				
	108		91.0	89.0				
	109		89.0	87.0				
	110		89.0	87.0				
	111		92.0	90.0				
	112		52.0	51.0				
	SYSTEM	92.0	87.0	85.1		720	705	613 77.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE REPLACEMENT PROGRAM WILL BEGIN ON DECEMBER 21, 1977. IT TAKES FOUR TO SIX DAYS FOR WORK ON EACH MODULE TO REPLACE THE STRAINER SYSTEM.

LOW MODULE OPERABILITIES WERE PRIMARILY A RESULT OF SPRAY WATER PUMP OVERHAULS WHICH ARE CONTINUING AT A RATE OF ONE TO TWO A WEEK (THERE ARE 24 PUMPS ON THE SYSTEM).

12/77	101		97.0	73.0				
	102		90.0	67.0				
	103		95.0	71.0				
	104		94.0	70.0				
	105		71.0	53.0				
	106		92.0	69.0				
	107		26.0	20.0				
	108		67.0	50.0				
	109		96.0	72.0				
	110		98.0	74.0				
	111		95.0	71.0				
	112		90.0	67.0				
	SYSTEM	93.0	91.9	68.8		744	557	512 59.0

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 107 REQUIRED EXTENSIVE MAINTENANCE ALONG WITH DOWNTIME FOR STRAINER REPLACEMENT.

PUMP OVERHAULS AND REPLACEMENT OF CARBON STEEL STRAINERS WITH 316L SS WERE PERFORMED ON MODULE 107 IN DECEMBER.

1/78	101		83.0	72.0				
	102		63.0	55.0				
	103		88.0	77.0				
	104		73.0	64.0				
	105		84.0	73.0				
	106		84.0	73.0				
	107		92.0	80.0				
	108		64.0	56.0				
	109		91.0	79.0				
	110		80.0	70.0				
	111		88.0	77.0				

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART. HOURS	BOILER HOURS	FGD CAP. HOURS FACTOR
	112 SYSTEM	92.0	82.0 88.4		71.0 77.0		744	648	573 68.0
2/78	101		0.0		0.0				
	102		93.0		88.0				
	103		92.0		87.0				
	104		89.0		84.0				
	105		74.0		70.0				
	106		85.0		81.0				
	107		89.0		84.0				
	108		88.0		83.0				
	109		76.0		72.0				
	110		86.0		82.0				
	111		88.0		83.0				
	112 SYSTEM	92.0	87.0 86.1		82.0 81.5		672	636	548 73.6

** PROBLEMS/SOLUTIONS/COMMENTS

MODULES WHICH ARE SHOWING OPERABILITY OF LESS THAN 80%, ARE THOSE IN WHICH THE STRAINER MODIFICATIONS WERE PERFORMED.

A BULK ENTRAINMENT SEPARATOR WAS INSTALLED ALONG WITH A KOCH WASH TRAY DURING THE PERIOD.

MODULE 101 WAS DOWN IN FEBRUARY FOR MODIFICATIONS TO THE SPRAY TOWER ABSORBER. MODIFICATIONS INCLUDED INSTALLATION OF A NEW PRE-MIST ELIMINATOR (KOCH WASH TRAY), NEW SPRAY NOZZLES AND REPLACEMENT OF TWO INCH DIAMETER STAINLESS STEEL RODS WITH 6.625-INCH DIAMETER CERAMIC-COATED CARBON STEEL RODS IN A MODULE PRIMARY CONTACTOR.

3/78	101		71.0		65.0				
	102		83.0		75.0				
	103		64.0		58.0				
	104		89.0		81.0				
	105		90.0		82.0				
	106		83.0		75.0				
	107		62.0		56.0				
	108		89.0		81.0				
	109		97.0		88.0				
	110		71.0		65.0				
	111		79.0		72.0				
	112 SYSTEM	92.0	90.0 88.0		82.0 80.0		744	676	595 76.9
4/78	101		92.0		91.0				
	102		87.0		86.0				
	103		87.0		86.0				
	104		44.0		44.0				
	105		81.0		80.0				
	106		85.0		84.0				
	107		91.0		90.0				
	108		86.0		85.0				
	109		92.0		91.0				
	110		91.0		90.0				
	111		87.0		86.0				
	112 SYSTEM	95.0	52.0 88.6		52.0 87.7		720	713	632 87.2

** PROBLEMS/SOLUTIONS/COMMENTS

STRAINER MODIFICATIONS WERE PERFORMED ON MODULES 104 AND 112 WHICH ACCOUNTED FOR THE LOW MODULE OPERABILITIES.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

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

5/78	101		61.0		52.0						
	102		86.0		73.0						
	103		85.0		73.0						
	104		86.0		73.0						
	105		89.0		76.0						
	106		64.0		55.0						
	107		62.0		53.0						
	108		83.0		71.0						
	109		82.0		70.0						
	110		71.0		61.0						
	111		87.0		74.0						
	112		79.0		67.0						
	SYSTEM	95.0	85.0		72.6		744	635	540	69.0	
6/78	101		50.0		50.0						
	102		84.0		84.0						
	103		85.0		84.0						
	104		85.0		84.0						
	105		62.0		62.0						
	106		78.0		78.0						
	107		55.0		55.0						
	108		83.0		83.0						
	109		88.0		87.0						
	110		82.0		82.0						
	111		72.0		72.0						
	112		95.0		94.0						
	SYSTEM	93.0	83.6		83.2		720	717	599	77.8	
7/78	101		82.0		76.0						
	102		76.0		71.0						
	103		71.0		66.0						
	104		74.0		69.0						
	105		75.0		70.0						
	106		52.0		49.0						
	107		75.0		70.0						
	108		63.0		59.0						
	109		62.0		58.0						
	110		72.0		67.0						
	111		66.0		62.0						
	112		73.0		68.0						
	SYSTEM	95.0	76.5		71.4		744	694	531	71.7	

** PROBLEMS/SOLUTIONS/COMMENTS

THE OCCURRENCE OF PLUGGING PROBLEMS IN THE MIST ELIMINATOR HAS BEEN MORE FREQUENT THAN NORMAL.

THE STRAINER MODIFICATIONS CONTINUED IN JUNE AND JULY.

THE UTILITY IS EVALUATING NEW RUBBER LINED PUMPS (8000 GPM) TO HELP CORRECT THE REHEATER AND MIST ELIMINATOR PLUGGING PROBLEMS.

THE OCCURRENCE OF PLUGGING PROBLEMS IN THE REHEATER HAS BEEN MORE FREQUENT THAN NORMAL

THE UTILITY IS PREPARING FOR THE STATE COMPLIANCE DEADLINE ON NOVEMBER 1, 1978. CURRENTLY TESTING HAS BEEN PROCEEDING ON DIFFERENT MODULES IN AN EFFORT TO FINE TUNE THE SYSTEM.

THE FGD SYSTEM HAS BEEN EXPERIENCING PRIMARY CONTACTOR WALL AND MARBLE BE WEAR.

THE UTILITY IS EVALUATING NEW STAINLESS STEEL MIST ELIMINATOR WASH

MODULES 104 AND 107 WERE DOWN IN OCTOBER AND MODULE 110 WAS DOWN IN OCTOBER AND NOVEMBER FOR THE INSTALLATION OF THE NEW 8000 GPM SPRAY PUMPS MENTIONED EARLIER.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

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

THE BOILER AND SCRUBBER SHOWED LOW OPERATING HOURS FOR OCTOBER BECAUSE
 THE BOILER/TURBINE OVERHAUL CONTINUED THROUGH THE FIRST HALF OF OCTOBER.

11/78	101		42.0		42.0				
	102		51.0		51.0				
	103		88.0		87.0				
	104		81.0		80.0				
	105		71.0		70.0				
	106		78.0		77.0				
	107		77.0		76.0				
	108		63.0		63.0				
	109		85.0		84.0				
	110		61.0		61.0				
	111		84.0		83.0				
	112		70.0		70.0				
	SYSTEM	92.0	77.4		76.7		720	714	552 76.2

** PROBLEMS/SOLUTIONS/COMMENTS

IN NOVEMBER MODULE 101 WAS DOWN (THE CONVERTED ROD SCRUBBER TEST MODULE)
 FOR PUMP WORK AND INTERNAL HEADER CONVERSION. THE MODULE IS BEING
 PREPARED FOR FURTHER TESTING.

12/78	101		77.0		76.0				
	102		73.0		72.0				
	103		77.0		76.0				
	104		73.0		72.0				
	105		86.0		85.0				
	106		87.0		86.0				
	107		93.0		91.0				
	108		85.0		84.0				
	109		93.0		91.0				
	110		86.0		85.0				
	111		90.0		89.0				
	112		88.0		87.0				
	SYSTEM	94.0	91.6		90.4		744	733	672 73.4

1/79	101		72.0		66.0				
	102		39.0		36.0				
	103		76.0		70.0				
	104		95.0		88.0				
	105		73.0		68.0				
	106		95.0		89.0				
	107		81.0		75.0				
	108		89.0		82.0				
	109		96.0		89.0				
	110		92.0		85.0				
	111		83.0		77.0				
	112		93.0		86.0				
	SYSTEM	94.0	89.5		82.7		744	688	615 63.2

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE PROBLEMS WITH THE COAL FEEDER BELTS RESULTING IN MOVING WET
 COAL FROM OLDER COAL STOCKPILES TO THE BOILER DURING THE DECEMBER-JANUARY
 PERIOD.

THE TESTING ON MODULE 101 HAS BEEN COMPLETED BUT NO RESULTS ARE YET
 AVAILABLE.

THE PROBLEMS ENCOUNTERED WERE MAINLY WEATHER RELATED IN DECEMBER AND
 JANUARY.

2/79	101		78.0		78.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	102		73.0		73.0					
	103		70.0		70.0					
	104		76.0		76.0					
	105		50.0		50.0					
	106		91.0		88.0					
	107		92.0		92.0					
	108		92.0		92.0					
	109		75.0		75.0					
	110		77.0		77.0					
	111		66.0		66.0					
	112		93.0		93.0					
	SYSTEM	89.0	84.8		84.8		672	672	570	64.2
3/79	101		61.0		60.0					
	102		88.0		87.0					
	103		45.0		44.0					
	104		86.0		85.0					
	105		94.0		93.0					
	106		71.0		70.0					
	107		91.0		90.0					
	108		73.0		72.0					
	109		91.0		90.0					
	110		80.0		79.0					
	111		89.0		88.0					
	112		80.0		79.0					
	SYSTEM	92.0	86.3		85.2		744	734	634	56.2
** PROBLEMS/SOLUTIONS/COMMENTS										
THE ONLY MAJOR PROBLEMS REPORTED BY THE UTILITY DURING FEBRUARY AND MARCH WERE BOILER RELATED-SPECIFICALLY PROBLEMS WITH WET COAL.										
CURRENTLY THE UTILITY IS INCREASING THE RECYCLE PUMP CAPACITY BY INSTALLING 8000 GPM WORTHINGTON RECYCLE PUMPS. DURING THIS PERIOD THEY HAVE BEEN INSTALLED ON MODULES 101,103,104,105,107, AND 110.										
4/79	SYSTEM	93.0					720	622		64.7
** PROBLEMS/SOLUTIONS/COMMENTS										
AS OF NOVEMBER 1979 THE UTILITY DECIDED THAT IT WILL NO LONGER REPORT MODULAR INFORMATION.										
5/79	SYSTEM	98.0					744	678		70.1
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO FGD SYSTEM PROBLEMS OCCURRED DURING APRIL OR MAY.										
6/79	SYSTEM	93.0					720	701		70.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT SOME GENERAL PLUGGING WAS EXPERIENCED DURING JUNE BUT IT WAS NOT SERIOUS.										
7/79	SYSTEM	93.0					744	695		72.0
8/79	SYSTEM	95.0					744	744		74.4
9/79	SYSTEM	92.0					720	166		17.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
** PROBLEMS/SOLUTIONS/COMMENTS										
ON SEPTEMBER 8 THE UNIT WENT DOWN FOR THE ANNUAL BOILER/TURBINE INSPECTION AND IS EXPECTED TO BE OFF LINE UNTIL THE LAST WEEK OF OCTOBER.										
10/79	SYSTEM	77.0					744	9		
11/79	SYSTEM	97.0					720	522		58.6
12/79	SYSTEM	95.0					744	744		82.3
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UNIT WAS SUPPOSED TO BE BACK ON LINE IN OCTOBER AFTER THE ANNUAL BOILER/TURBINE INSPECTION, BUT CONTAMINANTS IN THE MAIN TURBINE OIL MADE IT NECESSARY TO CONTINUE THE OUTAGE UNTIL THE SECOND WEEK OF NOVEMBER.										
PRESENTLY THE UTILITY IS SELECTIVELY REMOVING MARBLE BEDS FROM SERVICE TO TEST THE FEASIBILITY OF CONVERTING THE FGD MODULES TO SPRAY TOWERS.										
ALL PIPING HAS BEEN CONVERTED FROM CARBON STEEL TO FIBERGLASS.										
1/80	SYSTEM	97.0					744	743		90.8
2/80	SYSTEM	97.0					696	687		66.2
3/80	SYSTEM	98.0					744	688		84.1
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE FIRST QUARTER OF 1980 NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE FGD SYSTEM.										
FROM MID-SEPTEMBER TO MID-OCTOBER THE UTILITY HAS SCHEDULED A BOILER OUTAGE AT WHICH TIME THE MARBLE BEDS WILL BE INSPECTED.										
THE UTILITY HAS DECIDED TO CONVERT THE ENTIRE MARBLE BED SCRUBBING SYSTEM TO A SPRAY TOWER SYSTEM BY REMOVING THE MARBLE BEDS AND MODIFYING THE SPRAY ARRANGEMENT. TESTS CONDUCTED IN 1978 AND 1979 SHOW THAT MOST OF THE SO2 IS COLLECTED IN THE VENTURI SECTION OF THE SCRUBBING TRAINS AND THAT ALTHOUGH THE MARBLE BEDS IN THE ABSORBER SECTIONS IMPROVE INTIMATE SO2/SLURRY MIXING, SO2 REMOVAL EFFICIENCY OF THE SCRUBBING TRAINS IS NOT MARKEDLY DIFFERENT WHEN MARBLE BEDS ARE REMOVED.										
4/80	SYSTEM	97.0					720	720		79.4
5/80	SYSTEM	96.0					744	720		78.1
6/80	SYSTEM	96.0					720	697		74.7
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR OPERATIONAL PROBLEMS WERE REPORTED DURING THE SECOND QUARTER OF 1980.										
7/80	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	82.1
** PROBLEMS/SOLUTIONS/COMMENTS										
NO OPERATIONAL PROBLEMS WERE ENCOUNTERED IN JULY.										
8/80	SYSTEM	100.0	100.0	100.0	99.2		744	738	738	69.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE TWO SHORT TERM OUTAGES IN JULY DUE TO BOILER RELATED TRIPS.

PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
9/80	SYSTEM	100.0	100.0	100.0	99.6		720	717	717	76.8

** PROBLEMS/SOLUTIONS/COMMENTS

A BOILER RELATED PROBLEM CAUSED THE ONLY OUTAGE TIME IN SEPTEMBER.

10/80	SYSTEM	100.0		100.0	71.9		744	535	535	57.7
11/80	SYSTEM	100.0	0.0		0.0		720	0	0	0.0
12/80	SYSTEM	100.0	100.0	100.0	81.0		744	603	603	51.1

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE OCTOBER-DECEMBER PERIOD THE UNIT WAS SHUTDOWN FOR THE ANNUAL BOILER/TURBINE INSPECTION. THE OUTAGE EXTENDED LONGER THAN EXPECTED DUE TO SOME BOILER TUBE LEAKS.

DURING THE ANNUAL BOILER/TURBINE INSPECTION GENERAL MAINTENANCE WAS PERFORMED ON THE SCRUBBING SYSTEM. THE MAINTENANCE INCLUDED THE OVERHAUL OF THE SPRAY PUMPS AND THE REBUILDING OF THE PC RODS.

1/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	73.2
2/81	SYSTEM	100.0	100.0	100.0	95.0		672	640	640	71.2
3/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	78.3

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.

WORK IS CONTINUING ON CONVERTING THE MARBLE BED SCRUBBING SYSTEM TO A SPRAY TOWER SYSTEM. FIVE OF THE TWELVE ABSORBERS ARE COMPLETED.

4/81	SYSTEM	100.0	100.0	100.0	100.0		720	719	719	80.0
5/81	SYSTEM	100.0	100.0	100.0	81.0		744	608	608	62.0
6/81	SYSTEM	100.0	100.0	100.0	87.0		720	632	632	62.0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE SECOND QUARTER THE FGD SYSTEM WAS OUT OF SERVICE A FEW HOURS AS A RESULT OF A BOILER TUBE LEAK.

7/81	SYSTEM	100.0	100.0	100.0	91.0		744	678	678	65.0
8/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	69.0
9/81	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	71.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TWICE DURING THE THIRD QUARTER AS A RESULT OF BOILER TUBE LEAKS.

10/81	SYSTEM	100.0	100.0	100.0	92.0		744	690	690	71.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
11/81	SYSTEM	100.0	100.0	100.0	95.0			720	686	69.0
12/81	SYSTEM	100.0	100.0	100.0	100.0			744	744	79.0

** PROBLEMS/SOLUTIONS/COMMENTS

BOILER TUBE LEAKS CONTINUED TO BE A PROBLEM DURING THE FOURTH QUARTER.

THE FGD SYSTEM WAS OUT OF SERVICE FOR A SHORT PERIOD SO THAT THE BOILER AIR PREHEATER COULD BE CLEANED.

1/82	SYSTEM	100.0	100.0	100.0	99.2			744	738	88.2
2/82	SYSTEM	100.0	100.0	100.0	96.4			672	648	84.3
3/82	SYSTEM	100.0	100.0	100.0	91.9			744	684	72.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982.

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		

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL 1982 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 1982 THROUGH JUNE 1983

7/83	SYSTEM							744		
8/83	SYSTEM							744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (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											
INFORMATION WAS UNAVAILABLE FOR THE THIRD QUARTER OF 1983.											
10/83	SYSTEM										
11/83	SYSTEM							720			
12/83	SYSTEM							744			
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS NOT AVAILABLE 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.											
10/84	SYSTEM							744			
11/84	SYSTEM							720			
12/84	SYSTEM							744			
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE FOURTH QUARTER OF 1984.											
1/85	SYSTEM			100.0				744	744		83.7
2/85	SYSTEM			100.0				672	672		84.6
3/85	SYSTEM			100.0				744	508		51.9
4/85	SYSTEM			0.0				720	0		0.0
5/85	SYSTEM			100.0				744	567		51.9
6/85	SYSTEM			100.0				720	720		70.0
7/85	SYSTEM			100.0				744	706		60.3
8/85	SYSTEM			100.0				744	683		61.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

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

9/85	SYSTEM				100.0			720	720		82.9
10/85	SYSTEM				100.0			744	733		83.7
11/85	SYSTEM				100.0			720	719		85.2
12/85	SYSTEM				100.0			744	735		80.1

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1985. HOWEVER, THE PLANT WAS OFF-LINE IN APRIL FOR A SCHEDULED TURBINE/BOILER MAINTENANCE OUTAGE.

THE UTILITY PLANS TO CHANGE THE NUMBER AND SIZE OF THE SPRAY NOZZLES AND REPLACE CARBON STEEL SECTIONS OF THE MODULE VESSELS LOCATED NEAR THE PRIMARY CONTACTOR WITH 304 STAINLESS STEEL. THESE REPAIRS WILL BE MADE DURING SCHEDULED 1986 UNIT OUTAGES.

1/86	SYSTEM			100.0				744	681		66.2
2/86	SYSTEM			100.0				672	610		70.8
3/86	SYSTEM			100.0				744	726		73.4
4/86	SYSTEM			100.0				720	719		70.6
5/86	SYSTEM			100.0				744	721		65.3
6/86	SYSTEM			100.0				720	720		66.8
7/86	SYSTEM			100.0				744	670		61.7
8/86	SYSTEM			100.0				744	590		45.5
9/86	SYSTEM			100.0				720			
10/86	SYSTEM			100.0				744	548		50.6
11/86	SYSTEM			100.0				720	665		72.0
12/86	SYSTEM			100.0				744	679		63.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED 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			
8/87	SYSTEM							744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 1 (CONT.)

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE CO.	
UNIT NUMBER	2	
CITY	BECKER	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	37.	(0.087 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	413.	(0.960 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	1420	
GROSS UNIT GENERATING CAPACITY - MW	750	
NET UNIT GENERATING CAPACITY W/FGD - MW	705	
NET UNIT GENERATING CAPACITY WO/FGD - MW	735	
EQUIVALENT SCRUBBED CAPACITY - MW	750	
*** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	COMBUSTION ENGINEERING	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1349.16	(2859000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	154.4	(310 F)
STACK HEIGHT - M	198.	(650 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	9.9	(32.6 FT)
*** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	19538.	(8400 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		8300-8500
AVERAGE ASH CONTENT - %	9.00	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	25.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	0.80	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	0.03	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** MECHANICAL COLLECTOR		
NUMBER	0	
TYPE	NONE	
** ESP		
NUMBER	0	
TYPE	NONE	
** PARTICLE SCRUBBER		
NUMBER	12	
NUMBER OF SPARES	2	
INITIAL START-UP DATE	4/1977	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	VARIABLE-THROAT/VERTICALLY-ADJUSTABLE ROD DECKS	
TRADE NAME/COMMON NAME	ROD SCRUBBER	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	3.0 X 25.5	
SHELL GENERIC MATERIAL	STAINLESS STEEL	
SHELL SPECIFIC MATERIAL	AUSTENITIC	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
GAS CONTACTING DEVICE TYPE	TYPE 304 STAINLESS STEEL RODS	
NUMBER OF CONTACTING ZONES	2	
LIQUID RECIRCULATION RATE - LITER/S	223.0	(3540 GPM)
L/G RATIO - LITER/CU.M	1.8	(13.6 GAL/1000ACF)
PRESSURE DROP - KPA	3.5	(14.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	24.4	(80.0 FT/S)
INLET GAS FLOW RATE - CU.M/S	122.6	(259900 ACFM)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

INLET GAS TEMPERATURE - C	154.4	(310 F)
PARTICLE REMOVAL EFFICIENCY - %	99.0	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE/ALKALINE FLYASH
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
A-E FIRM	BLACK & VEATCH
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	50.00
ENERGY CONSUMPTION - %	4.0
CURRENT STATUS	1
COMMERCIAL START-UP	4/1977
INITIAL START-UP	3/1977
CONTRACT AWARDED	0/1971

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	0.70	
DESIGN COAL HEAT CONTENT - J/G	19305.8	(8300 BTU/LB)
DESIGN COAL ASH CONTENT - %	9.00	
DESIGN MOISTURE CONTENT - %	28.00	
DESIGN CHLORIDE CONTENT - %	*****	
SPACE REQUIREMENTS - SQ M	1312.0	(14123 SQ FT)
OPER. & MAINT. REQUIREMENT - MANHR/DAY	212.0	

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	12	
NUMBER OF SPARES	2	
GENERIC TYPE	SPRAY TOWER	
SPECIFIC TYPE	OPEN COUNTERCURRENT SPRAY	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	COMBUSTION ENGINEERING	
DIMENSIONS - FT	18 X 26.5 X 60	
SHELL GENERIC MATERIAL	CARBON STEEL	
SHELL SPECIFIC MATERIAL	AISI 1110	
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A	
LINER GENERIC MATERIAL	ORGANIC	
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	FLAKELINE 151	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	378.	(6000 GPM)
L/G RATIO - L/CU.M	2.9	(21.8 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	3.0	(10.0 FT/S)
INLET GAS FLOW - CU. M/S	129.77	(275000 ACFM)
INLET GAS TEMPERATURE - C	54.4	(130 F)
SO2 REMOVAL EFFICIENCY - %	50.0	
PARTICLE REMOVAL EFFICIENCY - %	99.0	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	12	
NUMBER OF SPARES PER SYSTEM	2	
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	3	
FREEBOARD DISTANCE - M	3.20	(10.5 FT)

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

DISTANCE BETWEEN STAGES - CM	25.40	(10.0 IN)
DISTANCE BETWEEN VANES - CM	10.2	(4.00 IN)
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	FIBER-REINFORCED POLYESTER	
WASH WATER SOURCE	MAKE-UP WATER	
WASH FREQUENCY	ONCE PER 24 HRS	
WASH RATE - L/S	126.2	(2000 GAL/MIN)
** REHEATER		
NUMBER	12	
NUMBER OF SPARES	2	
NUMBER PER MODULE	1	
GENERIC TYPE	IN-LINE	
SPECIFIC TYPE	HOT WATER	
TRADE NAME/COMMON TYPE	FIN TUBE	
LOCATION	10 FT ABOVE ME	
TEMPERATURE INCREASE - C	22.2	(40 F)
INLET FLUE GAS FLOW RATE - CU. M/S	94.38	(200000 ACFM)
INLET FLUE GAS TEMPERATURE - C	54.4	(130 F)
OUTLET FLUE GAS TEMPERATURE - C	76.7	(170 F)
NUMBER OF HEAT EXCHANGER BANKS	4	
NUMBER OF TUBES PER BUNDLE	45	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
** FANS		
NUMBER	4	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FAN	
FUNCTION	UNIT	
APPLICATION	INDUCED DRAFT	
SERVICE	DRY	
FLUE GAS FLOW RATE - CU.M/S	94.38	(200000 ACFM)
FLUE GAS TEMPERATURE - C	76.7	(170 F)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
** DAMPERS		
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL	
CONSTRUCTION MATERIAL SPECIFIC TYPE	AISI 1110	
LINER GENERIC MATERIAL TYPE	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	PARALLEL BLADE MULTILOUVER	
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	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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

** DUCTWORK	
LOCATION	REHEATER 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
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	WET BALL MILL
DEVICE	COMPARTMENTED
DEVICE TYPE	NR
MANUFACTURER	ALLIS CHALMERS
NUMBER	1
NUMBER OF SPARES	0
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	21.8 (24 TPH)
PRODUCT QUALITY - % SOLIDS	65.0
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	12
MAKEUP WATER	1
REAGENT PREP PRODUCT	4
** PUMPS	
SERVICE	NUMBER
-----	-----
POND RETURN	1
THICKENER UNDERFLOW	1
MAKEUP WATER	1
REHEAT WATER	2
SCRUBBER RECIRCULATION	2
ABSORBER RECIRCULATION	12
LIMESTONE CLASSIFIER RECYCLE	****
LIMESTONE DILUTION	****
LIMESTONE SLURRY TRANSFER	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	2
NUMBER OF SPARES	1
DIMENSIONS - FT	160.0 DIA X 10.0
SHELL GENERIC MATERIAL TYPE	CARBON STEEL
SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
FEED STREAM SOURCE	ABSORBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	28% SOLIDS
OUTLET STREAM DISPOSITION	POND
OVERFLOW STREAM DISPOSITION	LIMESTONE SLURRY TRANSFER TANK
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FORCED OXIDATION
DEVICE	REACTION TANK
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE DIMENSIONS	62 ACRES X 50 FT
SITE CAPACITY - CU.M	3791300 (3100.0 ACRE-FT)
** PROCESS CONTROL AND INSTRUMENTATION	
CHEMICAL PARAMETERS	SLURRY PH, SO2
PHYSICAL VARIABLES	PRESSURE DROP, PERCENT SOLIDS, TANK LEVELS
CONTROL LEVELS	PRESSURE DROP 12 IN H2O, 10% SOLIDS, PH=5-5.5
MONITOR TYPE	DUPONT 'SO2!
MONITOR LOCATION	BOILER OUTLET & ON MODULES 'SO2!
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN
RECEIVING WATER STREAM	MISSISSIPPI RIVER
SOURCE OF MAKEUP WATER	RIVER WATER & COOLING TOWER BLOWDOWN
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	LIMESTONE
PRINCIPAL CONSTITUENT	95% CaCO3
CONSUMPTION	3.0-3.5 TPH
POINT OF ADDITION	BALL MILL
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	9.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	1.0

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
4/77	201		0.0		0.0					
	202		95.0		91.9					
	203		93.3		90.3					
	204		87.4		84.6					
	205		82.6		80.0					
	206		83.8		81.1					
	207		93.7		90.7					
	208		73.9		71.5					
	209		90.5		87.6					
	210		86.8		84.0					
	211		84.7		81.9					
	212		85.5		82.8					
	SYSTEM	92.0	87.0		84.2	57.50	99.00	720	697	590 83.0
5/77	201		32.9		28.5					
	202		100.0		86.6					
	203		44.4		38.4					
	204		94.6		81.9					
	205		93.9		81.3					
	206		100.0		86.6					
	207		75.9		65.7					
	208		98.0		84.8					
	209		93.9		81.3					
	210		92.2		79.8					
	211		91.2		78.9					
	212		97.8		84.7					
	SYSTEM	91.0	92.3		79.9			744	644	594 76.5

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM BEGAN OPERATIONS IN APRIL 1977. ONLY MINOR PROBLEMS OCCURRED DURING APRIL AND MAY. THE SYSTEM IS CURRENTLY IN A SHAKEDOWN PHASE OF OPERATION.

6/77	201		92.0		92.0					
	202		76.0		76.0					
	203		78.0		78.0					
	204		79.0		79.0					
	205		89.0		89.0					
	206		74.0		74.0					
	207		67.0		67.0					
	208		88.0		88.0					
	209		88.0		88.0					
	210		78.0		78.0					
	211		45.0		45.0					
	212		85.0		85.0					
	SYSTEM	96.0	85.4		85.4		720	720	615	79.5

** PROBLEMS/SOLUTIONS/COMMENTS

CRACKING AND BUBBLING OF THE CEILCOTE LINING HAS BEEN OBSERVED ABOVE THE LIQUID LEVEL OF THE INTERNAL RECYCLE TANK.

7/77	201		96.0		78.0					
	202		87.0		70.0					
	203		86.0		70.0					
	204		97.0		79.0					
	205		96.0		78.0					
	206		88.0		71.0					
	207		88.0		71.0					
	208		95.0		77.0					
	209		57.0		46.0					
	210		93.0		75.0					
	211		94.0		76.0					
	212		87.0		70.0					
	SYSTEM	97.0	96.7		78.3		744	602	531	69.6

8/77	201		88.0		80.0					
	202		75.0		68.0					
	203		67.0		61.0					
	204		82.0		74.0					
	205		84.0		76.0					
	206		35.0		32.0					
	207		81.0		74.0					
	208		80.0		73.0					
	209		56.0		51.0					
	210		79.0		72.0					
	211		71.0		64.0					
	212		33.0		30.0					
	SYSTEM	93.0	75.6		68.6		744	675	510	66.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE SPRAY PUMPS WERE OVERHAULED DURING AUGUST ON MODULES 206 AND 209.

THE SPRAY NOZZLES ON MODULES 206 AND 209 REQUIRED EXTENSIVE CLEANING.

9/77	201		89.0		89.0					
	202		61.0		61.0					
	203		82.0		82.0					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	204		90.0		90.0				
	205		81.0		81.0				
	206		86.0		86.0				
	207		52.0		52.0				
	208		88.0		88.0				
	209		56.0		56.0				
	210		87.0		87.0				
	211		73.0		73.0				
	212		86.0		86.0				
	SYSTEM	94.0	84.6		84.6			720 717	609 79.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE STRAINERS IN THE MODULE 207 AND 209 REACTION TANKS HAVE STARTED ERODING. THE UTILITY ANTICIPATES REPLACING THEM VERY SOON.

10/77	201		98.0		90.0				
	202		89.0		82.0				
	203		87.0		80.0				
	204		86.0		79.0				
	205		62.0		57.0				
	206		99.0		91.0				
	207		98.0		90.0				
	208		93.0		86.0				
	209		96.0		88.0				
	210		96.0		88.0				
	211		70.0		64.0				
	212		81.0		75.0				
	SYSTEM	95.0	95.9		88.2			744 684	656 81.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE LOW OPERABILITIES ARE DUE TO SPRAY WATER PUMP OVERHAULS. 24 PUMPS ARE BEING OVERHAULED.

STRAINER/WASHER SCREEN EROSION HAS BEEN A PROBLEM. 316 SS MATERIAL WILL BE USED IN THE FUTURE. REPLACEMENT MATERIAL IS EXPECTED TO ARRIVE IN DECEMBER AND WORK IS EXPECTED TO LAST FOR THREE MONTHS.

11/77	201		85.0		84.0				
	202		93.0		92.0				
	203		68.0		68.0				
	204		80.0		79.0				
	205		93.0		92.0				
	206		73.0		73.0				
	207		75.0		75.0				
	208		66.0		66.0				
	209		94.0		93.0				
	210		77.0		77.0				
	211		91.0		90.0				
	212		65.0		65.0				
	SYSTEM	91.0	87.3		86.7			720 715	624 81.7

12/77	201		53.0		52.0				
	202		93.0		92.0				
	203		94.0		93.0				
	204		87.0		86.0				
	205		89.0		88.0				
	206		95.0		94.0				
	207		93.0		92.0				
	208		83.0		82.0				
	209		62.0		61.0				
	210		82.0		81.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
	211		90.0		89.0					
	212		92.0		91.0					
	SYSTEM	93.0	92.1		91.0		744	733	677	80.6
1/78	201		91.0		83.0					
	202		75.0		69.0					
	203		64.0		59.0					
	204		72.0		66.0					
	205		74.0		68.0					
	206		67.0		61.0					
	207		91.0		83.0					
	208		88.0		81.0					
	209		77.0		71.0					
	210		72.0		66.0					
	211		73.0		70.0					
	212		84.0		77.0					
	SYSTEM	92.0	84.4		77.6		744	682	577	70.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE REPLACEMENT OF STRAINER SCREENS BEGAN ON DECEMBER 21. FOUR TO SIX DAYS OF WORK ON EACH MODULE ARE REQUIRED TO MAKE STRAINER SCREEN REPLACEMENTS.

2/78	201		83.0		77.0					
	202		85.0		78.0					
	203		55.0		51.0					
	204		91.0		84.0					
	205		89.0		82.0					
	206		76.0		70.0					
	207		71.0		66.0					
	208		89.0		82.0					
	209		85.0		78.0					
	210		81.0		75.0					
	211		97.0		90.0					
	212		60.0		55.0					
	SYSTEM	92.0	87.4		80.7		672	620	542	73.8

** PROBLEMS/SOLUTIONS/COMMENTS

STRAINER MODIFICATIONS WERE PERFORMED ON MODULES 203 AND 212.

3/78	201		82.0		82.0					
	202		92.0		92.0					
	203		90.0		90.0					
	204		83.0		83.0					
	205		78.0		78.0					
	206		85.0		85.0					
	207		91.0		91.0					
	208		62.0		62.0					
	209		83.0		83.0					
	210		78.0		78.0					
	211		88.0		88.0					
	212		89.0		89.0					
	SYSTEM	97.0	91.0		91.0		744	744	677	87.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT GENERATED MAXIMUM MEGAWATT-HOURS AND THE FGD SYSTEM TIED THE HIGHEST RECORDED AVAILABILITY OF 97%.

STRAINER MODIFICATIONS WERE PERFORMED ON MODULES 208 AND 210.

4/78	201		70.0		70.0					

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	202		82.0		82.0				
	203		90.0		90.0				
	204		84.0		84.0				
	205		91.0		91.0				
	206		83.0		83.0				
	207		84.0		84.0				
	208		86.0		86.0				
	209		78.0		78.0				
	210		90.0		90.0				
	211		67.0		67.0				
	212		85.0		85.0				
	SYSTEM	92.0	90.0		90.0		720	719	648 81.9

** PROBLEMS/SOLUTIONS/COMMENTS

FROM FULL SCALE STARTUP ON APRIL 1, THE SYSTEM HAS BEEN OPERATING VERY WELL WITH NO MAJOR PROBLEMS ENCOUNTERED. THE UTILITY IS MAINTAINING A SCHEDULE OF NIGHTLY CLEANING ON THE SCRUBBERS. THE CURRENT SCHEME IS SUCH THAT EACH MODULE IS CLEANED AFTER SEVEN OR EIGHT DAYS OF OPERATION.

MODULE 201 WAS CONVERTED TO A SPRAY TOWER DURING APRIL.

5/78	201		97.0		16.0				
	202		94.0		15.0				
	203		80.0		13.0				
	204		90.0		15.0				
	205		90.0		15.0				
	206		89.0		14.0				
	207		90.0		15.0				
	208		92.0		15.0				
	209		28.0		5.0				
	210		91.0		15.0				
	211		78.0		13.0				
	212		14.0		2.0				
	SYSTEM	91.0	84.8		13.9		744	120	103 12.7

** PROBLEMS/SOLUTIONS/COMMENTS

THERE WERE LINER FAILURES (CEILCOTE) IN MOST OF THE MODULES DURING APRIL AND MAY. THE LINERS WERE REPAIRED BY THE CEILCOTE COMPANY AT THEIR OWN EXPENSE.

THE UNIT WENT DOWN ON MAY 6 FOR THE FIRST YEAR BOILER AND TURBINE INSPECTION AND WAS DOWN THE REMAINDER OF MAY.

6/78	201		77.0		61.0				
	202		46.0		37.0				
	203		41.0		33.0				
	204		67.0		53.0				
	205		62.0		49.0				
	206		62.0		49.0				
	207		72.0		57.0				
	208		78.0		62.0				
	209		60.0		48.0				
	210		62.0		49.0				
	211		76.0		60.0				
	212		75.0		60.0				
	SYSTEM	95.0	70.7		56.2		720	572	405 61.3
7/78	201		87.0		82.0				
	202		89.0		83.0				
	203		62.0		58.0				
	204		93.0		87.0				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

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

	205		90.0		84.0						
	206		64.0		60.0						
	207		86.0		81.0						
	208		67.0		63.0						
	209		64.0		60.0						
	210		81.0		76.0						
	211		73.0		68.0						
	212		71.0		67.0						
	SYSTEM	95.0	84.3		79.0			744	697	588	71.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY IS EVALUATING NEW RUBBER LINED PUMPS (8000 GPM) AS POSSIBLE SOLUTIONS TO THE MIST ELIMINATOR AND REHEATER PLUGGING PROBLEMS.

THE UTILITY IS EVALUATING NEW STAINLESS STEEL MIST ELIMINATOR WASH LANCES (TO REPLACE ORIGINAL FIBERGLASS LANCES).

THE FGD SYSTEM HAS BEEN EXPERIENCING PRIMARY CONTACTOR WALL AND MARBLE BED WEAR.

THE UTILITY IS PREPARING FOR THE STATE COMPLIANCE DEADLINE ON NOVEMBER 1. CURRENTLY TESTING HAS BEEN PROCEEDING ON DIFFERENT MODULES IN AN EFFORT TO FINE TUNE THE SYSTEM.

PLUGGING PROBLEMS IN THE REHEATER HAVE BEEN MORE FREQUENT THAN NORMAL.

THE UTILITY IS IN THE PROCESS OF REPLACING THE ORIGINAL ZURN DUPLEX STRAINERS WITH 316 SS STRAINERS.

THE INLET SEAL STRIPS WERE REPAIRED.

PLUGGING PROBLEMS IN THE MIST ELIMINATOR HAVE BEEN MORE FREQUENT THAN NORMAL.

8/78	201		88.0		82.0					
	202		100.0		93.0					
	203		48.0		45.0					
	204		79.0		74.0					
	205		81.0		76.0					
	206		72.0		67.0					
	207		64.0		60.0					
	208		87.0		81.0					
	209		54.0		50.0					
	210		76.0		71.0					
	211		80.0		75.0					
	212		71.0		66.0					
	SYSTEM	93.0	81.8		76.4		744	695	569	69.8
9/78	201		72.0		72.0					
	202		82.0		82.0					
	203		70.0		70.0					
	204		61.0		61.0					
	205		74.0		74.0					
	206		64.0		64.0					
	207		82.0		82.0					
	208		72.0		72.0					
	209		75.0		75.0					
	210		78.0		78.0					
	211		82.0		82.0					
	212		68.0		68.0					
	SYSTEM	96.0	80.0		80.0		720	720	576	74.4

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 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 RUBBER LINED PUMPS THAT THE UTILITY WAS INVESTIGATING HAVE BEEN ORDERED. FOUR OF THE PUMPS HAVE BEEN RECEIVED AND ONE IS INSTALLED. THE OTHERS WILL BE INSTALLED AS THEY ARE RECEIVED.

DIFFERENT MIST ELIMINATOR SPRAY PATTERNS ARE BEING TESTED TO MINIMIZE PLUGGING OCCURRENCES.

NO FGD RELATED OUTAGES WERE REPORTED BY THE UTILITY FOR THE AUGUST-SEPTEMBER REPORT PERIOD.

10/78	201		90.0		83.0				
	202		79.0		73.0				
	203		59.0		55.0				
	204		73.0		68.0				
	205		69.0		64.0				
	206		64.0		59.0				
	207		78.0		72.0				
	208		76.0		70.0				
	209		72.0		67.0				
	210		69.0		64.0				
	211		72.0		67.0				
	212		82.0		76.0				
	SYSTEM	94.0	80.3		74.4	744	688	553	68.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING OCTOBER MODULE 203 EXPERIENCED STRAINER PLUGGING.

DURING OCTOBER MODULE 203 EXPERIENCED REHEATER PROBLEMS WHICH TOGETHER WITH STRAINER PLUGGING CAUSED A FOUR TO FIVE DAY OUTAGE.

11/78	201		84.0		55.0				
	202		45.0		30.0				
	203		82.0		54.0				
	204		80.0		52.0				
	205		75.0		49.0				
	206		58.0		38.0				
	207		77.0		51.0				
	208		75.0		49.0				
	209		83.0		54.0				
	210		83.0		54.0				
	211		72.0		47.0				
	212		47.0		31.0				
	SYSTEM	92.0	78.3		51.3	720	472	369	44.6

** PROBLEMS/SOLUTIONS/COMMENTS

LOW NOVEMBER BOILER HOURS RESULTED FROM A NECESSARY TURBINE INSPECTION.

NORMAL OVERHAUL MAINTENANCE WAS PERFORMED ON THE SPRAY PUMPS OF MODULES 202 AND 212.

12/78	201		85.0		84.0				
	202		92.0		91.0				
	203		89.0		88.0				
	204		84.0		83.0				
	205		84.0		83.0				
	206		84.0		83.0				
	207		96.0		95.0				
	208		88.0		87.0				

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	209		78.0		77.0					
	210		92.0		91.0					
	211		81.0		80.0					
	212		94.0		93.0					
	SYSTEM	94.0	95.2		94.0		744	733	698	74.0
1/79	201		57.0		53.0					
	202		89.0		82.0					
	203		91.0		84.0					
	204		85.0		79.0					
	205		92.0		85.0					
	206		82.0		76.0					
	207		75.0		69.0					
	208		97.0		90.0					
	209		74.0		68.0					
	210		88.0		81.0					
	211		100.0		92.0					
	212		90.0		83.0					
	SYSTEM	94.0	92.7		85.6		744	688	638	66.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE PROBLEMS ENCOUNTERED IN DECEMBER AND JANUARY WERE MAINLY WEATHER RELATED.

THERE WERE PROBLEMS WITH THE COAL FEEDER BELTS RESULTING IN MOVING WET COAL FROM OLDER COAL STOCKPILES TO THE BOILER DURING THE DECEMBER-JANUARY PERIOD.

2/79	201		86.0		86.0					
	202		84.0		84.0					
	203		73.0		73.0					
	204		89.0		89.0					
	205		59.0		59.0					
	206		76.0		76.0					
	207		72.0		72.0					
	208		68.0		68.0					
	209		80.0		80.0					
	210		75.0		75.0					
	211		92.0		92.0					
	212		65.0		65.0					
	SYSTEM	93.0	83.6		83.5		672	671	561	66.2
3/79	201		85.0		85.0					
	202		69.0		69.0					
	203		78.0		78.0					
	204		47.0		47.0					
	205		71.0		71.0					
	206		76.0		76.0					
	207		90.0		90.0					
	208		78.0		78.0					
	209		50.0		50.0					
	210		85.0		85.0					
	211		57.0		57.0					
	212		86.0		86.0					
	SYSTEM	91.0	79.3		79.3		744	744	590	53.7

** PROBLEMS/SOLUTIONS/COMMENTS

THE ONLY PROBLEMS ENCOUNTERED DURING FEBRUARY AND MARCH WERE BOILER-RELATED PROBLEMS RESULTING FROM WET COAL.

THE RECYCLE PUMPS ARE BEING REPLACED WITH LARGER 8000 GPM WORTHINGTON PUMPS. DURING THIS PERIOD THE PUMPS WERE INSTALLED ON MODULES 204 AND

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

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

206.										
4/79	SYSTEM	95.0					720	717		71.8
** PROBLEMS/SOLUTIONS/COMMENTS										
AS OF APRIL 1979 THE UTILITY HAS DECIDED THAT IT WILL ONLY REPORT THE AVAILABILITY OF THE TOTAL SYSTEM FOR THIS REPORT.										
5/79	SYSTEM	99.0					744	263		28.1
** PROBLEMS/SOLUTIONS/COMMENTS										
THE LOW BOILER HOURS IN MAY WERE DUE TO COMMENCEMENT OF THE ANNUAL BOILER AND TURBINE INSPECTION.										
ALL PIPING HAS BEEN CHANGED TO FIBERGLASS.										
6/79	SYSTEM	90.0					720	454		38.7
** PROBLEMS/SOLUTIONS/COMMENTS										
THE ONLY PROBLEM REPORTED BY THE UTILITY WAS THE LOSS OF A BOILER SURGE PUMP AFTER THE UNIT RESTARTED.										
7/79	SYSTEM	95.0					744	741		78.9
8/79	SYSTEM	96.0					744	740		72.3
9/79	SYSTEM	95.0					720	657		68.9
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR OPERATIONAL PROBLEMS HAVE BEEN ENCOUNTERED WITH THIS UNIT SINCE IT CAME BACK ON LINE AFTER THE ANNUAL BOILER/TURBINE OVERHAUL IN MAY.										
10/79	SYSTEM	94.0					744	732		
11/79	SYSTEM	97.0					720	719		
12/79	SYSTEM	97.0					744	662		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO MAJOR BOILER OR FGD OPERATIONAL PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1979.										
1/80	SYSTEM	97.0					744	744		90.1
2/80	SYSTEM	96.0					696	696		91.8
3/80	SYSTEM	98.0					744	744		91.9
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE FIRST QUARTER OF 1980 THE FGD SYSTEM EXPERIENCED NO MAJOR PROBLEMS.										
A FOUR WEEK BOILER OUTAGE IS SCHEDULED FOR MAY AT WHICH TIME THE MARBLE BEDS WILL BE REMOVED FROM THE FGD SYSTEM.										
THE UTILITY HAS DECIDED TO CONVERT THE ENTIRE MARBLE BED SCRUBBING SYSTEM TO A SPRAY TOWER SYSTEM BY REMOVING THE MARBLE BEDS AND MODIFYING THE SPRAY ARRANGEMENT. TESTS CONDUCTED AT UNIT 1 IN 1978 AND 1979 SHOW THAT MOST OF										

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
THE SO2 IS COLLECTED IN THE VENTURI SECTION OF THE SCRUBBING TRAINS AND THAT ALTHOUGH THE MARBLE BEDS IN THE ABSORBER SECTIONS IMPROVE INTIMATE SO2/SLURRY MIXING, SO2 REMOVAL EFFICIENCY OF THE SCRUBBING TRAINS IS NOT MARKEDLY DIFFERENT WHEN MARBLE BEDS ARE REMOVED.											
4/80	SYSTEM	96.0						720	704		68.6
** PROBLEMS/SOLUTIONS/COMMENTS											
NO MAJOR OPERATIONAL PROBLEMS WERE ENCOUNTERED IN APRIL.											
5/80	SYSTEM	96.0						744	214		24.2
6/80	SYSTEM	100.0						720	51		2.8
** PROBLEMS/SOLUTIONS/COMMENTS											
THE FGD SYSTEM WAS OUT OF SERVICE MOST OF MAY AND JUNE BECAUSE OF THE ANNUAL BOILER AND TURBINE INSPECTION.											
7/80	SYSTEM	100.0	100.0	100.0	82.7			744	615	615	63.8
** PROBLEMS/SOLUTIONS/COMMENTS											
BOILER TUBE LEAKS CAUSED THE BOILER NOT TO OPERATE FOR 73 HOURS IN JULY.											
BOTTOM ASH PLUGGING ALSO FORCED THE BOILER DOWN FOR 56 HOURS.											
8/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	70.7
9/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	100.0
** PROBLEMS/SOLUTIONS/COMMENTS											
THE BOILER AND FGD SYSTEM RAN CONTINUOUSLY THROUGH AUGUST AND SEPTEMBER WITHOUT ANY PROBLEMS.											
10/80	SYSTEM	100.0	100.0	100.0	99.7			744	742	742	81.9
11/80	SYSTEM	100.0	100.0	100.0	100.0			720	720	720	82.2
12/80	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	79.2
** PROBLEMS/SOLUTIONS/COMMENTS											
DURING THE OCTOBER-DECEMBER PERIOD THE FGD SYSTEM WAS AVAILABLE 100% OF THE TIME.											
1/81	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	76.5
2/81	SYSTEM	100.0	100.0	100.0	98.8			672	664	664	77.0
3/81	SYSTEM	100.0	100.0	100.0	100.0			744	744	744	78.8
** PROBLEMS/SOLUTIONS/COMMENTS											
DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED.											
WORK IS CONTINUING ON CONVERTING THE MARBLE BED SCRUBBING SYSTEM TO A SPRAY TOWER SYSTEM. SEVEN OF THE TWELVE ABSORBERS ARE COMPLETED.											
4/81	SYSTEM	100.0	100.0	100.0	80.0			720	579	579	61.0
5/81	SYSTEM	100.0	100.0	100.0	91.0			744	679	679	69.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
6/81	SYSTEM	100.0	100.0	100.0	99.0		720	713	713	73.0
** PROBLEMS/SOLUTIONS/COMMENTS										
DURING THE SECOND QUARTER THE FGD SYSTEM WAS OUT OF SERVICE A FEW HOURS AS A RESULT OF A BOILER TUBE LEAK.										
7/81	SYSTEM	100.0	100.0	100.0	99.0		744	741	741	72.0
8/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	70.0
9/81	SYSTEM	100.0	100.0	100.0	85.0		720	616	616	58.0
** PROBLEMS/SOLUTIONS/COMMENTS										
THE FGD SYSTEM WAS TAKEN OUT OF SERVICE TWICE DURING THE THIRD QUARTER AS A RESULT OF BOILER TUBE LEAKS.										
10/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	79.0
11/81	SYSTEM	100.0	100.0	100.0	100.0		720	720	720	73.0
12/81	SYSTEM	100.0	100.0	100.0	100.0		744	744	744	79.0
** PROBLEMS/SOLUTIONS/COMMENTS										
BOILER TUBE LEAKS CONTINUED TO BE A PROBLEM DURING THE FOURTH QUARTER.										
1/82	SYSTEM	100.0	100.0	100.0	94.4		744	702	702	82.9
2/82	SYSTEM	100.0	100.0	100.0	17.6		672	118	118	16.1
3/82	SYSTEM	100.0	100.0	100.0	51.9		744	386	386	37.1
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER 1982. HOWEVER, THE UNIT WAS DOWN MOST OF FEBRUAR AND PART OF MARCH FOR A SCHEDULED BOILER/TURBINE INSPECTION.										
4/82	SYSTEM						720			
5/82	SYSTEM						744			
6/82	SYSTEM						720			
** PROBLEMS/SOLUTIONS/COMMENTS										
THE SECOND QUARTER 1982 UPDATE INFORMATION IS NOT AVAILABLE AT THIS TIME.										
7/82	SYSTEM						744			
8/82	SYSTEM						744			
9/82	SYSTEM						720			
10/82	SYSTEM						744			
11/82	SYSTEM						720			
12/82	SYSTEM						744			
1/83	SYSTEM						744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
2/83	SYSTEM								672		
3/83	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF APRIL 1982 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 1982 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										
11/83	SYSTEM								720		
12/83	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
INFORMATION WAS NOT AVAILABLE 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 UNAVAILABLE FOR THE FIRST THREE QUARTERS OF 1984.											
10/84	SYSTEM								744		
11/84	SYSTEM								720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

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

12/84	SYSTEM						744	

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR THE FOURTH QUARTER OF 1984.

1/85	SYSTEM				100.0		744	744	83.7
2/85	SYSTEM				100.0		672	672	85.5
3/85	SYSTEM				100.0		744	744	78.5
4/85	SYSTEM				100.0		720	719	76.2
5/85	SYSTEM				100.0		744	738	71.4
6/85	SYSTEM				100.0		720	614	58.6
7/85	SYSTEM				100.0		744	738	62.7
8/85	SYSTEM				100.0		744	737	66.8
9/85	SYSTEM				100.0		720	720	83.8
10/85	SYSTEM				100.0		744	745	85.9
11/85	SYSTEM				100.0		720	720	85.9
12/85	SYSTEM				100.0		744	651	70.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE YEAR 1985.

THE UTILITY PLANS TO CHANGE THE NUMBER AND SIZE OF THE SPRAY NOZZLES AND REPLACE CARBON STEEL SECTIONS OF THE MODULE VESSELS LOCATED NEAR THE PRIMARY CONTACTOR WITH 304 STAINLESS STEEL. THESE REPAIRS WILL BE MADE DURING SCHEDULED 1986 UNIT OUTAGES.

1/86	SYSTEM				100.0		744	591	56.6
2/86	SYSTEM				0.0		672	0	0.0
3/86	SYSTEM				100.0		744	202	16.4
4/86	SYSTEM				100.0		720	677	65.0
5/86	SYSTEM				100.0		744	656	57.9
6/86	SYSTEM				98.0		720	643	57.6
7/86	SYSTEM				100.0		744	744	63.4
8/86	SYSTEM				100.0		744	664	49.9
9/86	SYSTEM				99.5		720	683	61.7
10/86	SYSTEM				98.0		744	679	66.1
11/86	SYSTEM				98.0		720	653	70.3
12/86	SYSTEM				100.0		744	633	62.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED 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	
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.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	NORTHERN STATES POWER	
PLANT NAME	SHERBURNE CO.	
UNIT NUMBER	3	
CITY	BECKER	
STATE	MINNESOTA	
REGULATORY CLASSIFICATION	A	
PARTICULATE EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258.	(0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	*****	(***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2191	
GROSS UNIT GENERATING CAPACITY - MW	850	
NET UNIT GENERATING CAPACITY W/FGD - MW	800	
NET UNIT GENERATING CAPACITY WO/FGD - MW	834	
EQUIVALENT SCRUBBED CAPACITY - MW	801	
** UNIT DATA - BOILER AND STACK		
BOILER SUPPLIER	BABCOCK & WILCOX	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	*****	(***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	*****	(**** F)
STACK HEIGHT - M	*****	(**** FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	*****	(***** FT)
** FUEL DATA		
FUEL TYPE	COAL	
FUEL GRADE	SUBBITUMINOUS	
AVERAGE HEAT CONTENT - J/G	20236.	(8700 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****	
AVERAGE ASH CONTENT - %	9.50	
RANGE ASH CONTENT - %	****	
AVERAGE MOISTURE CONTENT - %	25.00	
RANGE MOISTURE CONTENT - %	****	
AVERAGE SULFUR CONTENT - %	1.00	
RANGE SULFUR CONTENT - %	****	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	
*** PARTICLE CONTROL		
** FABRIC FILTER		
NUMBER	3	
TYPE	REVERSE AIR	
NUMBER OF COMPARTMENTS	16	
INLET FLUE GAS TEMPERATURE - C	73.9	(165 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	
*** FGD SYSTEM		
** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	SPRAY DRYING	
PROCESS TYPE	LIME/SPRAY DRYING	
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER	
A-E FIRM	BLACK & VEATCH	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	0.70	

NORTHERN STATES POWER: SHERBURNE CO. 3 (CONT.)

ENERGY CONSUMPTION - %	4.0	
CURRENT STATUS	1	
COMMERCIAL START-UP	1/1988	
INITIAL START-UP	7/1987	
CONTRACT AWARDED	1/1983	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** ABSORBER		
NUMBER	8	
NUMBER OF SPARES	2	
GENERIC TYPE	SPRAY DRYER	
SPECIFIC TYPE	NA	
TRADE NAME/COMMON TYPE	NA	
DIMENSIONS - FT	46X36	
SHELL GENERIC MATERIAL	NA	
SHELL SPECIFIC MATERIAL	NA	
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA	
LINER GENERIC MATERIAL	NONE	
LINER SPECIFIC MATERIAL	N/A	
LINER MATERIAL TRADE NAME/COMMON TYPE	N/A	
INLET GAS FLOW - CU. M/S	1784.25	(3781000 ACFM)
INLET GAS TEMPERATURE - C	153.3	(308 F)
** 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	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	NA	
TRADE NAME/COMMON TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
** FANS		
DESIGN	NR	
FUNCTION	NA	
APPLICATION	NR	
SERVICE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
** DAMPERS		
FUNCTION	NA	
GENERIC TYPE	NA	
SPECIFIC TYPE	NA	
CONSTRUCTION MATERIAL GENERIC TYPE	NA	
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA	
LINER GENERIC MATERIAL TYPE	NA	
LINER SPECIFIC MATERIAL TYPE	NA	
** DUCTWORK		
SHELL GENERIC MATERIAL TYPE	NA	
SHELL SPECIFIC MATERIAL TYPE	NA	
LINER GENERIC MATERIAL TYPE	NA	
LINER SPECIFIC MATERIAL TYPE	NA	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	SLAKER	
DEVICE	BALL MILL	
DEVICE TYPE	N/A	
NUMBER	2	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

NORTHERN STATES POWER: SHERBURNE CO. 3 (CONT.)

FULL LOAD DRY FEED CAPACITY - M.TONS/HR	13.6	(15 TPH)
** PUMPS SERVICE ----- NA	NUMBER ----- ****	
** SOLIDS CONCENTRATING/DEWATERING DEVICE	NONE	
*** SALEABLE BYPRODUCTS NATURE DISPOSITION	NONE N/A	
*** SLUDGE		
** TREATMENT METHOD DEVICE PROPRIETARY PROCESS	UNSTABILIZED N/A N/A	
** DISPOSAL NATURE TYPE LOCATION SITE TREATMENT	FINAL LANDFILL ON-SITE CLAY LINING	
** WATER BALANCE WATER LOOP TYPE SOURCE OF MAKEUP WATER	CLOSED COOLING TOWER	

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 ANNOUNCED THAT INITIAL OPERATIONS OF THE SHERBURNE 3 FGD SYSTEM COMMENCED IN JULY 1987 AND THAT THE ENTIRE PLANT WAS DECLARED COMMERCIAL BY NOVEMBER 1987. NO MAJOR FGD-RELATED PROBLEMS HAVE BEEN

NORTHERN STATES POWER: SHERBURNE CO. 3 (CONT.)

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

ENCOUNTERED SINCE START-UP.										

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	ORLANDO UTILITIES COMMISSION
PLANT NAME	C.H. STANTON
UNIT NUMBER	1
CITY	ORLANDO
STATE	FLORIDA
REGULATORY CLASSIFICATION	A
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	415
GROSS UNIT GENERATING CAPACITY - MW	460
NET UNIT GENERATING CAPACITY W/FGD - MW	415
NET UNIT GENERATING CAPACITY WO/FGD - MW	427
EQUIVALENT SCRUBBED CAPACITY - MW	460
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	****
BOILER TYPE	****
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	***** (**** FT)
STACK SHELL	****
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	****
AVERAGE HEAT CONTENT - J/G	***** (***** BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	*****
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.80
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** ESP	
NUMBER	1
SUPPLIER	WHEELABRATOR-FRYE
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIMESTONE
SYSTEM SUPPLIER	COMBUSTION ENGINEERING
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	90.00
ENERGY CONSUMPTION - %	2.6
CURRENT STATUS	1
INITIAL START-UP	5/1987
** DESIGN AND OPERATING PARAMETERS	
DESIGN COAL SULFUR CONTENT - %	0.80
DESIGN CHLORIDE CONTENT - %	*****
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

ORLANDO UTILITIES COMMISSION: C.H. STANTON 1 (CONT.)

*** SLUDGE

** TREATMENT
METHOD
PROPRIETARY PROCESS

FIXATION
CONVERSION SYSTEMS 'POZ-O-TEC'

** DISPOSAL
NATURE
TYPE

FINAL
LANDFILL

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

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 ANNOUNCED THAT THE CH STANTON 1 PLANT BEGAN INITIAL OPERATIONS
IN MAY WITH COMMERCIAL OPERATIONS OCCURRING ON JULY 1, 1987.

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 FGD-RELATED PROBLEMS HAVE BEEN ENCOUNTERED
SINCE STARTUP AND DECLARED THE UNIT THE BEST OPERATING COAL PLANT IN
SERVICE.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	OXFORD ENERGY CO.
PLANT NAME	WESTLEY
UNIT NUMBER	1
CITY	WESTLEY
STATE	CALIFORNIA
REGULATORY CLASSIFICATION	*****
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	14
NET UNIT GENERATING CAPACITY W/FGD - MW	*****
NET UNIT GENERATING CAPACITY WO/FGD - MW	*****
EQUIVALENT SCRUBBED CAPACITY - MW	14
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	STANDARD KESSEL
BOILER TYPE	STOKER
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	***** (***** ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	***** (**** FT)
STACK SHELL	****
STACK TOP DIAMETER - M	***** (**** FT)
** FUEL DATA	
FUEL TYPE	TIRES
FUEL GRADE	N/A
AVERAGE HEAT CONTENT - J/G	31401. (13500 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	12000 - 15000
AVERAGE ASH CONTENT - %	*****
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	1.75
RANGE SULFUR CONTENT - %	1.5 - 2.0
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** FABRIC FILTER	
NUMBER	2
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	SALEABLE PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	FICHTER CONSULTING ENGINEERS
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.90
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	95.60
CURRENT STATUS	1
COMMERCIAL START-UP	10/1987
INITIAL START-UP	10/1987
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** ABSORBER	
NUMBER	2
NUMBER OF SPARES	2
GENERIC TYPE	SPRAY TOWER

OXFORD ENERGY CO.: WESTLEY 1 (CONT.)

** ABSORBER
 GENERIC TYPE SPRAY DRYER

** REHEATER
 NUMBER 2
 GENERIC TYPE WASTE HEAT RECOVERY
 SPECIFIC TYPE GAS/GAS

*** SALEABLE BYPRODUCTS
 NATURE FLYASH
 DISPOSITION METAL RECOVERY PLANT
 NATURE OF END PRODUCT ZINC

*** SLUDGE

** DISPOSAL
 NATURE FINAL
 TYPE LANDFILL

** WATER BALANCE
 WATER LOOP TYPE CLOSED

-----PERFORMANCE DATA-----							
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER FGD CAP. HOURS HOURS HOURS FACTOR
10/87	SYSTEM					744	9999 999.9
11/87	SYSTEM					720	9999 999.9
12/87	SYSTEM					744	9999 999.9

** PROBLEMS/SOLUTIONS/COMMENTS

START-UP OF THE TIRE-BURNING UNIT OCCURRED IN OCTOBER, 1987. THE UNIT HAS EXPERIENCED SOME PROBLEMS RELATED TO THE VARIABILITY OF THE FEED. NO MAJOR FGD-SYSTEM PROBLEMS HAVE BEEN REPORTED, AND THE SCRUBBER HAS ACHIEVED 95% SO2 REMOVAL.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PACIFIC POWER & LIGHT
PLANT NAME	DAVE JOHNSTON
UNIT NUMBER	4
CITY	GLENROCK
STATE	WYOMING
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	43. (0.100 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	215. (0.500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	330
NET UNIT GENERATING CAPACITY W/FGD - MW	327
NET UNIT GENERATING CAPACITY WO/FGD - MW	330
EQUIVALENT SCRUBBED CAPACITY - MW	330
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	707.85 (1500000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	132.2 (270 F)
STACK HEIGHT - M	76. (250 FT)
STACK SHELL	NR
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	17282. (7430 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	5000-9000
AVERAGE ASH CONTENT - %	12.00
RANGE ASH CONTENT - %	*****
AVERAGE MOISTURE CONTENT - %	26.00
RANGE MOISTURE CONTENT - %	*****
AVERAGE SULFUR CONTENT - %	0.50
RANGE SULFUR CONTENT - %	*****
AVERAGE CHLORIDE CONTENT - %	0.04
RANGE CHLORIDE CONTENT - %	*****
*** PARTICLE CONTROL	
** PARTICLE SCRUBBER	
NUMBER	3
INITIAL START-UP DATE	4/1972
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE-THROAT/TOP-ENTRY PLUMB BOB
TRADE NAME/COMMON NAME	N/A
SUPPLIER	GE ENVIRONMENTAL SERVICES
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	POLYESTER
GAS CONTACTING DEVICE TYPE	N/A
LIQUID RECIRCULATION RATE - LITER/S	409.5 (6500 GPM)
L/G RATIO - LITER/CU.M	1.7 (13.0 GAL/1000ACF)
PH CONTROL ADDITIVE	LIME/ALKALINE FLYASH
PRESSURE DROP - KPA	2.5 (10.0 IN-H2O)
INLET GAS FLOW RATE - CU.M/S	327.5 (694000 ACFM)
INLET GAS TEMPERATURE - C	135.0 (275 F)
SO2 REMOVAL EFFICIENCY - %	40.0
PARTICLE REMOVAL EFFICIENCY - %	99.7
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME/WET INJECTION
PROCESS ADDITIVES	NONE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

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

SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	EBASCO
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	0.60
ENERGY CONSUMPTION - %	0.9
CURRENT STATUS	1
COMMERCIAL START-UP	2/1985
INITIAL START-UP	2/1985
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	3
NUMBER OF SPARES	0
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	VARIABLE THROAT/TOP ENERGY PLUM BOB
TRADE NAME/COMMON TYPE	N/A
SUPPLIER	GE ENVIROMENTAL SERVICES
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	POLYESTER
LINER MATERIAL TRADE NAME/COMMON TYPE	NR
GAS CONTACTING DEVICE TYPE	N/A
LIQUID RECIRCULATION RATE - LITER/S	410. (6500 GPM)
L/G RATIO - L/CU.M	1.7 (13.0 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	2.5 (10.0 IN-H2O)
INLET GAS FLOW - CU. M/S	327.50 (694000 ACFM)
INLET GAS TEMPERATURE - C	107.2 (225 F)
PARTICLE REMOVAL EFFICENCY - %	99.7
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	6
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/COMMON TYPE	CLOSED VANE
CONFIGURATION	HORIZONTAL
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYVINYL CHLORIDE
** REHEATER	
NUMBER	0
GENERIC TYPE	NONE
SPECIFIC TYPE	N/A
TRADE NAME/COMMON TYPE	N/A
CONSTRUCTION MATERIAL GENERIC TYPE	NONE
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A
** FANS	
APPLICATION	INDUCED DRAFT
SERVICE	WET
** 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

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

** DUCTWORK	
LOCATION	OUTLET
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	NR
DEVICE	NR
DEVICE TYPE	NR
** TANKS	
SERVICE	NUMBER
-----	-----
****	****
** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NR
*** SLUDGE	
** TREATMENT	
METHOD	NR
DEVICE	NR
PROPRIETARY PROCESS	NR
** DISPOSAL	
NATURE	FINAL
TYPE	POND
SITE TREATMENT	NONE
** WATER BALANCE	
WATER LOOP TYPE	OPEN
EVAPORATION WATER LOSS - LITER/S	27.1 (430 GPM)
MAKEUP WATER ADDITION - LITERS/S	50.4 (800 GPM)

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

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

4/72 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE STARTUP IN APRIL 1972, THE SCRUBBING UNIT HAS EXPERIENCED MAJOR SCALING PROBLEMS. HARD GYPSUM SCALE ACCUMULATES IN THE SCRUBBER VESSELS AND PIPING. THE USE OF LIME FOR PH CONTROL AND LIGNO SULFONATE TO ALTER THE HARDNESS OF DEPOSITS IMPROVED THE SCALE PROBLEM. FRESH WATER WASHING HAS BEEN REQUIRED TO FLUSH ASH AND SCALE DEPOSITS FROM THE SCRUBBER VESSELS.

SOLIDS BUILDUP HAS OCCURRED AT THE WET-DRY INTERFACE AND IN THE BLEED AND RECYCLE LINES. THE UTILITY IS USING AN ADDITIVE (HEXAMETA PHOSPHATE) IN WHICH THE EFFECTS HAVE YET TO BE DETERMINED.

ADDITIONAL OPERATING PROBLEMS EXPERIENCED SINCE STARTUP INCLUDE EROSION IN THE RECYCLE PUMP AND "SILTING" DURING SHUTDOWN.

THE UTILITY CHARACTERIZED THE AVAILABILITY AS BEING DEPENDENT ON THE AMOUNT OF BLOWDOWN AND FRESH WATER IRRIGATION THAT ARE EMPLOYED.

10/79 SYSTEM

744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

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

		-----PERFORMANCE DATA-----								
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
11/79	SYSTEM							720		
12/79	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR THE FOURTH QUARTER 1979.										
1/80	SYSTEM							744		
2/80	SYSTEM							696		
3/80	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER OF 1980.										
4/80	SYSTEM							720		
5/80	SYSTEM							744		
6/80	SYSTEM							720		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR PROBLEMS OCCURRED DURING THE SECOND QUARTER OF 1980.										
7/80	SYSTEM							744		
8/80	SYSTEM							744		
9/80	SYSTEM							720		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR THE THIRD QUARTER OF 1980.										
10/80	SYSTEM							744		
11/80	SYSTEM							720		
12/80	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
THE UTILITY REPORTED THAT NO MAJOR PROBLEMS WERE ENCOUNTERED WITH THE SCRUBBING OPERATIONS DURING THE OCTOBER THROUGH DECEMBER PERIOD.										
1/81	SYSTEM							744		
2/81	SYSTEM							672		
3/81	SYSTEM							744		
** PROBLEMS/SOLUTIONS/COMMENTS										
NO INFORMATION WAS AVAILABLE FOR THE FIRST QUARTER 1981.										

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PACIFIC POWER & LIGHT
PLANT NAME	JIM BRIDGER
UNIT NUMBER	2
CITY	ROCK SPRINGS
STATE	WYOMING
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	129. (0.300 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2034
GROSS UNIT GENERATING CAPACITY - MW	508
NET UNIT GENERATING CAPACITY W/FGD - MW	500
NET UNIT GENERATING CAPACITY WO/FGD - MW	501
EQUIVALENT SCRUBBED CAPACITY - MW	508
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1283.57 (2720000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	152. (500 FT)
STACK SHELL	NA
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	21632. (9300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	9.00
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	18.00
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.56
RANGE SULFUR CONTENT - %	****
AVERAGE CHLORIDE CONTENT - %	0.01
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** 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	SODIUM CARBONATE
SYSTEM SUPPLIER	BABCOCK & WILCOX
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
ENERGY CONSUMPTION - %	0.2
CURRENT STATUS	1
COMMERCIAL START-UP	9/1986
INITIAL START-UP	6/1986
CONTRACT AWARDED	7/1983

PACIFIC POWER & LIGHT: JIM BRIDGER 2 (CONT.)

** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** ABSORBER	
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
SHELL GENERIC MATERIAL	NA
SHELL SPECIFIC MATERIAL	NA
SHELL MATERIAL TRADE NAME/COMMON TYPE	NA
LINER GENERIC MATERIAL	NA
LINER SPECIFIC MATERIAL	NA
LINER MATERIAL TRADE NAME/COMMON TYPE	NA
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** REHEATER	
GENERIC TYPE	NA
SPECIFIC TYPE	NA
TRADE NAME/COMMON TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
** FANS	
DESIGN	NR
FUNCTION	NA
APPLICATION	NR
SERVICE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
** DAMPERS	
FUNCTION	NA
GENERIC TYPE	NA
SPECIFIC TYPE	NA
CONSTRUCTION MATERIAL GENERIC TYPE	NA
CONSTRUCTION MATERIAL SPECIFIC TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** DUCTWORK	
SHELL GENERIC MATERIAL TYPE	NA
SHELL SPECIFIC MATERIAL TYPE	NA
LINER GENERIC MATERIAL TYPE	NA
LINER SPECIFIC MATERIAL TYPE	NA
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** PUMPS	
SERVICE	NUMBER
-----	-----
NA	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	NR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PACIFIC POWER & LIGHT: JIM BRIDGER 2 (CONT.)

*** SALEABLE BYPRODUCTS
NATURE NONE
DISPOSITION N/A

*** SLUDGE

** TREATMENT
METHOD DEWATERED
DEVICE NA
PROPRIETARY PROCESS NA

** DISPOSAL
NATURE FINAL
TYPE POND
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

6/86 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATION OF THE UNIT 2 FGD SYSTEM
COMMENCED IN JUNE 1986.

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 FOURTH QUARTER THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED
OUTAGES WERE ENCOUNTERED. HOWEVER, MINOR PROBLEMS SUCH AS WET ASH
PRECIPITATION IN THE SPRAY DRYER AND THE STICKING OF THE ESP INLET
LOUVRE DRYER WERE EXPERIENCED.

NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED AFTER STARTUP. FGD
SYSTEM AVAILABILITY WAS REPORTED TO BE APPROXIMATELY GREATER THAN 98
PERCENT.

1/87 SYSTEM 744

2/87 SYSTEM 672

3/87 SYSTEM 744

4/87 SYSTEM 720

5/87 SYSTEM 744

6/87 SYSTEM 720

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PACIFIC POWER & LIGHT: JIM BRIDGER 2 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
7/87	SYSTEM							744		
8/87	SYSTEM							744		
9/87	SYSTEM							720		
10/87	SYSTEM							744		
11/87	SYSTEM							720		
12/87	SYSTEM							744	9999	999.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PACIFIC POWER & LIGHT
PLANT NAME	JIM BRIDGER
UNIT NUMBER	4
CITY	ROCK SPRINGS
STATE	WYOMING
REGULATORY CLASSIFICATION	C
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	2034
GROSS UNIT GENERATING CAPACITY - MW	508
NET UNIT GENERATING CAPACITY W/FGD - MW	500
NET UNIT GENERATING CAPACITY WO/FGD - MW	501
EQUIVALENT SCRUBBED CAPACITY - MW	508
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	COMBUSTION ENGINEERING
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1283.57 (2720000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	***** (**** F)
STACK HEIGHT - M	152. (500 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	21632. (9300 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	9.00
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	18.00
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.56
RANGE SULFUR CONTENT - %	****
AVERAGE CHLORIDE CONTENT - %	0.01
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** ESP	
TYPE	COLD SIDE
SUPPLIER	CARBORUNDUM
INLET FLUE GAS CAPACITY - CU.M/S	1099.9 (2330890 ACFM)
INLET FLUE GAS TEMPERATURE - C	121.1 (250 F)
PARTICLE REMOVAL EFFICIENCY - %	99.0
** 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	SODIUM CARBONATE
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	AIR CORRECTION DIVISION, UOP
A-E FIRM	BECHTEL
DEVELOPMENT LEVEL	FULL SCALE

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.00
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	91.00
ENERGY CONSUMPTION - %	0.2
CURRENT STATUS	1
COMMERCIAL START-UP	2/1980
INITIAL START-UP	9/1979
CONTRACT AWARDED	10/1976
** DESIGN AND OPERATING PARAMETERS	
DESIGN CHLORIDE CONTENT - %	*****
** QUENCHER/PRESATURATOR	
CONSTRUCTION MATERIAL GENERIC TYPE	NR
CONSTRUCTION MATERIAL SPECIFIC TYPE	NR
** ABSORBER	
NUMBER	3
GENERIC TYPE	TRAY TOWER
SPECIFIC TYPE	SIEVE TRAY
TRADE NAME/COMMON TYPE	N/A
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
SHELL MATERIAL TRADE NAME/COMMON TYPE	N/A
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	NATURAL RUBBER
LINER MATERIAL TRADE NAME/COMMON TYPE	BLACK NATURAL RUBBER
GAS CONTACTING DEVICE TYPE	PERFORATED TRAY
NUMBER OF CONTACTING ZONES	1
L/G RATIO - L/CU.M	2.7 (20.0 GAL/1000 ACF)
SO2 REMOVAL EFFICIENCY - %	91.0
** MIST ELIMINATOR	
PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
GENERIC TYPE	NR
SPECIFIC TYPE	NR
TRADE NAME/COMMON TYPE	NR
VANE ANGLES - DEGREES	45
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	N/A
CONSTRUCTION MATERIAL SPECIFIC TYPE	N/A
** 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

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

** REAGENT PREPARATION EQUIPMENT	
FUNCTION	MIX TANK
DEVICE	N/A
DEVICE TYPE	AGITATED TANK
** PUMPS	
SERVICE	NUMBER
-----	-----
ABSORBER RECIRCULATION	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
OUTLET STREAM CHARACTERISTICS	18% SOLIDS
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	DEWATERED
DEVICE	N/A
PROPRIETARY PROCESS	N/A
** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	ON-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	CLAY LINING
SITE SERVICE LIFE - YRS	11
** WATER BALANCE	
WATER LOOP TYPE	CLOSED
** FGD SPARE CAPACITY INDICES	
ABSORBER - %	0.0
** FGD SPARE COMPONENT INDICES	
ABSORBER	0.0

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

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

9/79 SYSTEM

720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT STARTED OPERATIONS AS SCHEDULED IN SEPTEMBER 1979. PRESENTLY THE FGD SYSTEM IS IN THE START UP PHASE WITH COMMERCIAL OPERATION SCHEDULE FOR DECEMBER.

THE UTILITY IS IN THE PROCESS OF CHECKING INTERLOCKS AND OTHER COMPONENTS BUILT INTO THE FGD SYSTEM TO PROTECT THE BOILER. FLUE GAS IS PASSING THROUGH MODULES ON AN INDIVIDUAL BASIS. THE FGD SYSTEM WILL NOT BE OPERATED IN AN INTEGRATED MODE UNTIL LATE OCTOBER.

10/79 SYSTEM

744

11/79 SYSTEM

720

12/79 SYSTEM

744

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

** PROBLEMS/SOLUTIONS/COMMENTS

SHAKEDOWN OPERATIONS CONTINUED THROUGHOUT THE FOURTH QUARTER OF 1979.

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT IS STILL IN THE SHAKEDOWN PHASE OF OPERATIONS. A NUMBER OF MECHANICAL PROBLEMS AND SOME CONTROL PROBLEMS HAVE BEEN ENCOUNTERED. NO PROCESS-RELATED PROBLEMS HAVE OCCURRED.

4/80	41	27.5	18.4	22.3	14.2			
	42	24.0	23.9	26.3	18.4			
	43	26.6	34.0	34.2	26.1			
	SYSTEM	26.0	25.4	27.6	19.6	720	553	141

** PROBLEMS/SOLUTIONS/COMMENTS

ALL THREE MODULES WERE OUT OF SERVICE THE FIRST 21 DAYS OF APRIL WHILE THE UTILITY WAITED FOR DELIVERY OF NEW SPRAY NOZZLES. SOME PLUGGING HAD OCCURRED IN THE ORIGINAL NOZZLES. THE NEW NOZZLES WERE INSTALLED FOR TESTING PURPOSES.

5/80	41	95.2	46.0	92.6	42.9			
	42	72.4	75.1	71.7	70.1			
	43	100.0	81.6	100.0	76.1			
	SYSTEM	89.2	67.6	88.1	63.0	744	694	469

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 42 WAS FORCED OUT OF SERVICE FOR EIGHT DAYS IN MAY WHILE A VORTEX BREAKER WAS INSTALLED IN THE ABSORBER VESSEL. THE VESSEL WAS DRAINING BEFORE REACHING DESIGN FLUID LEVELS.

VORTEX BREAKERS WERE INSTALLED IN MODULES 41 AND 43 AS WELL BUT INSTALLATION IN THESE MODULES WAS NOT UNDERTAKEN DURING PERIODS WHEN MODULE SERVICE WAS REQUIRED.

6/80	41	81.2	77.7	66.5	30.9			
	42	89.2	100.0	85.1	43.2			
	43	86.0	75.0	73.6	29.8			
	SYSTEM	85.5	87.1	75.4	34.6	744	296	258

** PROBLEMS/SOLUTIONS/COMMENTS

THE FGD SYSTEM WAS DOWN FOR 5 DAYS TO REPAIR A RECIRCULATION PUMP BREAKER ON MODULE 41.

MODULES 41 AND 42 WERE UNAVAILABLE FOR A COMBINED TOTAL OF 6 DAYS DUE TO THE REPLACING OF THE PH CONTROL PIPING.

7/80	41	97.3	67.2	96.0	64.8			
	42	97.4	91.2	97.1	87.8			
	43	99.4	90.2	99.3	86.9			
	SYSTEM	98.0	82.9	97.6	79.8	744	717	594

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

-----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 PROBLEMS WERE ENCOUNTERED IN JULY.

8/80	41	99.7	92.8	99.7	86.1			
	42	94.1	92.3	93.6	85.6			
	43	94.7	68.4	92.4	63.5			
	SYSTEM	96.2	84.5	95.2	78.4	744	690	583

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF AUGUST.

9/80	SYSTEM			0.0		720	0	0
10/80	SYSTEM			0.0		744	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER AND FGD SYSTEM WERE OUT OF SERVICE DURING THE MONTHS OF SEPTEMBER AND OCTOBER FOR THE ANNUAL BOILER OUTAGE.

11/80	SYSTEM					720		

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR NOVEMBER 1980.

12/80	41	100.0	85.9	100.0	77.2			
	42	91.7	74.6	88.9	66.9			
	43	93.0	71.6	90.4	64.2			
	SYSTEM	94.9	77.4	93.1	69.4	744	668	517

** PROBLEMS/SOLUTIONS/COMMENTS

SCALING PROBLEMS WERE ENCOUNTERED DURING DECEMBER. NO OTHER MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR THE MONTH.

1/81	SYSTEM					744	695	

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTH OF JANUARY WAS NOT AVAILABLE.

2/81	41	93.3	83.8	93.7	82.4			
	42	83.9	82.1	88.0	80.8			
	43	31.5	23.6	27.3	23.2			
	SYSTEM	69.6	63.2	69.7	62.1	672	661	417

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 43 WAS DOWN FOR APPROXIMATELY 11 DAYS DURING FEBRUARY FOR INSTALLATION OF A NEW PRESATURATOR AND RECYCLE NOZZLES.

3/81	41	85.3	81.0	83.4	73.4			
	42	70.6	70.6	68.5	64.0			
	43	49.5	42.1	43.0	38.2			
	SYSTEM	68.5	64.6	65.0	58.5	744	674	435

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING MARCH, PROBLEMS WERE ENCOUNTERED WITH FLOW METERS AND THERE WAS A LACK OF SPARE PARTS NECESSARY FOR FGD SYSTEM OPERATION.

4/81	41	3.3	1.2	1.1	1.1			
	42	90.8	88.6	89.0	82.4			
	43	100.0	93.4	99.7	86.9			
	SYSTEM	62.5	61.1	63.3	56.8	720	669	409

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 41 EXPERIENCED LOW AVAILABILITY DURING APRIL AS A RESULT OF FAILURE OF THE MAG FLOW METER.

5/81	41	100.0	76.1	100.0	59.1			
	42	0.0	0.0	0.0	0.0			
	43	100.0	98.8	100.0	76.7			
	SYSTEM	66.7	58.3	66.7	45.3	744	578	337

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE 42 WAS UNAVAILABLE DURING MAY DUE TO FAILURE OF THE MAG FLOW METER.

6/81	41	100.0	99.1	99.1	95.1			
	42	100.0	0.0		0.0			
	43	100.0	98.9	100.0	95.0			
	SYSTEM	100.0	66.0	99.6	63.4	720	691	456

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FOR THE MONTH OF JUNE. MODULE 42 WAS NOT IN SERVICE AS A RESULT OF LOW UNIT DEMAND.

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		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART. HOURS	PER BOILER HOURS	FGD HOURS	CAP. FACTOR
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 JULY 1981 THROUGH MARCH 1983									
4/83	SYSTEM						720		
5/83	SYSTEM						744		
6/83	SYSTEM						720		
** PROBLEMS/SOLUTIONS/COMMENTS									
INFORMATION WAS UNAVAILABLE FOR THE PERIOD OF JULY 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.									
10/83	SYSTEM						744		
11/83	SYSTEM						720		
12/83	SYSTEM						744		
** PROBLEMS/SOLUTIONS/COMMENTS									
THE UTILITY REPORTED THAT THE FGD SYSTEM WAS DOWN 3 HOURS DURING THE FOURTH QUARTER DUE TO LOW PH IN ABSORBER MODULES 43 AND 44.									
THE FGD SYSTEM WAS DOWN 2 HOURS DURING THE FOURTH QUARTER DUE TO SODA LIQUOR MAKEUP FLOW PROBLEMS AT MODULE 43.									
A 4 HOUR FGD SYSTEM OUTAGE OCCURRED DURING THE FOURTH QUARTER DUE TO THE REPAIR OF LEAKS.									
TOTAL FGD SYSTEM OPERATING TIME DURING THE FOURTH QUARTER WAS REPORTED TO BE 2199 HOURS.									
1/84	SYSTEM						744		
2/84	SYSTEM						696		
3/84	SYSTEM						744		
4/84	SYSTEM						720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
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 NO MAJOR FGD-RELATED PROBLEMS AROSE 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 NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FOURTH QUARTER OF 1984. A UNIT OUTAGE IS SCHEDULED FOR THE END OF MARCH.											
1/85	SYSTEM								744		
2/85	SYSTEM								672		
3/85	SYSTEM								744		
4/85	SYSTEM								720		
5/85	SYSTEM								744		
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING THE MONTHS OF JANUARY THROUGH MAY 1985. THE UNIT WAS DOWN THE END OF APRIL AND ALL OF MAY FOR A SIX WEEK SCHEDULED BOILER/TURBINE MAINTENANCE OUTAGE.											
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 REPORT THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED (WITH THE EXCEPTION OF A 1 WEEK CLEANING OUTAGE IN NOVEMBER) DURING THE MONTHS OF JUNE THROUGH DECEMBER 1985.											

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PACIFIC POWER & LIGHT: JIM BRIDGER 4 (CONT.)

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

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED OUTAGES WERE ENCOUNTERED DURING 1986. HOWEVER, A FEW CAUSES OF SCALE BUILDUP ON THE TRAYS WERE REPORTED.

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	9999		999.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PACIFIC POWER & LIGHT
PLANT NAME	WYODAK
UNIT NUMBER	1
CITY	JOLIET
STATE	WYOMING
REGULATORY CLASSIFICATION	A
PARTICULATE EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	215. (0.500 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	301. (0.700 LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	*****
GROSS UNIT GENERATING CAPACITY - MW	320
NET UNIT GENERATING CAPACITY W/FGD - MW	315
NET UNIT GENERATING CAPACITY WO/FGD - MW	323
EQUIVALENT SCRUBBED CAPACITY - MW	320
*** 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	122. (400 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	***** (***** FT)
*** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	SUBBITUMINOUS
AVERAGE HEAT CONTENT - J/G	***** (***** BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	*****
RANGE ASH CONTENT - %	****
AVERAGE MOISTURE CONTENT - %	*****
RANGE MOISTURE CONTENT - %	****
AVERAGE SULFUR CONTENT - %	0.55
RANGE SULFUR CONTENT - %	0.26 - 0.70
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** FABRIC FILTER	
NUMBER	0
TYPE	N/A
SUPPLIER	N/A
** ESP	
NUMBER	1
NUMBER OF SPARES	0
TYPE	COLD SIDE
SUPPLIER	BABCOCK & WILCOX
INLET FLUE GAS TEMPERATURE - C	71.1 (160 F)
*** FGD SYSTEM	
** GENERAL DATA	
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	SPRAY DRYING
PROCESS TYPE	LIME/SPRAY DRYING
PROCESS ADDITIVES	NONE
SYSTEM SUPPLIER	JOY MFG/NIRO ATOMIZER
A-E FIRM	STONE & WEBSTER
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	RETROFIT
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	0.75
ENERGY CONSUMPTION - %	2.5
CURRENT STATUS	1
COMMERCIAL START-UP	12/1986
INITIAL START-UP	9/1986

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PACIFIC POWER & LIGHT: WYODAK 1 (CONT.)

CONTRACT AWARDED	1/1984	
** DESIGN AND OPERATING PARAMETERS		
DESIGN CHLORIDE CONTENT - %	*****	
** ABSORBER		
NUMBER	3	
DIMENSIONS - FT	49X39	
INLET GAS FLOW - CU. M/S	1066.49	(2260000 ACFM)
INLET GAS TEMPERATURE - C	182.2	(360 F)
** REHEATER		
GENERIC TYPE	BYPASS	
SPECIFIC TYPE	HOT SIDE	
PERCENT GAS BYPASSED - AVG	0.5	
** DAMPERS		
GENERIC TYPE	LOUVER	
** DAMPERS		
GENERIC TYPE	GUILLOTINE	
** REAGENT PREPARATION EQUIPMENT		
FUNCTION	SLAKER	
DEVICE	BALL MILL	
DEVICE TYPE	NR	
NUMBER	2	
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	6.4	(7 TPH)
*** SALEABLE BYPRODUCTS		
*** SLUDGE		
** DISPOSAL		
NATURE	FINAL	
TYPE	LANDFILL	
LOCATION	ON-SITE	
** 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

9/86 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY ANNOUNCED THAT INITIAL OPERATION OF THE WYODAK 1 FGD SYSTEM COMMENCED IN SEPTEMBER 1986.

10/86 SYSTEM 774

11/86 SYSTEM 720

12/86 SYSTEM 774

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED EXPERIENCING ESP ASH HANDLING PROBLEMS. MOIST FLYASH

1/87 SYSTEM 744

2/87 SYSTEM 672

PACIFIC POWER & LIGHT: WYODAK 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER BOILER HOURS HOURS	FGD HOURS	CAP. FACTOR
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	9999	999.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PENNSYLVANIA POWER
PLANT NAME	BRUCE MANSFIELD
UNIT NUMBER	1
CITY	SHIPPINGPORT
STATE	PENNSYLVANIA
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	15. (0.035 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258. (0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2360
GROSS UNIT GENERATING CAPACITY - MW	835
NET UNIT GENERATING CAPACITY W/FGD - MW	780
NET UNIT GENERATING CAPACITY WO/FGD - MW	815
EQUIVALENT SCRUBBED CAPACITY - MW	835
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	FOSTER WHEELER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1580.86 (3350000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6 (285 F)
STACK HEIGHT - M	290. (950 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	5.9 (19.2 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	27912. (12000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	*****
AVERAGE ASH CONTENT - %	12.80
RANGE ASH CONTENT - %	8.0-15.0
AVERAGE MOISTURE CONTENT - %	7.00
RANGE MOISTURE CONTENT - %	5.5-8.5
AVERAGE SULFUR CONTENT - %	3.50
RANGE SULFUR CONTENT - %	3.0-4.0
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	****
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	0
TYPE	NONE
** PARTICLE SCRUBBER	
NUMBER	6
NUMBER OF SPARES	0
INITIAL START-UP DATE	12/1975
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	FIXED-THROAT/TOP-ENTRY PLUMB BOB
TRADE NAME/COMMON NAME	N/A
SUPPLIER	GE ENVIRONMENTAL SERVICES
DIMENSIONS - FT	35.5 DIA X 52.0
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	1258.2 (19971 GPM)
L/G RATIO - LITER/CU.M	4.8 (35.8 GAL/1000ACF)
PH CONTROL ADDITIVE	THIOSORBIC LIME
PRESSURE DROP - KPA	4.7 (19.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0 (200.0 FT/S)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

INLET GAS FLOW RATE - CU.M/S	263.3	(558000 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICIENCY - %	70.0	
PARTICLE REMOVAL EFFICIENCY - %	99.8	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	92.10
ENERGY CONSUMPTION - %	4.2
CURRENT STATUS	1
COMMERCIAL START-UP	6/1976
INITIAL START-UP	12/1975
CONTRACT AWARDED	10/1974

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.70	
DESIGN COAL HEAT CONTENT - J/G	27679.4	(11900 BTU/LB)
DESIGN COAL ASH CONTENT - %	19.70	
DESIGN CHLORIDE CONTENT - %	*****	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	214.0	

** QUENCHER/PRESATURATOR
NUMBER

0

** ABSORBER

NUMBER	6	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
TRADE NAME/COMMON TYPE	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
DIMENSIONS - FT	34.0 DIA X 51.5	
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	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/COMMON TYPE	RIGIFLAK 4850	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1112.	(17650 GPM)
L/G RATIO - L/CU.M	5.5	(41.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	30.5	(100.0 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	52.8	(127 F)
SO2 REMOVAL EFFICIENCY - %	92.1	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR	
NUMBER PER SYSTEM	6	
NUMBER OF SPARES PER SYSTEM	0	
NUMBER PER MODULE	1	
GENERIC TYPE	IMPINGEMENT	
SPECIFIC TYPE	BAFFLE	
TRADE NAME/COMMON TYPE	CLOSED VANE	
MANUFACTURER	HEIL PROCESS EQUIPMENT	
CONFIGURATION	HORIZONTAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	4	
DISTANCE BETWEEN VANES - CM	7.6	(3.00 IN)

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

VANE ANGLES - DEGREES	90
PRESSURE DROP - KPA	0.1 (0.6 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	THICKENER OVERFLOW
WASH FREQUENCY	ONCE EVERY 12 MINUTES
WASH RATE - L/S	3.8 (60 GAL/MIN)
** FANS	
NUMBER	6
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	GREEN FUEL ECONOMIZER
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	WET
FLUE GAS FLOW RATE - CU.M/S	263.32 (558000 ACFM)
FLUE GAS TEMPERATURE - C	47.8 (118 F)
PRESSURE DROP - KPA	18.9 (62.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL;; HIGH ALLOY; HIGH ALLOY; HIGH ALLOY
** DAMPERS	
NUMBER	6
FUNCTION	SHUT-OFF
GENERIC TYPE	BUTTERFLY
SPECIFIC TYPE	N/A
MANUFACTURER	MOSSER
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	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	6
FUNCTION	NONE
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
MANUFACTURER	MOSSER
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	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DAMPERS	
NUMBER	6
FUNCTION	CONTROL
GENERIC TYPE	LOUVER
SPECIFIC TYPE	NR
MANUFACTURER	GREEN FAN
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	NONE
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	OUTLET TO INOPERABLE REHEATER
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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

** DUCTWORK	
LOCATION	OUTLET FROM INOPERABLE REHEATER
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	DETENTION
DEVICE TYPE	N/A
MANUFACTURER	DORR-OLIVER
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	20.0 (22 TPH)
PRODUCT QUALITY - % SOLIDS	13.5
** TANKS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECYCLE	6
ABSORBER RECYCLE	6
THICKENER OVERFLOW	1
CALCILOX ADDITION 'MIX!	3
SLAKER TANK	2
SLURRY STORAGE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
VENTURI RECIRCULATION	12
SLURRY FEED	4
LIME SLURRY RECIRCULATION	4
ABSORBER RECIRCULATION	12
THICKENER UNDERFLOW	4
THICKENER CLEAR WATER TRANSFER	4
SLUDGE	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	200.0 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 'WALLS!; MAT-REINFO
FEED STREAM SOURCE	PARTICLE SCRUBBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS
OUTLET STREAM DISPOSITION	SLUDGE TREATMENT
OVERFLOW STREAM DISPOSITION	PARTICLE SCRUBBER RECYCLE LOOP
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	MIX TANK
PROPRIETARY PROCESS	DRAVO 'CALCILOX!
INLET QUALITY - %	30.0

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

** DISPOSAL
 NATURE FINAL
 TYPE POND
 LOCATION OFF-SITE
 SITE TRANSPORTATION METHOD PIPELINE
 SITE TREATMENT NONE
 SITE DIMENSIONS 1300-1400 ACRES
 SITE CAPACITY - CU.M 59926992 (49000.0 ACRE-FT)
 SITE SERVICE LIFE - YRS 25

** PROCESS CONTROL AND INSTRUMENTATION
 PROCESS STREAM INLET SLURRY TO SCRUBBER & ABSORBER
 CHEMICAL PARAMETERS PH
 CONTROL LEVELS PH 7
 MONITOR TYPE UNILOCK
 MONITOR LOCATION SPRAY HEADERS
 PROCESS CONTROL MANNER AUTOMATIC
 PROCESS CHEMISTRY MODE FEEDBACK

** WATER BALANCE
 WATER LOOP TYPE OPEN
 RECEIVING WATER STREAM OHIO RIVER

** CHEMICALS AND CONSUMPTION
 FUNCTION ABSORBENT
 NAME THIOSORBIC LIME
 PRINCIPAL CONSTITUENT 90% CAO MIN., 2-6% MGO, MAX. 4% ACID INSOLUBLES
 SOURCE/SUPPLIER DRAVO
 UTILIZATION - % 84.0
 POINT OF ADDITION SLAKER

** FGD SPARE CAPACITY INDICES
 SCRUBBER - % 0.0
 ABSORBER - % 0.0
 MIST ELIMINATOR - % 0.0
 FAN - % 0.0
 THICKENER - % 0.0

** FGD SPARE COMPONENT INDICES
 SCRUBBER 0.0
 ABSORBER 0.0
 MIST ELIMINATOR 0.0
 FAN 0.0
 THICKENER 0.0

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

12/75 SYSTEM

744

** PROBLEMS/SOLUTIONS/COMMENTS

INITIAL OPERATION (SHAKEDOWN AND DEBUGGING) FOR PART OF THE SYSTEM COMMENCED IN DECEMBER 1975.

0/76 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

SINCE THE UNIT COMMENCED SCRUBBING OPERATIONS A NUMBER OF PROBLEM AREAS HAVE BEEN ENCOUNTERED. MAJOR AREAS OF CONCERN ARE SPECIFIED BELOW:

1. EXCESSIVE MAINTENANCE PROBLEMS WITH THE WET ID FAN HOUSINGS.
2. EXCESSIVE WATER ENTRAINMENT AND CARRY OVER OUT OF THE STACK CAUSING A STACK RAIN PROBLEM.
3. REHEAT BURNER PROBLEMS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

4. STACK FLUE LINER FAILURES.

1/76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT SHUT DOWN FOR ONE WEEK DUE TO PLUGGED MIST ELIMINATORS.

AN ID FAN HOUSING VIBRATION CAUSED PART OF THE ONE WEEK OUTAGE, ALONG WITH THE MIST ELIMINATOR PROBLEMS.

2/76 SYSTEM 696

3/76 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

FIRST ATTEMPTS AT STARTING UP THE REHEAT BURNERS WERE MADE THIS MONTH. SO MANY PROBLEMS WERE ENCOUNTERED THAT THE SYSTEM SUPPLIER IS GOING TO REDESIGN NEW REHEAT BURNERS.

4/76 SYSTEM 720 506

** PROBLEMS/SOLUTIONS/COMMENTS

THE INSTALLATION BEGAN PARTIAL COMMERCIAL OPERATION ON APRIL 5.

TOTAL OPERATING HOURS ACCUMULATED TO DATE ARE AS FOLLOWS: 0, 210, 984, 2147, 2808, AND 2427 FOR MODULES A THROUGH F RESPECTIVELY. THE SCRUBBING SYSTEM IS CURRENTLY HANDLING FLUE GAS AT A TOTAL EQUIVALENT CAPACITY OF APPROXIMATELY 640 MW (GROSS).

5/76	A		35.1		28.1			
	B		100.0		81.3			
	C		99.5		79.6			
	D		82.7		66.1			
	E		100.0		83.6			
	F		82.9		66.3			
	SYSTEM	80.0	83.4		67.5	744	595	502

** PROBLEMS/SOLUTIONS/COMMENTS

THE LAST SCRUBBER TRAIN WAS PLACED IN SERVICE DURING THE MONTH. DURING OFF PEAK HOURS ON THE WEEKENDS WHEN THE UNIT IS OPERATING AT REDUCED LOADS, MAINTENANCE IS PERFORMED ON THE SHUT DOWN FGD MODULES SO THAT THEY WILL BE IN OPERATING CONDITION FOR FULL LOAD OPERATION DURING THE HIGH DEMAND.

6/76	A		99.2		99.2			
	B		94.4		94.4			
	C		97.4		97.4			
	D		93.6		93.6			
	E		97.9		97.9			
	F		79.6		79.6			
	SYSTEM	100.0	93.7		93.7	720	720	675

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS DECLARED COMMERCIALY AVAILABLE FOR FULL LOAD OPERATION AT 825 MW (NET) ON JUNE 1, 1976. OVER THE PERIOD A REVISED SCRUBBER BAFFLE SYSTEM WAS INSTALLED IN AN EFFORT TO CORRECT SCRUBBER RECYCLE PUMP CAVITATION PROBLEMS.

7/76 A 79.8 72.2

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B		87.7		79.3					
	C		90.0		81.5					
	D		94.7		85.6					
	E		98.4		88.9					
	F		98.2		88.8					
	SYSTEM	90.0	91.5		82.7		744	673	615	

** PROBLEMS/SOLUTIONS/COMMENTS

THE SYSTEM SUPPLIER IS STILL TRYING TO SOLVE THE REHEAT BURNER PROBLEMS.

TESTS CONDUCTED THIS MONTH SHOWED THAT THE FGD SYSTEM MIST ELIMINATORS ARE NOT PERFORMING TO DESIGN AND THAT THERE IS EXCESSIVE WATER ENTRAINMENT IN THE CLEANED FLUE GASES CAUSING A STACK RAIN PROBLEM. CHEMICO IS WORKING ON THE DESIGN OF ADDITIONAL MIST ELIMINATORS THAT WILL REMOVE THIS EXCESS WATER.

8/76	A		95.3		90.3					
	B		87.9		83.3					
	C		92.6		87.8					
	D		75.9		71.9					
	E		70.9		67.2					
	F		94.8		89.8					
	SYSTEM	95.0	86.2		81.7		744	705	608	

** PROBLEMS/SOLUTIONS/COMMENTS

SECONDARY VERTICAL MIST ELIMINATORS WERE INSTALLED IN THE ABSORBER DISCHARGE DUCT IN AN ATTEMPT TO REDUCE THE EXCESSIVE ENTRAINMENT WATER. THEY DID NOT WORK BECAUSE THE FLUE GAS BLEW THEM APART IN A FEW MINUTES OF OPERATION.

9/76	A		98.3		98.3					
	B		85.7		85.7					
	C		96.3		96.3					
	D		96.5		96.5					
	E		82.8		82.8					
	F		64.4		64.4					
	SYSTEM	100.0	87.3		87.3		720	720	629	

10/76	A		96.1		95.4					
	B		74.3		73.8					
	C		85.4		84.8					
	D		83.8		83.2					
	E		93.5		92.9					
	F		93.5		92.9					
	SYSTEM	99.0	87.8		87.2		744	739	649	

11/76	A		97.5		37.5					
	B		100.0		38.6					
	C		100.0		39.2					
	D		40.8		15.7					
	E		57.4		22.1					
	F		88.8		34.2					
	SYSTEM	38.0	80.8		31.2		720	277	225	

** PROBLEMS/SOLUTIONS/COMMENTS

A THREE WEEK OUTAGE OCCURRED DUE TO A FURNACE IMPLOSION.

DURING THE OUTAGE SCALE THROUGHOUT THE FGD SYSTEM WAS REMOVED.

DURING THE THREE WEEK OUTAGE THE UNIT 1 CHIMNEY FLUES WERE INSPECTED. THE A-SIDE FLUE POLYESTER LINING MATERIAL WAS FLAKING OFF AND ACID ATTACK WAS

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

STARTING TO CORRODE THE CARBON STEEL FLUE. THE LINING SUPPLIER IS INVESTIGATING THE PROBLEM.

DURING THE OUTAGE THE PLUGGED MIST ELIMINATORS WERE CLEANED.

12/76	A		80.9		78.5			
	B		100.0		97.5			
	C		94.7		91.9			
	D		60.0		58.2			
	E		86.1		83.6			
	F		86.7		84.1			
	SYSTEM	100.0	84.7		82.3	744	722	612
1/77	A	95.0	98.0		89.0			
	B	92.0	91.0		82.0			
	C	77.0	74.0		68.0			
	D	95.0	98.0		89.0			
	E	92.0	93.0		84.0			
	F	91.0	91.0		83.0			
	SYSTEM	90.3	90.8		82.5	744	675	614

** PROBLEMS/SOLUTIONS/COMMENTS

SEVERE WINTER WEATHER MADE OPERATION OF THE OUTDOOR FGD SYSTEM VERY DIFFICULT AND AFFECTED THE RELIABILITY OF THE UNIT.

DURING THE FIRST PART OF THE MONTH THE THICKENER RAKE MECHANISM JAMMED AND COULD NOT BE REPAIRED. THE THICKENER WAS OPERATED FOR APPROXIMATELY THREE WEEKS WITH THE RAKE STOPPED UNTIL THE UNIT 2 THICKENER COULD BE PUT INTO EMERGENCY SERVICE.

2/77	A	77.0	81.0		65.0			
	B	69.0	70.0		56.0			
	C	77.0	81.0		65.0			
	D	86.0	96.0		77.0			
	E	92.0	100.0		81.0			
	F	81.0	84.0		67.0			
	SYSTEM	80.3	85.3		68.5	672	540	460

** PROBLEMS/SOLUTIONS/COMMENTS

A SECOND SET OF VERTICAL SECONDARY MIST ELIMINATORS WAS INSTALLED IN THE ABSORBER DISCHARGE DUCT BUT THE FLUE GAS BLEW THEM OUT BEFORE THEIR EFFICIENCY FOR REMOVING ENTRAINED WATER IN THE FLUE GAS COULD BE TESTED.

3/77	A	99.0	98.0		34.8			
	B	100.0	100.0		35.5			
	C	58.0	58.0		20.4			
	D	95.0	95.0		33.9			
	E	97.0	97.0		34.5			
	F	80.0	77.0		27.2			
	SYSTEM	88.2	87.5		31.1	744	264	231

** PROBLEMS/SOLUTIONS/COMMENTS

AT MIDNIGHT ON MARCH 12, THE UNIT WAS SHUT DOWN FOR A 10-WEEK TURBINE OVERHAUL OUTAGE.

DURING THE MARCH OUTAGE REPAIRS WERE STARTED ON THE A-SIDE CHIMNEY FLUE WHICH WILL NOT BE COMPLETED UNTIL THE END OF AUGUST. AN INSPECTION OF THE B-SIDE CHIMNEY FLUE SHOWED THE SAME TYPE OF REPAIRS WOULD BE NEEDED, BUT WORK WILL NOT START ON THE B-SIDE UNTIL THE A-SIDE FLUE HAS BEEN REPAIRED BECAUSE OF THESE REPAIRS THE UNIT WILL BE OPERATING AT APPROXIMATELY HALF LOAD FOR ROUGHLY ONE YEAR.

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

BECAUSE OF THE EXCESSIVE MAINTENANCE REQUIRED ON THE RUBBER LINED CARBON STEEL ID FAN HOUSINGS FROM PIECES OF SCRUBBER SCALE DAMAGING THE LINING AND CORROSION OF THE CARBON STEEL, INCONEL PLATE WILL BE INSTALLED ON THE SCROLL AREA OF EACH OF THE SIX FANS DURING THE OUTAGE.

A NEWLY DESIGNED SECONDARY VERTICAL MIST ELIMINATOR WILL BE INSTALLED IN THE ABSORBER DISCHARGE DUCT OF ONE OF THE SCRUBBER MODULES DURING THE OUTAGE.

DURING THE OUTAGE ALL SCRUBBING VESSELS, DUCTS, PIPING AND MIST ELIMINATORS WILL BE CLEANED AND ALL THE SCALE REMOVED.

DURING OPERATION OF THE FGD SYSTEM THE PH CONTROL COULD NOT BE AUTOMATED BECAUSE OF POOR DESIGN AND OPERATIONAL PROBLEMS WITH THE PROVIDED CONTROL SYSTEM. PH CONTROL WAS MANUALLY SAMPLED AND CONTROLLED OVER APPROXIMATELY ONE YEAR OF OPERATION. THE PH CONTROL AND MONITORING SYSTEM ARE BEING REVISED BY OPERATING PERSONNEL DURING THE OUTAGE IN AN EFFORT TO IMPROVE THE PH CONTROL SYSTEM.

THE LIME ADDITION PIPING IS BEING REVISED IN EACH OF THE SCRUBBER VESSELS DUE TO THE SEVERE SCALING OCCURRING WITH THE CURRENT LIME ADDITION SYSTEM.

THE SYSTEM SUPPLIER IS REDESIGNING THE EXISTING MIST ELIMINATOR SPRAY PIPING IN AN EFFORT TO CORRECT THE EXCESSIVE SCALING AND PLUGGING OF THE MIST ELIMINATORS.

CHANGES IN FLUSH WATER AND SEAL WATER PIPING ARE BEING MADE IN AN EFFORT TO CLOSE THE WATER LOOP.

NEWLY MODIFIED REHEAT BURNERS WILL BE INSTALLED DURING THE OUTAGE AND TESTED ON THE B-SIDE REHEATER WHEN THE UNIT STARTS UP IN MAY.

THE UNIT 1 THICKENER WAS CLEANED OUT AND THE JAMMED RAKE DRIVE MECHANISM WAS REPAIRED DURING THE OUTAGE.

4/77	SYSTEM			0.0		720	0	0	0.0
5/77	A	0.0	0.0	0.0					
	B	0.0	0.0	0.0					
	C	0.0	0.0	0.0					
	D	100.0	84.0	13.7					
	E	100.0	84.8	13.8					
	F	47.2	41.2	6.7					
	SYSTEM	41.2	35.0	5.7		744	121	42	

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS STARTED UP ON MAY 23 USING D, E, AND F MODULES DUE TO REPAIR BEING MADE TO THE A-SIDE CHIMNEY FLUE.

THERE WERE PROBLEMS SLAKING LIME AND GETTING MAGNESIUM LEVELS BUILT UP IN THE SCRUBBER RECYCLE LOOPS AFTER STARTUP.

6/77	A	0.0	0.0	0.0					
	B	0.0	0.0	0.0					
	C	0.0	0.0	0.0					
	D	94.0	100.0	94.0					
	E	95.0	100.0	95.1					
	F	90.0	97.0	90.0					
	SYSTEM	46.5	49.5	46.5		720	669	335	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

HORIZONTAL MIST ELIMINATOR PRESSURE DROPS INCREASED TO THE POINT THAT NEW MIST ELIMINATORS HAD TO BE INSTALLED IN JUNE ON THE D, E AND F SCRUBBERS AND THE D AND E ABSORBERS.

7/77	A	0.0	0.0	0.0					
	B	0.0	0.0	0.0					
	C	0.0	0.0	0.0					
	D	99.0	100.0	66.0					
	E	99.0	100.0	66.0					
	F	100.0	100.0	63.0					
	SYSTEM	49.7	50.0	32.5			744	473	242

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM JULY 1 THROUGH JULY 12 TO MAKE SOME MODIFICATIONS TO THE GENERATOR COOLING SYSTEM. ON JULY 19 AND 20 THE PENNSYLVANIA DEPARTMENT OF ENVIRONMENTAL RESOURCES TESTED THE SO2 AND PARTICLE EMISSIONS FROM THE UNIT 1 FGD SYSTEM. SO2 EMISSIONS WERE 0.44 LB/MM BTU AND 1.26 LB/MM BTU FOR THE TWO TESTS RESPECTIVELY. FGD SO2 REMOVAL EFFICIENCY VARIED FROM 78% TO 89% FOR THE MONTH.

8/77	A	55.0	57.0	52.0					
	B	53.0	56.0	50.0					
	C	31.0	31.0	28.0					
	D	96.0	100.0	93.0					
	E	95.0	100.0	93.0					
	F	88.0	95.0	85.0					
	SYSTEM	69.7	73.2	66.8			744	692	497

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 WAS DOWN FROM AUGUST 13 TO 15 BECAUSE OF BOILER TUBE LEAKS.

ON AUGUST 16 THE 1A CHIMNEY FLUE LINER REPAIRS WERE COMPLETED AND THE A, B AND C TRAINS WERE STARTED UP.

SEVERAL REPAIRS WERE MADE TO THE ID FAN HOUSING THIS MONTH.

THE AVERAGE SO2 REMOVAL EFFICIENCY FOR THE MONTH WAS 86.7% BASED ON THREE GRAB SAMPLES.

YORK RESEARCH BEGAN SETTING UP EQUIPMENT TO CONTINUOUSLY MONITOR THE SO2 REMOVAL EFFICIENCIES AS PART OF AN EPA RESEARCH PROJECT TO DETERMINE FEASIBLE NSPS FOR FGD.

EXTENSIVE MODIFICATIONS ARE BEING MADE IN THE PH CONTROL SYSTEMS IN AN EFFORT TO DEVISE A WORKABLE PH CONTROL SYSTEM.

9/77	A	84.0	97.0	75.0					
	B	82.0	95.0	73.0					
	C	81.0	98.0	76.0					
	D	53.0	60.0	46.0					
	E	50.0	56.0	44.0					
	F	43.0	44.0	34.0					
	SYSTEM	65.5	75.0	58.0			720	558	418

** PROBLEMS/SOLUTIONS/COMMENTS

FROM SEPTEMBER 17 TO 22 THE UNIT WAS DOWN TO INSTALL RIGGING IN THE 1B CHIMNEY FLUE TO BEGIN FLUE LINER REPAIRS. D, E AND F TRAINS WERE OFF THE REMAINDER OF THE MONTH.

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

THE AVERAGE SO2 REMOVAL EFFICIENCIES FOR THE MONTH WERE 93.2% BASED ON FOUR GRAB SAMPLE TESTS.

A BOILER TUBE LEAK CAUSED THE UNIT TO BE DOWN SEPTEMBER 10 TO 12.

10/77	A	93.0	96.0	93.0			
	B	98.0	100.0	98.0			
	C	87.0	90.0	87.0			
	D	0.0	0.0	0.0			
	E	0.0	0.0	0.0			
	F	0.0	0.0	0.0			
	SYSTEM	46.3	47.7	46.3	744	720	344

** PROBLEMS/SOLUTIONS/COMMENTS

THE C-MODULE MIST ELIMINATOR SPRAY NOZZLES AND MIST ELIMINATOR ITSELF WERE CLEANED.

ABS STACK REPAIRS ON UNIT 2 NECESSITATED TAKING UNIT 1 DOWN FOR TWO DAYS. (A PROTECTIVE CAP HAD TO BE PUT OVER THE 2B FLUE BY HELICOPTER. PREVAILING WINDS NECESSITATED TAKING UNIT 1 OFF IN ORDER TO DO THIS.)

11/77	A	95.0	95.0	95.0			
	B	99.0	99.0	99.0			
	C	91.0	91.0	91.0			
	D	0.0	0.0	0.0			
	E	0.0	0.0	0.0			
	F	0.0	0.0	0.0			
	SYSTEM	47.5	47.5	47.5	720	720	342

** PROBLEMS/SOLUTIONS/COMMENTS

REMOVAL OF THE OLD COATING AND PRIMING OF THE FLUE LINING IN FLUE 1B IS PROCEEDING SLOWER THAN ANTICIPATED. IT IS EXPECTED THAT TOTAL WORK ON THE FLUE WILL NOT BE COMPLETED UNTIL FEBRUARY OR MARCH 1978.

12/77	A	100.0	100.0	91.0			
	B	93.0	94.0	79.0			
	C	99.0	100.0	91.0			
	D	0.0	0.0	0.0			
	E	0.0	0.0	0.0			
	F	0.0	0.0	0.0			
	SYSTEM	48.7	49.0	43.5	744	626	324

** PROBLEMS/SOLUTIONS/COMMENTS

SANDBLASTING OF UNIT 1B FLUE IS NEARING COMPLETION. THE FLUE WILL BE RELINED WITH CXL-2000.

0/78 SYSTEM

** PROBLEMS/SOLUTIONS/COMMENTS

NOTE: AN ATTEMPT IS ALWAYS MADE TO BEGIN OPERATION OF THE BOILER AND FGD SYSTEM SIMULTANEOUSLY AT BRUCE MANSFIELD. OCCASIONALLY PROBLEMS DELAY BOILER STARTUP MAKING IT POSSIBLE FOR MONTHLY FGD MODULE HOURS TO EXCEED ACTUAL BOILER HOURS.

1/78	A	100.0	100.0	58.0			
	B	0.0	0.0	0.0			
	C	100.0	100.0	58.0			
	D	0.0	0.0	0.0			
	E	0.0	0.0	0.0			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

F	0.0	0.0	0.0			
SYSTEM	33.3	33.3	19.3	744	331	144

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT TRIPPED SEVERAL TIMES DUE TO DIFFICULTIES IN BURNING WET STOCK-PILE COAL.

THERE WERE PROBLEMS WITH THE 1B FAN WHICH NECESSITATED EXTENSIVE REPAIRS. LINING ABRASION AND DISBONDMENT IN THE FAN CAUSED CORROSION OF UNDERLYING SUPPORT METAL.

2/78	A	79.0	100.0	79.0		
	B	61.0	80.0	61.0		
	C	82.0	100.0	82.0		
	D	0.0	0.0	0.0		
	E	0.0	0.0	0.0		
	F	0.0	0.0	0.0		
	SYSTEM	37.0	46.7	37.0	672	514 249

** PROBLEMS/SOLUTIONS/COMMENTS

EXTENSIVE REPAIRS TO THE 1B ID FAN AND THE EMERGENCY NEED FOR LOAD FROM THE PLANT DURING THE COAL STRIKE TEMPORARILY OVERLOADED THE 1A AND 1C TRAINS. THE 1C MIST ELIMINATORS WILL BE REPLACED AS A RESULT OF THIS.

THE 1B FLUE RELINING CONTINUED.

3/78	A	43.0	47.0	43.0		
	B	91.0	98.0	91.0		
	C	90.0	97.0	90.0		
	D	65.0	70.0	65.0		
	E	50.0	54.0	50.0		
	F	60.0	65.0	60.0		
	SYSTEM	66.5	71.8	66.5	744	689 495

** PROBLEMS/SOLUTIONS/COMMENTS

REPLACEMENT OF THE LINING IN THE 1B CHIMNEY WITH CXL 2000 WAS COMPLETED.

REPAIRS WERE MADE ON THE A, B AND C FAN HOUSINGS.

4/78	A	74.0	74.0	74.0		
	B	88.0	88.0	88.0		
	C	49.0	49.0	49.0		
	D	87.0	87.0	87.0		
	E	97.0	97.0	97.0		
	F	94.0	94.0	94.0		
	SYSTEM	81.5	81.5	81.5	720	720 587

** PROBLEMS/SOLUTIONS/COMMENTS

FAN HOUSINGS LEAK REPAIRS WERE MADE DURING APRIL.

MISCELLANEOUS LEAK REPAIRS WERE MADE TO DUCTS.

5/78	A	98.0	97.0	59.0		
	B	0.0	0.0	0.0		
	C	98.0	97.0	59.0		
	D	91.0	85.0	52.0		
	E	92.0	84.0	52.0		
	F	92.0	86.0	53.0		
	SYSTEM	78.5	74.8	45.8	744	457 341

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE ANNUAL BOILER INSPECTION OUTAGE BEGAN ON MAY 20.

EXTENSIVE REPAIRS WERE MADE ON THE 1B FAN.

6/78	A	0.0								
	B	0.0								
	C	100.0								
	D	100.0								
	E	100.0								
	F	100.0								
	SYSTEM	66.7			0.0		720	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER INSPECTION AND GENERATOR STATOR COOLER REPAIRS CONTINUED THROUGH JUNE.

7/78	SYSTEM						744			
8/78	SYSTEM						744			
9/78	SYSTEM						720			
10/78	SYSTEM	96.3					744	671		
11/78	SYSTEM						720			
12/78	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THIS REPORT PERIOD.

1/79	SYSTEM						744			
2/79	SYSTEM						672			
3/79	SYSTEM						744			
4/79	SYSTEM						720			
5/79	SYSTEM						744			

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 1 IS CURRENTLY DOWN FOR A BOILER OVERHAUL.

SIX OF THE TWELVE FAN HOUSINGS HAVE BEEN CHANGED FROM CARBON STEEL TO INCOLLOY 825.

6/79	SYSTEM						720			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTS THAT THE AVAILABILITY FROM JANUARY 1, 1979 THROUGH MAY 31, 1979 WAS 92.0%.

THE UTILITY REPORTED THAT FAN MOTOR FAILURES WERE A MAJOR PROBLEM AREA DURING THE FIRST HALF OF 1979.

7/79	SYSTEM						744			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
8/79	SYSTEM							744	
9/79	SYSTEM							720	
** PROBLEMS/SOLUTIONS/COMMENTS									
FAN HOUSING WORK (CHANGING FROM LINED CARBON STEEL TO INCOLLOY 825) IS CONTINUING.									
NEW PH MONITOR MODIFICATIONS HAVE YIELDED PROMISING RESULTS WITH RESPECT TO MONITOR AVAILABILITY.									
THE FGD SYSTEM ATTRIBUTED 17.4% OF THE TOTAL UNIT UNAVAILABILITY FOR 1979 TO DATE. THE BREAKDOWN IS AS FOLLOWS:									
7.6% SCRUBBER ID FAN WORK/PROBLEMS									
8.3% GENERAL SCRUBBER PROBLEMS AND MAINTENANCE									
1.0% REAGENT HANDLING PROBLEMS (LIME SLAKER AND PIPING)									
0.5% MIST ELIMINATOR PLUGGING									
10/79	SYSTEM	96.1						744	
11/79	SYSTEM	90.8						720	
12/79	SYSTEM	99.8						744	
** PROBLEMS/SOLUTIONS/COMMENTS									
DURING THE PERIOD AN ADDITIONAL FAN HOUSING WAS REPLACED WITH THE NEW INCOLLOY 825. BY THE END OF 1980 ALL THE FAN HOUSINGS WILL BE REPLACED WITH THE NEW MATERIAL.									
WHERE THE NEW PH MONITORS HAVE BEEN INSTALLED, THE PROBE MAINTENANCE HAS BEEN CUT 80%, AND THE MIST ELIMINATORS HAVE BEEN LESS OF A PROBLEM TO MAINTAIN.									
THE SLUDGE PUMPS HAVE BEEN A PROBLEM. THE PUMPS REQUIRE AN OVERHAUL EVERY 1000 HOURS AND HAVE FREQUENT VALVE FAILURES. NEW VALVE MANIFOLDS MA BE INSTALLED TO IMPROVE PUMP SERVICE BY ALLOWING ACCESS TO INDIVIDUAL BALL VALVES.									
1/80	SYSTEM	98.6	100.0		73.1			744	544 544
2/80	SYSTEM	98.4	100.0		74.9			696	521 521
** PROBLEMS/SOLUTIONS/COMMENTS									
NO MAJOR FGD-RELATED PROBLEMS OCCURRED DURING JANUARY AND FEBRUARY.									
3/80	SYSTEM	98.8	100.0		72.6			744	540 540
** PROBLEMS/SOLUTIONS/COMMENTS									
THE BOILER WAS OUT OF SERVICE ONE WEEK IN MARCH DUE TO A PLUGGED AIR PREHEATER. NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED FOR MARCH.									
4/80	SYSTEM	91.1	100.0		81.4			720	586 586
5/80	SYSTEM							744	
6/80	SYSTEM							720	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 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 FOR THE MONTHS OF MAY AND JUNE IS NOT YET AVAILABLE.

7/80	SYSTEM	98.4	100.0	85.9	744	639	639
8/80	SYSTEM	98.9	100.0	55.4	744	412	412
9/80	SYSTEM	95.3	100.0	74.0	720	533	533
10/80	SYSTEM	98.3	100.0	28.1	744	209	209

** PROBLEMS/SOLUTIONS/COMMENTS

ON OCTOBER 10 THE UNIT WAS TAKEN OUT OF SERVICE FOR A TURBINE OVERHAUL. DURING THIS OUTAGE THE UTILITY COMMENCED THE INSTALLATION OF A MANIFOLD SYSTEM IN THE STACK. THE OUTAGE IS SCHEDULED TO LAST APPROXIMATELY 12 WEEKS.

11/80	SYSTEM	0.0		0.0	720	0	0
12/80	SYSTEM	0.0		0.0	744	0	0

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE YEAR MINOR EROSION PROBLEMS WITH THE ID FAN ROTORS WERE ENCOUNTERED. FOUR OF THE SIX ID FAN ROTORS HAVE BEEN REPAIRED.

BRUCE MANSFIELD 1 REMAINED OFF LINE DURING NOVEMBER AND DECEMBER AS A RESULT OF THE TURBINE OVERHAUL.

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT THE FGD SYSTEM AVAILABILITY WAS 99.13%.

4/81	SYSTEM				720		
5/81	SYSTEM				744		
6/81	SYSTEM	99.9			720	457	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR UNIT OUTAGES OCCURRED DURING THE SECOND QUARTER DUE TO BOILER TUBE LEAKS. THE UTILITY REPORTED THAT THE YEAR TO DATE UNIT AVAILABILITY WAS 69.82%.

DURING THE SECOND QUARTER NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED. THE UTILITY REPORTED THAT THE YEAR TO DATE FGD SYSTEM AVAILABILITY WAS 99.0%.

7/81	SYSTEM				744		
8/81	SYSTEM	97.0			744		
9/81	SYSTEM	98.7			720		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 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

OVERALL FGD SYSTEM AVAILABILITY WAS NOT REPORTED FOR THE MONTH OF JULY.
 THE MAJOR PROBLEM ENCOUNTERED DURING THE THIRD QUARTER WAS MIST ELIMINATOR
 BUILDUP MAKING CLEANING NECESSARY.

THE YEAR TO DATE AVAILABILITY OF THE FGD SYSTEM (THROUGH AUGUST) WAS
 REPORTED TO BE 98.5%.

10/81	SYSTEM	99.5				744			
11/81	SYSTEM	97.5				720			
12/81	SYSTEM	99.0				744			

** PROBLEMS/SOLUTIONS/COMMENTS

MIST ELIMINATOR CLEANING CONTINUED TO BE A PROBLEM DURING THE FOURTH
 QUARTER.

1/82	SYSTEM	97.8				744			
2/82	SYSTEM	99.4				672			
3/82	SYSTEM	99.6				744			

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FGD SYSTEM PERFORMANCE WAS OUTSTANDING FOR THE
 FIRST QUARTER 1982.

4/82	A	99.9							
	B	97.4							
	C	99.6							
	D	99.5							
	E	99.9							
	F	94.9							
	SYSTEM	98.5	100.0		99.9	720	719	719	72.1
5/82	A	100.0							
	B	100.0							
	C	86.7							
	D	97.2							
	E	85.7							
	F	99.2							
	SYSTEM	94.8	100.0		100.0	744	744	744	75.4
6/82	A	98.6							
	B	90.8							
	C	93.1							
	D	93.9							
	E	99.0							
	F	97.5							
	SYSTEM	95.5	100.0		100.0	720	720	720	72.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED
 DURING THE SECOND QUARTER OF 1982.

7/82	A	99.0							
	B	100.0							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	96.7									
	D	100.0									
	E	100.0									
	F	97.8									
	SYSTEM	98.9	100.0		77.8			744	579	579	54.6
8/82	A	100.0									
	B	98.2									
	C	98.6									
	D	96.2									
	E	99.2									
	F	80.3									
	SYSTEM	95.4	100.0		100.0			744	744	744	69.3
** PROBLEMS/SOLUTIONS/COMMENTS											
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JULY AND AUGUST 1982.											
9/82	A	9.8									
	B	9.8									
	C	9.8									
	D	9.8									
	E	9.3									
	F	9.8									
	SYSTEM	9.7	100.0		9.7			720	70	70	5.4
** PROBLEMS/SOLUTIONS/COMMENTS											
A SCHEDULED BOILER OUTAGE COMMENCED ON SEPTEMBER 3.											
10/82	A	50.1									
	B	49.2									
	C	50.1									
	D	50.1									
	E	49.0									
	F	44.6									
	SYSTEM	48.9	100.0		47.8			744	356	356	22.9
** PROBLEMS/SOLUTIONS/COMMENTS											
THE SCHEDULED BOILER OUTAGE ENDED ON OCTOBER 15.											
11/82	A	100.0									
	B	100.0									
	C	100.0									
	D	100.0									
	E	100.0									
	F	83.4									
	SYSTEM	97.2	100.0		86.4			720	622	622	58.3
12/82	A	100.0									
	B	95.1									
	C	100.0									
	D	95.3									
	E	95.3									
	F	100.0									
	SYSTEM	97.6	100.0		78.1			744	581	581	43.6
** PROBLEMS/SOLUTIONS/COMMENTS											
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING NOVEMBER AND DECEMBER 1982.											
1/83	A	93.3									

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

	B	98.7							
	C	98.4							
	D	100.0							
	E	89.9							
	F	89.9							
	SYSTEM	95.1	100.0		100.0		744	744	744 62.3
2/83	A	100.0							
	B	90.1							
	C	93.9							
	D	100.0							
	E	92.0							
	F	94.2							
	SYSTEM	95.0	100.0		100.0		672	672	672 65.3
3/83	A	100.0							
	B	97.9		0.0	0.0				
	C	100.0							
	D	89.9							
	E	100.0							
	F	100.0							
	SYSTEM	98.0	100.0		94.1		744	700	700 61.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1983.

4/83	A	99.9							
	B	99.9							
	C	99.6							
	D	99.9							
	E	99.9							
	F	99.9							
	SYSTEM	99.8	100.0		87.8		720	632	632 54.4
5/83	A	94.9							
	B	100.0							
	C	100.0							
	D	100.0							
	E	92.1							
	F	100.0							
	SYSTEM	97.8	100.0		100.0		744	744	744 56.5
6/83	A	100.0							
	B	99.5							
	C	100.0							
	D	85.9							
	E	100.0							
	F	100.0							
	SYSTEM	97.6	100.0		65.1		720	469	469 40.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER OF 1983.

7/83	A	100.0	91.0	91.0	90.2				
	B	100.0	88.6	88.6	87.8				
	C	100.0	87.6	87.6	86.8				
	D	99.6	89.8	89.8	89.0				
	E	100.0	92.4	92.4	91.5				
	F	99.2	87.4	87.4	86.6				
	SYSTEM	99.8	89.5	89.5	88.6		744	737	660 64.0

PENNSYLVANIA POWER: BRUCE MANSFIELD 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 THIRD QUARTER OF 1983.

8/83	A	100.0	88.3	88.4	79.0				
	B	99.0	92.8	92.9	83.1				
	C	99.9	88.8	88.8	79.4				
	D	93.5	88.8	88.8	79.4				
	E	91.2	79.6	79.7	71.2				
	F	100.0	87.0	87.0	77.8				
	SYSTEM	98.4	87.6	87.6	78.3	744	666	583	54.3
9/83	A	100.0	94.3	94.3	94.3				
	B	93.9	79.2	79.2	79.2				
	C	90.6	46.7	46.7	46.7				
	D	95.7	73.2	73.2	73.2				
	E	100.0	94.0	94.0	94.0				
	F	100.0	91.1	91.1	91.1				
	SYSTEM	96.7	79.7	79.7	79.7	720	720	574	58.2
10/83	A	22.1	87.7	87.7	19.4				
	B	21.8	70.0	70.0	15.5				
	C	22.1	68.2	68.2	15.1				
	D	0.0	0.0	0.0	0.0				
	E	22.1	90.1	90.1	19.9				
	F	22.1	78.6	78.6	17.3				
	SYSTEM	18.3	65.8	65.8	14.5	744	164	108	11.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED A SCHEDULED BOILER OUTAGE DURING OCTOBER.

MODIFICATIONS TO THE MODULE D INDUCED DRAFT FAN MOTOR AND MOTOR BASE WERE MADE DURING OCTOBER.

11/83	A	76.9	79.9	79.9	61.0				
	B	76.9	69.4	69.4	52.9				
	C	76.9	79.8	79.8	60.8				
	D	61.9	72.5	72.5	55.3				
	E	76.6	82.1	82.1	62.6				
	F	76.3	43.9	43.9	33.5				
	SYSTEM	74.2	71.3	71.3	54.4	720	549	391	41.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED BOILER OUTAGE, WHICH BEGAN IN OCTOBER ENDED ON NOVEMBER 7.

12/83	A	99.2	67.1	67.1	28.6				
	B	100.0	55.1	55.1	23.5				
	C	100.0	85.6	85.6	36.6				
	D	99.1	75.6	75.6	32.3				
	E	99.5	61.4	61.4	26.2				
	F	100.0	65.5	65.5	28.0				
	SYSTEM	99.6	68.4	68.4	29.2	744	318	217	19.9

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/84	A	100.0	76.4	76.4	72.6				

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

	B	93.2	89.8	89.8	85.3						
	C	98.1	79.1	79.1	75.1						
	D	94.2	83.6	83.6	79.4						
	E	93.6	89.4	89.4	84.9						
	F	100.0	85.6	85.6	81.3						
	SYSTEM	96.5	84.0	84.0	79.8			744	707	594	58.1
	2/84	A	91.4	85.1	85.1	85.1					
B		91.2	73.0	73.0	73.0						
C		93.4	90.1	90.1	90.1						
D		92.8	86.2	86.2	86.2						
E		99.8	93.7	93.7	93.7						
F		88.3	79.7	79.7	79.7						
SYSTEM		92.8	84.6	84.6	84.6			696	696	589	71.2
3/84	A	92.3	83.5	83.5	81.3						
	B	99.1	97.2	97.2	94.6						
	C	99.9	97.0	97.0	94.5						
	D	93.6	87.9	87.9	85.6						
	E	99.1	100.0	100.0	98.4						
	F	95.3	89.6	89.6	87.2						
	SYSTEM	96.6	92.5	92.7	90.3			744	725	672	78.9
4/84	A	91.7	89.3	89.3	83.8						
	B	87.4	83.2	83.2	78.1						
	C	92.1	88.1	88.1	82.6						
	D	95.0	84.7	84.7	79.4						
	E	94.1	91.2	91.2	85.6						
	F	96.3	89.1	89.1	83.6						
	SYSTEM	92.8	87.6	87.6	82.2			720	675	592	65.6
5/84	A	91.2	81.6	81.6	81.6						
	B	92.7	77.2	77.2	77.2						
	C	93.4	92.5	92.5	92.5						
	D	92.8	92.1	92.1	92.1						
	E	91.6	84.5	84.5	84.5						
	F	83.7	69.8	69.8	69.8						
	SYSTEM	90.9	82.9	82.9	82.9			744	744	617	72.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED DURING THE PERIOD OF JANUARY THROUGH MAY 1984.

6/84	A	94.1	89.5	89.5	79.2					
	B	88.3	85.6	85.6	75.7					
	C	90.4	88.4	88.4	78.2					
	D	99.1	92.8	92.8	82.1					
	E	99.1	86.7	86.7	76.7					
		45.9	48.0	48.0	42.5					
	SYSTEM	86.1	81.8	81.8	72.4		720	637	521	60.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE F INDUCED DRAFT FAN MOTOR AND BASE UNDERWENT MODIFICATIONS DURING JUNE.

7/84	A	99.7	92.1	92.1	91.7					
	B	95.2	88.2	88.2	87.8					
	C	89.7	72.9	72.9	72.6					
	D	93.1	81.0	81.0	80.6					
	E	93.4	76.7	76.7	76.3					
	F	91.8	78.7	78.7	78.4					
	SYSTEM	93.8	81.6	81.6	81.2		744	741	604	64.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

8/84	A	91.7	90.9	90.9	86.6						
	B	92.5	80.0	80.0	76.2						
	C	93.0	87.7	87.7	83.5						
	D	98.2	77.6	77.6	73.9						
	E	98.4	94.0	94.0	89.5						
	F	100.0	98.1	98.1	93.4						
	SYSTEM	95.6	88.1	88.1	83.8			744	708	624	65.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED DURING JULY AND AUGUST 1984.

9/84 SYSTEM 720

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION WAS UNAVAILABLE FOR SEPTEMBER 1984.

9/84	A	64.0	78.9	78.9	54.6					
	B	63.5	66.2	66.2	45.8					
	C	64.9	62.8	62.8	43.5					
	D	69.2	95.2	95.2	65.8					
	E	68.4	88.3	88.3	61.1					
	F	62.8	84.3	84.3	58.3					
	SYSTEM	65.5	79.3	79.3	54.9		720	498	395	48.2

10/84	A	56.0	84.9	84.9	47.6					
	B	54.7	72.2	72.2	40.5					
	C	52.7	77.3	77.3	43.3					
	D	56.0	80.1	80.1	44.9					
	E	56.0	89.5	89.5	50.1					
	F	56.0	93.6	93.6	52.4					
	SYSTEM	55.2	82.9	82.9	46.5		744	417	346	37.4

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE UNIT WAS OFF LINE FROM SEPTEMBER 21 THRU OCTOBER 14 FOR A SCHEDULED MAINTAINENCE OUTAGE.

11/84	A	45.5	89.0	89.0	43.1					
	B	46.5	89.6	89.6	43.3					
	C	46.1	91.6	91.6	44.3					
	D	47.4	96.2	96.2	46.5					
	E	47.3	95.1	95.1	46.0					
	F	47.2	96.2	96.2	46.5					
	SYSTEM	46.7	93.0	93.0	45.0		720	348	324	39.1

12/84	A	94.2	83.9	83.9	81.2					
	B	93.5	82.5	82.5	79.8					
	C	93.5	91.6	91.6	88.6					
	D	94.3	68.2	68.2	66.0					
	E	99.9	92.7	92.7	89.7					
	F	95.4	93.2	93.2	90.2					
	SYSTEM	95.1	85.4	85.4	82.6		744	710	614	72.7

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/85	A	99.2	89.9	89.9	84.0					
	B	98.7	86.0	86.0	80.4					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	99.5	96.4	96.4	90.1					
	D	99.6	95.0	95.0	88.7					
	E	91.9	85.9	85.9	80.2					
	F	93.6	88.6	88.6	82.8					
	SYSTEM	97.1	90.3	90.3	84.4		744	695	628	75.0
2/85	A	98.0	94.5	94.5	91.7					
	B	98.8	89.9	89.9	87.2					
	C	100.0	92.5	92.5	89.7					
	D	92.8	86.2	86.2	83.6					
	E	97.8	84.9	84.9	82.4					
	F	92.5	85.1	85.1	82.6					
	SYSTEM	96.7	88.8	88.8	86.2		672	652	579	72.2
3/85	A	94.1	90.1	90.1	86.4					
	B	71.7	68.5	68.5	65.7					
	C	94.0	95.7	95.7	91.8					
	D	98.1	92.5	92.5	88.7					
	E	98.2	93.6	93.6	89.8					
	F	97.8	94.7	94.7	90.9					
	SYSTEM	92.3	89.2	89.2	85.6		744	714	637	75.6
4/85	A	99.0	93.6	93.6	91.8					
	B	86.3	83.3	83.3	81.7					
	C	94.1	87.8	87.8	86.1					
	D	92.0	83.7	83.7	82.1					
	E	92.5	89.0	89.0	87.2					
	F	96.6	83.7	83.7	82.1					
	SYSTEM	93.4	86.9	86.9	85.2		720	706	613	75.0
5/85	A	93.9	90.3	90.3	82.8					
	B	99.7	81.7	81.7	74.9					
	C	98.3	89.7	89.7	82.3					
	D	98.4	93.1	93.1	85.3					
	E	99.0	85.2	85.2	78.1					
	F	94.1	79.3	79.3	72.7					
	SYSTEM	97.2	86.6	86.6	79.3		744	682	590	62.8
6/85	A	98.1	95.1	95.1	92.2					
	B	92.0	81.5	81.5	79.0					
	C	91.9	78.6	78.6	76.3					
	D	94.2	95.1	95.1	92.2					
	E	66.9	58.2	58.2	56.4					
	F	100.0	93.5	93.5	90.7					
	SYSTEM	90.5	83.7	83.7	81.1		720	698	584	65.6
7/85	A	92.4	87.8	87.8	82.1					
	B	98.8	95.8	95.8	89.7					
	C	83.9	75.4	75.4	70.6					
	D	98.8	87.8	87.8	82.1					
	E	90.5	85.6	85.6	80.1					
	F	90.9	81.9	81.9	76.6					
	SYSTEM	92.5	85.7	85.7	80.2		744	696	597	64.9
8/85	A	97.2	81.3	81.3	77.8					
	B	93.7	87.2	87.2	83.5					
	C	94.6	84.3	84.3	80.6					
	D	92.1	84.8	84.8	81.2					
	E	92.5	90.6	90.6	86.7					
	F	94.7	87.8	87.8	84.0					
	SYSTEM	94.1	86.0	86.0	82.3		744	712	612	69.6
9/85	A	93.5	71.0	71.0	62.5					

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	100.0	90.7	90.7	79.9					
	C	97.7	79.5	79.5	70.0					
	D	99.2	77.9	77.9	68.6					
	E	94.6	83.1	83.1	73.2					
	F	99.0	71.1	71.1	62.6					
	SYSTEM	97.3	78.9	78.9	69.5		720	634	500	56.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH SEPTEMBER.

10/85	A	26.9	43.9	43.9	11.8					
	B	26.9	71.9	71.9	19.4					
	C	26.9	71.4	71.4	19.2					
	D	25.8	57.9	57.9	15.6					
	E	26.9	79.4	79.4	21.4					
	F	26.7	57.9	57.9	15.6					
	SYSTEM	26.7	63.7	63.7	17.2		744	200	128	15.8

** PROBLEMS/SOLUTIONS/COMMENTS

BOTH THE BOILER AND FGD SYSTEM WERE OFF LINE FOR A SCHEDULED UNIT OUTAGE DURING THE MONTH OF OCTOBER.

11/85	A	82.4	91.5	91.5	82.4					
	B	90.0	95.7	95.7	86.1					
	C	88.5	85.0	85.0	76.5					
	D	90.0	90.3	90.3	81.3					
	E	89.6	90.3	90.3	81.3					
	F	88.2	92.6	92.6	83.3					
	SYSTEM	88.1	90.9	90.9	81.8		720	648	589	67.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS OFF LINE FOR MORE THAN 72 HOURS AS A RESULT OF STEAM TUBE LEAKS.

12/85	A	94.5	87.8	87.8	83.6					
	B	95.2	73.1	73.1	69.6					
	C	91.7	75.5	75.5	71.9					
	D	86.6	68.1	68.1	64.8					
	E	89.9	78.2	78.2	74.5					
	F	88.3	86.4	86.4	82.3					
	SYSTEM	91.0	78.2	78.2	74.4		744	708	554	68.1

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTH OF DECEMBER.

1/86	A	86.3								
	B	95.4								
	C	92.7								
	D	98.4								
	E	99.5								
	F	100.0								
	SYSTEM	95.4					744	744		77.9
2/86	A	91.8								
	B	93.2								
	C	91.1								
	D	83.9								

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	E	85.6									
	F	86.5									
	SYSTEM	88.7						672	626		66.2
3/86	A	95.2									
	B	90.7									
	C	74.9									
	D	94.5									
	E	95.6									
	F	89.7									
	SYSTEM	90.1						744	711		95.2
4/86	A	89.0									
	B	96.1									
	C	96.7									
	D	92.4									
	E	94.0									
	F	95.1									
	SYSTEM	93.9						720	719		71.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH APRIL 1986.

5/86	A	47.6									
	B	48.0									
	C	48.0									
	D	44.5									
	E	47.3									
	F	47.7									
	SYSTEM	47.2						744	357		32.6
6/86	A	77.5									
	B	77.9									
	C	77.9									
	D	77.1									
	E	78.9									
	F	78.9									
	SYSTEM	78.0						720	568		55.5

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED BOILER OUTAGE OCCURRED DURING MAY AND JUNE.

7/86	A	91.3									
	B	83.1									
	C	83.1									
	D	91.3									
	E	91.3									
	F	86.3									
	SYSTEM	87.7						744	679		58.7
8/86	A	91.4									
	B	96.0									
	C	86.7									
	D	97.0									
	E	97.0									
	F	94.8									
	SYSTEM	93.8						744	722		69.0
9/86	A	94.2									
	B	100.0									

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	C	99.4									
	D	94.9									
	E	94.7									
	F	94.6									
	SYSTEM	96.3						720	720		75.4
10/86	A	90.3									
	B	88.7									
	C	88.4									
	D	92.7									
	E	87.1									
	F	86.3									
	SYSTEM	88.9						744	702		65.1
11/86	A	86.4									
	B	92.1									
	C	92.1									
	D	91.5									
	E	91.3									
	F	89.4									
	SYSTEM	90.5						720	664		71.0
12/86	A	92.2									
	B	97.0									
	C	97.0									
	D	96.6									
	E	92.9									
	F	94.5									
	SYSTEM	95.0						744	722		74.2

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JULY THROUGH DECEMBER 1986.

1/87	A	94.6	90.7	90.7	86.6					
	B	90.5	86.9	86.9	82.9					
	C	86.0	63.8	63.8	60.9					
	D	94.2	84.3	84.4	80.5					
	E	88.3	76.9	76.9	73.4					
	F	86.7	85.3	85.4	81.5					
	SYSTEM	90.1	81.3	81.3	77.6			744	710	578 65.3
2/87	A	86.3	92.5	92.5	86.3					
	B	89.9	82.2	82.1	76.6					
	C	74.1	72.4	72.4	67.6					
	D	82.6	74.5	74.5	69.5					
	E	90.2	91.3	91.2	85.1					
	F	93.3	91.1	91.1	85.0					
	SYSTEM	86.1	84.0	84.0	78.3			672	627	527 69.7
3/87	A	90.7	96.6	96.5	90.1					
	B	81.9	87.4	87.3	81.5					
	C	0.0	0.0	0.0	0.0					
	D	93.3	88.8	88.8	82.8					
	E	87.9	91.3	91.2	85.1					
	F	91.5	87.8	87.8	81.9					
	SYSTEM	74.2	75.3	75.3	70.2			744	694	522 64.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH MARCH 1987.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

4/87	A	74.4	97.8	97.8	73.8					
	B	74.9	99.3	99.3	74.9					
	C	2.8	0.0	0.0	0.0					
	D	75.0	93.0	93.0	70.1					
	E	75.4	100.0	100.0	75.4					
	F	66.3	81.0	81.0	61.1					
	SYSTEM	61.5	78.5	78.5	59.2		720	543	426	51.8
5/87	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					
	F	0.0			0.0					
	SYSTEM	0.0			0.0		744	0	0	0.0
6/87	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					
	F	0.0			0.0					
	SYSTEM	0.0			0.0		720	0	0	0.0
** PROBLEMS/SOLUTIONS/COMMENTS										
TURBINE/GENERATOR SCHEDULED OUTAGE BEGAN IN APRIL AND LASTED THROUGH JUNE.										
7/87	A	68.5	77.9	77.9	56.5					
	B	72.4	80.0	80.0	57.9					
	C	69.2	78.8	78.8	57.1					
	D	72.4	89.0	89.1	64.5					
	E	72.4	73.1	73.1	53.0					
	F	72.4	87.7	87.8	63.6					
	SYSTEM	71.3	81.1	81.1	58.8		744	539	437	46.8
8/87	A	92.5	69.0	69.0	65.2					
	B	94.5	95.2	95.2	89.9					
	C	93.5	76.0	76.0	71.8					
	D	90.6	85.3	85.2	80.5					
	E	85.9	81.6	81.5	77.0					
	F	94.5	85.4	85.3	80.6					
	SYSTEM	91.9	82.1	82.0	77.5		744	703	577	64.5
9/87	A	96.5	89.0	89.0	89.0					
	B	94.0	69.6	69.6	69.6					
	C	96.0	87.6	87.6	87.6					
	D	98.3	89.3	89.3	89.3					
	E	99.3	89.3	89.3	89.3					
	FF	94.6	83.9	83.9	83.9					
	SYSTEM	96.5	84.8	84.8	84.8		720	720	611	71.8
10/87	A	95.6	90.1	90.1	90.2					
	B	98.4	91.0	91.0	91.1					
	C	94.0	79.7	79.7	79.8					
	D	94.9	78.4	78.4	78.5					
	E	95.4	94.0	94.0	94.1					
	F	94.6	87.4	87.4	87.5					
	SYSTEM	95.5	86.8	86.8	86.9		744	745	646	75.7
11/87	A	95.0	88.5	88.5	88.5					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 1 (CONT.)

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

12/87	B	95.1	86.0	86.0	86.0						
	C	95.8	75.1	75.1	75.1						
	D	96.3	91.8	91.8	91.8						
	E	100.0	89.2	89.2	89.2						
	F	93.8	72.4	72.4	72.4						
	SYSTEM	96.0	83.8	83.8	83.8			720	720	604	71.9
	A	95.7	98.6	98.6	95.2						
	B	95.6	89.1	89.1	86.0						
	C	95.7	83.3	83.3	80.4						
	D	92.3	87.6	87.6	84.5						
	E	91.5	87.5	87.5	84.4						
	F	89.5	90.0	90.0	86.8						
	SYSTEM	93.4	89.3	89.3	86.2			744	718	642	78.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JULY
THROUGH DECEMBER 1987.

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PENNSYLVANIA POWER
PLANT NAME	BRUCE MANSFIELD
UNIT NUMBER	2
CITY	SHIPPINGPORT
STATE	PENNSYLVANIA
REGULATORY CLASSIFICATION	C
PARTICULATE EMISSION LIMITATION - NG/J	15. (0.035 LB/MMBTU)
SO2 EMISSION LIMITATION - NG/J	258. (0.600 LB/MMBTU)
NOX EMISSION LIMITATION - NG/J	***** (***** LB/MMBTU)
NET PLANT GENERATING CAPACITY - MW	2360
GROSS UNIT GENERATING CAPACITY - MW	835
NET UNIT GENERATING CAPACITY W/FGD - MW	780
NET UNIT GENERATING CAPACITY WO/FGD - MW	815
EQUIVALENT SCRUBBED CAPACITY - MW	835
** UNIT DATA - BOILER AND STACK	
BOILER SUPPLIER	FOSTER WHEELER
BOILER TYPE	PULVERIZED COAL
BOILER SERVICE LOAD	BASE
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1580.86 (3350000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6 (285 F)
STACK HEIGHT - M	290. (950 FT)
STACK SHELL	CONCRETE
STACK TOP DIAMETER - M	5.9 (19.2 FT)
** FUEL DATA	
FUEL TYPE	COAL
FUEL GRADE	BITUMINOUS
AVERAGE HEAT CONTENT - J/G	27912. (12000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB	****
AVERAGE ASH CONTENT - %	12.80
RANGE ASH CONTENT - %	8.0-15.0
AVERAGE MOISTURE CONTENT - %	7.00
RANGE MOISTURE CONTENT - %	5.5-8.5
AVERAGE SULFUR CONTENT - %	3.50
RANGE SULFUR CONTENT - %	3.0-4.0
AVERAGE CHLORIDE CONTENT - %	*****
RANGE CHLORIDE CONTENT - %	*****
*** PARTICLE CONTROL	
** MECHANICAL COLLECTOR	
NUMBER	0
TYPE	NONE
** ESP	
NUMBER	0
TYPE	NONE
** PARTICLE SCRUBBER	
NUMBER	6
NUMBER OF SPARES	0
INITIAL START-UP DATE	7/1977
GENERIC TYPE	VENTURI TOWER
SPECIFIC TYPE	FIXED-THROAT/TOP-ENTRY PLUMB BOB
TRADE NAME/COMMON NAME	N/A
SUPPLIER	GE ENVIRONMENTAL SERVICES
DIMENSIONS - FT	35.5 DIA X 52.0
SHELL GENERIC MATERIAL	CARBON STEEL
SHELL SPECIFIC MATERIAL	AISI 1110
LINER GENERIC MATERIAL	ORGANIC
LINER SPECIFIC MATERIAL	GLASS FLAKE-FILLED POLYESTER
GAS CONTACTING DEVICE TYPE	NONE
NUMBER OF CONTACTING ZONES	1
LIQUID RECIRCULATION RATE - LITER/S	1258.2 (19971 GPM)
L/G RATIO - LITER/CU.M	4.8 (35.8 GAL/1000ACF)
PH CONTROL ADDITIVE	THIOSORBIC LIME
PRESSURE DROP - KPA	4.7 (19.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/S	61.0 (200.0 FT/S)

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

INLET GAS FLOW RATE - CU.M/S	263.3	(558000 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICIENCY - %	70.0	
PARTICLE REMOVAL EFFICIENCY - %	99.8	

*** FGD SYSTEM

** GENERAL DATA

SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT
SO2 REMOVAL MODE	WET SCRUBBING
PROCESS TYPE	LIME
PROCESS ADDITIVES	MAGNESIUM OXIDE
SYSTEM SUPPLIER	GE ENVIRONMENTAL SERVICES
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES
DEVELOPMENT LEVEL	FULL SCALE
NEW/RETROFIT	NEW
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	99.80
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	92.10
ENERGY CONSUMPTION - %	4.2
CURRENT STATUS	1
COMMERCIAL START-UP	10/1977
INITIAL START-UP	7/1977
CONTRACT AWARDED	10/1974

** DESIGN AND OPERATING PARAMETERS

DESIGN COAL SULFUR CONTENT - %	4.70	
DESIGN COAL HEAT CONTENT - J/G	27679.4	(11900 BTU/LB)
DESIGN COAL ASH CONTENT - %	19.70	
DESIGN CHLORIDE CONTENT - %	*****	
OPER. & MAINT. REQUIREMENT - MANHR/DAY	214.0	

** QUENCHER/PRESATURATOR

NUMBER	0

** ABSORBER

NUMBER	6	
NUMBER OF SPARES	0	
GENERIC TYPE	VENTURI TOWER	
SPECIFIC TYPE	FIXED THROAT	
TRADE NAME/Common TYPE	N/A	
SUPPLIER	GE ENVIRONMENTAL SERVICES	
DIMENSIONS - FT	34.0 DIA X 51.5	
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	GLASS FLAKE-FILLED POLYESTER	
LINER MATERIAL TRADE NAME/Common TYPE	RIGIFLAK 4850	
GAS CONTACTING DEVICE TYPE	NONE	
NUMBER OF CONTACTING ZONES	1	
LIQUID RECIRCULATION RATE - LITER/S	1112.	(17650 GPM)
L/G RATIO - L/CU.M	5.5	(41.4 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	1.5	(6.0 IN-H2O)
SUPERFICIAL GAS VELOCITY - M/SEC	30.5	(100.0 FT/S)
INLET GAS FLOW - CU. M/S	201.31	(426600 ACFM)
INLET GAS TEMPERATURE - C	52.8	(127 F)
SO2 REMOVAL EFFICIENCY - %	92.1	

** MIST ELIMINATOR

PRE-MIST ELIMINATOR/MIST ELIMINATOR	PRIMARY COLLECTOR
NUMBER PER SYSTEM	6
NUMBER OF SPARES PER SYSTEM	0
NUMBER PER MODULE	1
GENERIC TYPE	IMPINGEMENT
SPECIFIC TYPE	BAFFLE
TRADE NAME/Common TYPE	CLOSED VANE
MANUFACTURER	HEIL PROCESS EQUIPMENT
CONFIGURATION	HORIZONTAL
NUMBER OF STAGES	1
NUMBER OF PASSES PER STAGE	4
DISTANCE BETWEEN VANES - CM	7.6 (3.00 IN)

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

VANE ANGLES - DEGREES	90	
PRESSURE DROP - KPA	0.1	(0.6 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	THICKENER OVERFLOW	
WASH FREQUENCY	ONCE EVERY 12 MINUTES	
WASH RATE - L/S	3.8	(60 GAL/MIN)
** FANS		
NUMBER	6	
NUMBER OF SPARES	0	
DESIGN	CENTRIFUGAL	
SUPPLIER	GREEN FUEL ECONOMIZER	
FUNCTION	UNIT	
APPLICATION	FORCED DRAFT	
SERVICE	WET	
FLUE GAS FLOW RATE - CU.M/S	263.32	(558000 ACFM)
FLUE GAS TEMPERATURE - C	47.8	(118 F)
PRESSURE DROP - KPA	18.9	(62.0 IN-H2O)
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL;; HIGH ALLOY; HIGH ALLOY; HIGH ALLOY	
** DAMPERS		
NUMBER	6	
FUNCTION	SHUT-OFF	
GENERIC TYPE	BUTTERFLY	
SPECIFIC TYPE	N/A	
MANUFACTURER	MOSSER	
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	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	6	
FUNCTION	NONE	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
MANUFACTURER	MOSSER	
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	NONE	
LINER SPECIFIC MATERIAL TYPE	N/A	
** DAMPERS		
NUMBER	6	
FUNCTION	CONTROL	
GENERIC TYPE	LOUVER	
SPECIFIC TYPE	NR	
MANUFACTURER	GREEN FAN	
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	NONE	
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	OUTLET TO INOPERABLE REHEATER	
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	

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

** DUCTWORK	
LOCATION	OUTLET FROM INOPERABLE REHEATER
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	DETENTION
DEVICE TYPE	N/A
MANUFACTURER	DORR-OLIVER
NUMBER	2
FULL LOAD DRY FEED CAPACITY - M.TONS/HR	20.0 (22 TPH)
PRODUCT QUALITY - % SOLIDS	13.5
** TANKS	
SERVICE	NUMBER
-----	-----
SCRUBBER RECYCLE	6
ABSORBER RECYCLE	6
THICKENER OVERFLOW	1
CALCILOX ADDITION 'MIX!	3
SLAKER TANK	2
SLURRY STORAGE	1
** PUMPS	
SERVICE	NUMBER
-----	-----
VENTURI RECIRCULATION	12
SLURRY FEED	4
LIME SLURRY RECIRCULATION	4
ABSORBER RECIRCULATION	12
THICKENER UNDERFLOW	4
THICKENER CLEAR WATER TRANSFER	4
SLUDGE	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
NUMBER OF SPARES	0
CONFIGURATION	CYLINDRICAL
DIMENSIONS - FT	200.0 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 'WALLS!; MAT-REINFO
FEED STREAM SOURCE	PARTICLE SCRUBBER BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	30% SOLIDS
OUTLET STREAM DISPOSITION	SLUDGE TREATMENT
OVERFLOW STREAM DISPOSITION	PARTICLE SCRUBBER RECYCLE LOOP
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	MIX TANK
PROPRIETARY PROCESS	DRAVO 'CALCILOX!
INLET QUALITY - %	30.0

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

** DISPOSAL	
NATURE	FINAL
TYPE	POND
LOCATION	OFF-SITE
SITE TRANSPORTATION METHOD	PIPELINE
SITE TREATMENT	NONE
SITE DIMENSIONS	1300-1400 ACRES
SITE CAPACITY - CU.M	59926992 (49000.0 ACRE-FT)
SITE SERVICE LIFE - YRS	25
** PROCESS CONTROL AND INSTRUMENTATION	
PROCESS STREAM	INLET SLURRY TO SCRUBBER & ABSORBER
CHEMICAL PARAMETERS	PH
CONTROL LEVELS	PH 7
MONITOR TYPE	UNILOCK
MONITOR LOCATION	SPRAY HEADERS
PROCESS CONTROL MANNER	AUTOMATIC
PROCESS CHEMISTRY MODE	FEEDBACK
** WATER BALANCE	
WATER LOOP TYPE	OPEN
RECEIVING WATER STREAM	OHIO RIVER
** CHEMICALS AND CONSUMPTION	
FUNCTION	ABSORBENT
NAME	THIOSORBIC LIME
PRINCIPAL CONSTITUENT	90% CAO MIN., 2-6% MGO, MAX. 4% ACID INSOLUBLES
SOURCE/SUPPLIER	DRAVO
UTILIZATION - %	84.0
POINT OF ADDITION	SLAKER
** FGD SPARE CAPACITY INDICES	
SCRUBBER - %	0.0
ABSORBER - %	0.0
MIST ELIMINATOR - %	0.0
FAN - %	0.0
THICKENER - %	0.0
** FGD SPARE COMPONENT INDICES	
SCRUBBER	0.0
ABSORBER	0.0
MIST ELIMINATOR	0.0
FAN	0.0
THICKENER	0.0

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PER PART.	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/77	2A	94.0	100.0		83.0					
	2B	97.0	100.0		88.0					
	2C	98.0	100.0		87.0					
	2D	63.0	61.0		48.0					
	2E	66.0	59.0		47.0					
	2F	61.0	51.0		41.0					
	SYSTEM	79.8	78.5		65.7		744	595	489	

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 2 WAS DECLARED AVAILABLE FOR COMMERCIAL OPERATION AT 825 MW ON OCTOBER 1, 1977.

THE SPRAYS IN THE 2F FAN WERE CLEANED.

REPAIRS WERE MADE TO THE 2B FLUE STACK LINING BECAUSE OF PREMATURE FAILURE OF SEVERAL TEST PATCHES.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

 THE UNIT TRIPPED DUE TO FAULTY GENERATOR CONTROL TRANSFORMERS.

11/77	2A	100.0	100.0	83.0			
	2B	96.0	100.0	81.0			
	2C	88.0	92.0	74.0			
	2D	47.0	57.0	46.0			
	2E	55.0	52.0	42.0			
	2F	47.0	42.0	34.0			
	SYSTEM	72.2	73.8	60.0	720	581	432

** PROBLEMS/SOLUTIONS/COMMENTS

PROBLEMS ASSOCIATED WITH THE STATION POWER TRANSFORMERS CAUSED LIMITATION IN LOAD ON UNIT 2. THREE OF THE SIX STATION POWER TRANSFORMERS FOR UNIT 2 WERE DESTROYED.

12/77	2A	74.0	77.0	63.0			
	2B	99.0	100.0	86.0			
	2C	98.0	100.0	83.0			
	2D	100.0	100.0	86.0			
	2E	89.0	85.0	69.0			
	2F	99.0	93.0	76.0			
	SYSTEM	93.2	92.5	77.2	744	607	574

** PROBLEMS/SOLUTIONS/COMMENTS

COLD WEATHER CAUSED SOME FREEZING PROBLEMS WITH PROCESS PIPING.

1/78	2A	95.0	58.0	31.0			
	2B	100.0	100.0	76.0			
	2C	96.0	56.0	29.0			
	2D	94.0	100.0	70.0			
	2E	99.0	100.0	64.0			
	2F	99.0	96.0	50.0			
	SYSTEM	97.2	85.0	53.3	744	391	397

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT TRIPPED SEVERAL TIMES DUE TO DIFFICULTIES IN BURNING WET STOCK-PILE COAL. WHEN THE UNIT WAS ON LINE DURING THIS MONTH, THE WET COAL ALSO PREVENTED FULL LOAD OPERATION OF COAL MILLS.

BOILER CONTROL VALVE ("W" VALVE) PROBLEMS COMPOUNDED START-UP DIFFICULTIES.

2/78	2A	84.0	46.0	48.0			
	2B	87.0	68.0	68.0			
	2C	89.0	88.0	88.0			
	2D	97.0	71.0	71.0			
	2E	99.0	99.0	99.0			
	2F	78.0	78.0	78.0			
	SYSTEM	89.0	75.0	75.3	672	672	506

** PROBLEMS/SOLUTIONS/COMMENTS

MANY PROBLEMS OCCURRED WITH ID FAN COOLERS DUE TO INCLEMENT WEATHER.

3/78	2A	100.0	100.0	67.0			
	2B	93.0	91.0	60.0			
	2C	13.0	10.0	13.0			
	2D	95.0	100.0	68.0			
	2E	95.0	96.0	64.0			
	2F	97.0	99.0	65.0			
	SYSTEM	82.2	82.7	56.2	744	494	418

PENNSYLVANIA POWER: BRUCE MANSFIELD 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

EXTENSIVE ID FAN HOUSING REPAIRS WERE PERFORMED ON THE 2C FAN.

A BOILER TUBE LEAK CAUSED SEVERAL DAYS OUTAGE.

4/78	2A	100.0	82.0	81.0			
	2B	100.0	82.0	81.0			
	2C	59.0	59.0	59.0			
	2D	15.0	15.0	15.0			
	2E	14.0	14.0	14.0			
	2F	13.0	13.0	13.0			
	SYSTEM	50.2	44.2	43.8	720	713	315

** PROBLEMS/SOLUTIONS/COMMENTS

FLUE LINING REPAIRS ON THE 2B CHIMNEY BEGAN ON APRIL 5.

EXTENSIVE REPAIRS WERE MADE ON THE 2C ID FAN, CAUSING IT TO BE DOWN FROM MARCH 6 THROUGH APRIL 13.

5/78	2A	100.0	100.0	37.0			
	2B	100.0	100.0	37.0			
	2C	100.0	100.0	37.0			
	2D	0.0	0.0	0.0			
	2E	0.0	0.0	0.0			
	2F	0.0	0.0	0.0			
	SYSTEM	50.0	50.0	18.5	744	270	138

** PROBLEMS/SOLUTIONS/COMMENTS

THE UNIT WAS OFF-LINE FOR THREE WEEKS FOR REPAIRS TO THE 2C ID FAN, INCLUDING COVERING THE HOUSING WITH INCOLOY 825.

2B STACK LINING REPAIRS CONTINUED.

6/78	2A	70.0	100.0	70.0			
	2B	69.0	100.0	69.0			
	2C	66.0	100.0	66.0			
	2D	0.0	0.0	0.0			
	2E	0.0	0.0	0.0			
	2F	0.0	0.0	0.0			
	SYSTEM	34.2	50.0	34.2	720	417	246

** PROBLEMS/SOLUTIONS/COMMENTS

2B STACK LINING REPAIRS CONTINUED.

-NOTE: AN ATTEMPT IS ALWAYS MADE TO BEGIN OPERATION OF THE BOILER AND FGD SYSTEM SIMULTANEOUSLY AT BRUCE MANSFIELD. OCCASIONALLY PROBLEMS DELAY BOILER START-UP, MAKING IT POSSIBLE FOR MONTHLY FGD MODULE HOURS TO EXCEED ACTUAL BOILER HOURS.

7/78	SYSTEM				744		
8/78	SYSTEM				744		
9/78	SYSTEM				720		
10/78	SYSTEM	99.3			744	144	
11/78	SYSTEM				720		
12/78	SYSTEM				744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS AVAILABLE FOR THIS PERIOD.

1/79	SYSTEM						744		
2/79	SYSTEM						672		
3/79	SYSTEM						744		
4/79	SYSTEM						720		

** PROBLEMS/SOLUTIONS/COMMENTS

NO INFORMATION WAS REPORTED FOR THIS PERIOD BY THE UTILITY.

5/79	SYSTEM						744		
6/79	SYSTEM						720		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE AVAILABILITY FOR JANUARY 1, 1979 THROUGH MAY 31, 1979 WAS 88.8%.

THE UTILITY REPORTED THAT SOME FAN PROBLEMS WERE RECENTLY ENCOUNTERED.

7/79	SYSTEM						744		
8/79	SYSTEM						744		
9/79	SYSTEM						720		

** PROBLEMS/SOLUTIONS/COMMENTS

CHIMNEY LINING WORK (APPLICATION OF CXL 2000) WAS COMPLETED IN EARLY 1979.

FAN HOUSING WORK (CHANGING FROM LINED CARBON STEEL TO INCOLLOY 825) IS CONTINUING.

NEW PH MONITOR MODIFICATIONS HAVE YIELDED PROMISING RESULTS WITH RESPECT TO MONITOR AVAILABILITY.

THE FGD SYSTEM ATTRIBUTED 10.8% OF THE TOTAL UNIT UNAVAILABILITY FOR 1979 TO DATE. THE BREAKDOWN IS AS FOLLOWS:

- 5.0% CHIMNEY (FINISHED CXL 2000 APPLICATION)
- 1.3% GENERAL SCRUBBER PROBLEMS AND MAINTENANCE
- 1.5% ID FAN WORK/PROBLEMS
- 2.0% MIST ELIMINATOR PLUGGING
- 1.0% EMISSION VIOLATION (CUT BACK OF BOILER LOAD BECAUSE OF LOW SO2 REMOVAL EFFICIENCY).

10/79	SYSTEM	97.5					744		
11/79	SYSTEM	100.0					720		
12/79	SYSTEM	96.5					744		

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE PERIOD AN ADDITIONAL FAN HOUSING WAS REPLACED WITH THE NEW INCOLLOY 825. BY THE END OF 1980 ALL THE FAN HOUSINGS WILL BE REPLACED WITH THE NEW MATERIAL.

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

WHERE THE NEW PH MONITORS HAVE BEEN INSTALLED, PROBE MAINTENANCE HAS BEEN CUT 80%, AND MIST ELIMINATOR MAINTENANCE HAS BEEN LESS OF A PROBLEM.

THE SLUDGE PUMPS HAVE BEEN A PROBLEM. THE PUMPS REQUIRE AN OVERHAUL EVERY 1000 HOURS AND HAVE FREQUENT VALVE FAILURES. NEW VALVE MANIFOLDS MAY BE INSTALLED TO IMPROVE PUMP SERVICE BY ALLOWING ACCESS TO INDIVIDUAL BALL VALVES.

1/80	SYSTEM	97.1	100.0	75.7	744	563	563
2/80	SYSTEM	94.7	100.0	89.3	696	622	622

** PROBLEMS/SOLUTIONS/COMMENTS

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

3/80	SYSTEM	98.4	100.0	47.4	744	353	353

** PROBLEMS/SOLUTIONS/COMMENTS

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

4/80	SYSTEM	89.5	100.0	87.0	720	626	626
5/80	SYSTEM				744		
6/80	SYSTEM				720		

** PROBLEMS/SOLUTIONS/COMMENTS

INFORMATION FOR THE MONTHS OF MAY AND JUNE IS NOT YET AVAILABLE.

7/80	SYSTEM	95.4	100.0	76.8	744	571	571
8/80	SYSTEM	93.9	100.0	74.1	744	551	551
9/80	SYSTEM	97.9	100.0	75.1	720	541	541
10/80	SYSTEM	97.2	100.0	90.3	744	672	672
11/80	SYSTEM	97.2	100.0	82.5	720	594	594
12/80	SYSTEM	97.9	100.0	68.1	744	507	507

** PROBLEMS/SOLUTIONS/COMMENTS

DURING A TURBINE OVERHAUL OF UNIT 1, A MANIFOLD SYSTEM WAS BEING INSTALLED IN THE STACK. UNIT 2 IS SCHEDULED TO BE SHUTDOWN IN LATE 1981 OR EARLY 1982 SO THAT THE MANIFOLD SYSTEM CAN BE COMPLETED. DURING THIS OUTAGE THE ID FAN ROTORS, WHICH HAVE ERODED, ARE SCHEDULED TO BE REPLACED.

1/81	SYSTEM				744		
2/81	SYSTEM				672		

** PROBLEMS/SOLUTIONS/COMMENTS

THE BOILER WAS TAKEN OUT OF SERVICE ON FEBRUARY 28, 1981 FOR A SCHEDULED FOUR WEEK OUTAGE.

3/81	SYSTEM				744		

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
 PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT THE FGD SYSTEM AVAILABILITY WAS 97.37%.

4/81	SYSTEM						720		
5/81	SYSTEM						744		
6/81	SYSTEM	99.8					720	590	

** PROBLEMS/SOLUTIONS/COMMENTS

MINOR UNIT OUTAGES OCCURRED DURING THE SECOND QUARTER DUE TO BOILER TUBE LEAKS. THE UNIT WAS ALSO DOWN DURING PART OF THE QUARTER DUE TO LOW LOAD REQUIREMENTS. THE UTILITY REPORTED THAT THE YEAR TO DATE UNIT AVAILABILITY WAS 72.9%.

DURING THE SECOND QUARTER NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED. THE UTILITY REPORTED THAT THE YEAR TO DATE FGD SYSTEM AVAILABILITY WAS 98.2%.

7/81	SYSTEM						744		
8/81	SYSTEM	96.7					744		
9/81	SYSTEM	96.3					720		

** PROBLEMS/SOLUTIONS/COMMENTS

OVERALL FGD SYSTEM AVAILABILITY WAS NOT REPORTED FOR THE MONTH OF JULY. THE MAJOR PROBLEM ENCOUNTERED DURING THE THIRD QUARTER WAS MIST ELIMINATOR BUILDUP MAKING CLEANING NECESSARY.

DURING SEPTEMBER THE UTILITY REPORTED PROBLEMS WITH THE ID FAN SPRAYS PLUGGING.

THE YEAR TO DATE AVAILABILITY OF THE FGD SYSTEM (THROUGH AUGUST) WAS REPORTED TO BE 97.9%.

10/81	SYSTEM	98.0					744		
11/81	SYSTEM	94.2					720		
12/81	SYSTEM	94.8					744		

** PROBLEMS/SOLUTIONS/COMMENTS

AT THE END OF NOVEMBER THE BOILER WAS TAKEN OFF-LINE FOR SCHEDULED MAINTENANCE. DURING THIS TIME THE ID FAN MOTOR WAS REPLACED. THE OUTAGE LASTED FOR APPROXIMATELY TWO WEEKS WHICH INCLUDES SOME TIME IN DECEMBER.

1/82	SYSTEM	98.1					744		
2/82	SYSTEM	98.4					672		
3/82	SYSTEM	99.3					744		

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT FGD SYSTEM PERFORMANCE WAS OUTSTANDING FOR THE FIRST QUARTER 1982.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

4/82	A	98.3							
	B	96.4							
	C	97.8							
	D	99.3							
	E	99.5							
	F	99.9							
	SYSTEM	98.5	100.0		64.3		720	463	463 37.5

5/82	A	99.3							
	B	87.9							
	C	99.0							
	D	83.1							
	E	98.2							
	F	93.5							
	SYSTEM	93.5	100.0		83.5		744	621	621 60.0

6/82	A	95.5							
	B	100.0							
	C	98.9							
	D	100.0							
	E	100.0							
	F	97.9							
	SYSTEM	98.7	100.0		95.3		720	686	686 71.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER OF 1982.

7/82	A	95.1							
	B	95.2							
	C	97.6							
	D	98.0							
	E	97.7							
	F	95.3							
	SYSTEM	96.5	100.0		100.0		744	744	81.3

8/82	A	98.2							
	B	98.8							
	C	97.3							
	D	97.2							
	E	100.0							
	F	99.6							
	SYSTEM	98.5	100.0		52.6		744	391	391 30.1

9/82	A	100.0							
	B	96.8							
	C	100.0							
	D	95.0							
	E	98.1							
	F	94.0							
	SYSTEM	97.3	100.0		77.8		720	560	560 48.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1982.

10/82	A	99.1							
	B	98.3							
	C	98.2							
	D	96.9							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

	E	98.5							
	F	95.9							
	SYSTEM	97.8	100.0		96.1		744	715	715 61.8

11/82	A	90.9							
	B	99.1							
	C	95.3							
	D	100.0							
	E	93.1							
	F	100.0							
	SYSTEM	96.4	100.0		85.3		720	614	614 54.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED DURING OCTOBER AND NOVEMBER 1982.

12/82	A	41.7							
	B	92.0							
	C	98.4							
	D	99.4							
	E	95.0							
	F	99.4							
	SYSTEM	87.6	100.0		91.9		744	684	684 48.8

** PROBLEMS/SOLUTIONS/COMMENTS

DURING DECEMBER REPAIRS WERE MADE ON THE 2A ID FAN. MOTOR MODIFICATIONS WERE PERFORMED AND THE J-BOLTS, GROUTS, AND SOLE PLATES OF THE MOTOR BASE WERE REPLACED.

1/83	A	94.9							
	B	100.0							
	C	100.0							
	D	99.8							
	E	91.2							
	F	100.0							
	SYSTEM	97.6	100.0		100.0		744	744	744 60.9

2/83	A	100.0							
	B	96.5							
	C	95.5							
	D	99.0							
	E	100.0							
	F	90.0							
	SYSTEM	96.8	100.0		100.0		672	672	672 64.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED DURING JANUARY AND FEBRUARY 1983.

3/83	A	73.6							
	B	1.1							
	C	1.1							
	D	73.0							
	E	57.6							
	F	79.4							
	SYSTEM	47.6	100.0		79.4		744	591	591 34.7

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED TURBINE/GENERATOR OUTAGE COMMENCED ON MARCH 25.

DURING MARCH REPAIRS WERE MADE ON THE 2B AND 2C ID FANS. MOTOR MODIFICATIONS WERE PERFORMED AND THE J-BOLTS, GROUT, AND SOLE PLATE OF THE MOTOR

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

 BASE WERE REPLACED.

4/83	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				
	F	0.0			0.0				
	SYSTEM	0.0			0.0	720	0	0	0.0

5/83	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				
	F	0.0			0.0				
	SYSTEM	0.0			0.0	744	0	0	0.0

6/83	A	64.4							
	B	50.8							
	C	64.7							
	D	63.8							
	E	64.7							
	F	64.7							
	SYSTEM	62.2	100.0		50.7	720	365	365	29.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE SCHEDULED TURBINE/GENERATOR OUTAGE WHICH COMMENCED IN MARCH ENDED ON JUNE 11.

7/83	A	91.9	76.7	76.7	76.7				
	B	100.0	95.6	95.6	95.6				
	C	98.9	94.6	94.6	94.6				
	D	96.0	85.5	85.5	85.5				
	E	56.1	46.9	46.9	46.9				
	F	98.6	91.5	91.5	91.5				
	SYSTEM	90.3	81.8	81.8	81.8	744	744	609	66.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED MODIFICATIONS TO THE MODULE E INDUCED DRAFT FAN MOTOR AND MOTOR BASE DURING JULY.

8/83	A	100.0	90.7	90.7	81.6				
	B	96.8	76.3	76.3	68.7				
	C	94.4	76.9	76.9	69.2				
	D	100.0	87.5	87.5	78.8				
	E	61.8	51.2	51.2	46.1				
	F	96.3	85.4	85.4	76.9				
	SYSTEM	91.5	78.0	78.0	70.2	744	669	522	57.1

9/83	A	95.8	61.0	61.0	55.1				
	B	98.3	81.3	81.3	73.5				
	C	99.2	68.1	68.1	61.5				
	D	99.8	86.0	86.0	77.8				
	E	99.1	78.1	78.1	70.6				
	F	95.5	72.5	72.5	65.6				
	SYSTEM	98.0	74.5	74.5	67.3	720	651	485	45.9

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987
PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING AUGUST AND SEPTEMBER 1983.

10/83	A	100.0	77.5	77.5	68.8					
	B	95.8	96.5	96.5	85.8					
	C	95.7	74.0	74.0	65.7					
	D	98.6	72.3	72.3	64.2					
	E	96.2	81.5	81.5	72.4					
	F	94.7	68.8	68.8	61.2					
	SYSTEM	96.8	78.4	78.4	69.7		744	661	519	49.0
11/83	A	99.0	84.5	84.5	80.7					
	B	98.4	79.4	79.4	75.8					
	C	97.2	71.0	71.0	67.8					
	D	94.6	81.6	81.6	77.9					
	E	99.8	77.2	77.2	73.8					
	F	98.4	68.1	68.1	65.0					
	SYSTEM	97.9	76.9	76.9	73.5		720	688	529	61.2
12/83	A	98.7	79.2	79.2	77.0					
	B	98.8	73.4	73.4	71.4					
	C	99.6	80.4	80.4	78.2					
	D	100.0	69.5	69.5	67.6					
	E	95.6	80.6	80.6	78.4					
	F	100.0	86.1	86.1	83.7					
	SYSTEM	98.8	78.2	78.2	76.1		744	724	566	63.1

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/84	A	100.0	79.0	79.0	74.6					
	B	99.4	96.4	96.4	91.0					
	C	98.8	80.3	80.3	75.8					
	D	49.4	31.5	31.5	29.7					
	E	99.8	94.2	94.2	89.0					
	F	96.9	89.0	89.0	84.0					
	SYSTEM	90.7	78.4	78.4	74.0		744	702	551	58.2
2/84	A	95.4	82.8	82.8	76.3					
	B	96.0	89.0	89.0	82.0					
	C	97.5	85.1	85.1	78.4					
	D	66.9	61.1	61.1	56.3					
	E	99.2	83.7	83.7	77.2					
	F	83.8	64.2	64.2	59.2					
	SYSTEM	89.8	77.7	77.7	71.6		696	641	498	56.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING JANUARY AND FEBRUARY.

3/84	A	100.0	93.8	93.8	93.8					
	B	98.1	95.4	95.4	95.4					
	C	95.0	94.4	94.4	94.4					
	D	100.0	89.1	89.1	89.1					
	E	95.6	93.3	93.3	93.3					
	F	25.5	26.1	26.1	26.1					
	SYSTEM	85.7	82.0	82.0	82.0		744	744	610	79.0

PENNSYLVANIA POWER: BRUCE MANSFIELD 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 F UNDER WENT DRAFT FAN MOTOR AND BASE MODIFICATIONS AND WAS OUT OF SERVICE PART OF THE MONTH.

4/84	A	94.4	86.8	86.8	86.7				
	B	95.7	96.1	96.1	96.0				
	D	94.5	87.6	87.6	87.5				
	E	95.3	93.5	93.5	93.3				
	F	66.7	66.8	66.8	66.7				
	SYSTEM	89.8	83.9	83.9	83.8	720	719	603	77.6

** PROBLEMS/SOLUTIONS/COMMENTS

THE MODULE F INDUCED DRAFT MOTOR FAILED DURING APRIL, 1984.

5/84	A	25.7	77.9	77.9	22.7				
	B	9.6	29.5	29.5	8.6				
	C	16.9	58.1	58.1	16.9				
	D	25.7	86.6	86.6	25.3				
	E	25.2	80.2	80.2	23.4				
	F	25.7	84.3	84.3	24.6				
	SYSTEM	21.5	69.4	69.4	20.3	744	217	151	16.4

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED BOILER OUTAGE STARTED ON MAY 11, 1984.

6/84	A	88.4	91.3	91.3	83.1				
	B	88.9	90.3	90.3	82.2				
	C	89.7	74.6	74.6	67.9				
	D	88.1	83.6	83.6	76.1				
	E	88.5	82.3	82.3	74.9				
	F	89.4	87.4	87.4	79.6				
	SYSTEM	88.8	84.9	84.9	77.3	720	655	557	66.0

7/84	B	95.9	88.1	88.1	83.1				
	C	97.8	83.3	83.3	78.5				
	D	93.5	78.2	78.2	73.7				
	E	97.7	84.0	84.0	79.2				
	F	100.0	88.9	88.9	83.7				
	SYSTEM	97.2	84.3	84.3	79.5	744	701	591	64.3

8/84	A	97.1	100.0	100.0	84.9				
	B	99.2	95.2	95.2	78.4				
	C	97.1	97.3	97.3	80.1				
	D	99.4	98.0	98.0	80.6				
	E	94.9	81.0	81.0	66.7				
	F	95.3	88.7	88.7	73.0				
	SYSTEM	97.2	93.4	93.9	77.3	744	612	575	58.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED DURING JULY AND AUGUST 1984.

9/84	A	100.0	91.7	91.7	91.7				
	B	96.9	91.0	91.0	91.0				
	C	94.1	85.1	85.1	85.1				
	D	90.4	81.7	81.7	81.7				
	E	98.3	95.7	95.7	95.7				
	F	96.2	87.2	87.2	87.2				
	SYSTEM	96.0	88.7	88.7	88.7	720	720	639	77.7

9/84	SYSTEM					720			

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 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 SEPTEMBER 1984.

10/84	A	97.3	96.9	96.9	97.0				
	B	99.0	97.3	97.3	97.4				
	C	97.1	92.2	92.2	92.3				
	D	99.1	96.4	96.4	96.5				
	E	96.5	92.8	92.8	92.9				
	F	96.0	92.2	92.2	92.3				
	SYSTEM	97.5	94.6	94.6	94.8	744	745	705	86.0
11/84	A	99.1	98.6	98.6	98.6				
	B	96.2	95.8	95.8	95.8				
	C	95.1	94.6	94.6	94.6				
	D	94.8	94.2	94.2	94.2				
	E	98.8	97.4	97.4	97.4				
	F	97.0	96.3	96.3	96.3				
	SYSTEM	96.8	96.1	96.1	96.1	720	720	692	83.4
12/84	A	95.9	94.2	94.2	94.2				
	B	92.9	91.8	91.8	91.8				
	C	93.3	91.5	91.5	91.5				
	D	92.7	87.6	87.6	87.6				
	E	94.5	94.6	94.6	94.6				
	F	93.7	90.1	90.1	90.1				
	SYSTEM	93.8	91.6	91.6	91.6	744	744	682	78.9

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF SEPTEMBER THRU DECEMBER 1984.

1/85	A	100.0	95.0	95.0	87.9				
	B	93.9	91.2	91.2	84.4				
	C	94.4	86.7	86.7	80.2				
	D	94.6	87.2	87.2	80.6				
	E	94.2	91.4	91.4	84.5				
	F	98.6	92.6	92.6	85.6				
	SYSTEM	96.0	90.7	90.7	83.9	744	688	624	70.1
2/85	A	93.0	91.8	91.8	91.8				
	B	98.1	95.8	95.8	95.8				
	C	99.3	98.1	98.1	98.1				
	D	98.9	97.5	97.5	97.5				
	E	94.1	93.6	93.6	93.6				
	F	97.4	89.0	89.0	89.0				
	SYSTEM	96.8	94.3	94.3	94.3	672	672	634	76.7
3/85	A	99.3	98.8	98.8	96.6				
	B	92.4	92.5	92.5	90.5				
	C	98.9	91.5	91.5	89.5				
	D	93.7	96.5	96.5	94.4				
	E	92.5	85.3	85.3	83.5				
	F	92.6	91.6	91.6	89.7				
	SYSTEM	94.9	92.7	92.7	90.7	744	728	675	74.4
4/85	A	98.6	88.7	88.7	83.3				
	B	98.2	94.4	94.4	88.6				
	C	93.1	91.0	91.0	85.4				
	D	98.1	89.0	89.0	83.6				
	E	97.4	92.3	92.3	86.7				

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% SO2	REMOVAL PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	F	92.7	88.0	88.0	82.6						
	SYSTEM	96.4	90.6	90.6	85.0			720	676	612	71.9

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY THROUGH APRIL.

5/85	A	50.8	45.1	45.1	44.9					
	B	95.2	95.3	95.3	94.9					
	C	99.1	95.5	95.5	95.2					
	D	94.5	83.8	83.8	83.5					
	E	91.9	90.5	90.5	90.2					
	F	95.6	87.4	87.4	87.1					
	SYSTEM	87.8	82.9	82.9	82.6		744	741	615	68.4

** PROBLEMS/SOLUTIONS/COMMENTS

MODULE A WAS OUT OF SERVICE FOR PART OF THE MONTH TO PERMIT INSTALLATION OF BAFFLES AND PERMANENT SCAFFOLDING IN THE ABSORBER VESSEL.

6/85	A	31.5	86.0	86.0	27.1					
	B	30.3	85.1	85.1	26.8					
	C	30.7	84.2	84.2	26.5					
	D	31.0	85.1	85.1	26.8					
	E	31.5	95.2	95.2	30.0					
	F	0.0	0.0	0.0	0.0					
	SYSTEM	25.8	72.6	72.6	22.9		720	227	165	18.6

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED BOILER OUTAGE OCCURRED IN JUNE. DURING THE OUTAGE THE UTILITY REPORTED THAT STAINLESS STEEL MIST ELIMINATORS WERE INSTALLED IN MODULE F.

7/85	A	97.4	92.1	92.1	92.1					
	B	100.0	95.4	95.4	95.4					
	C	95.4	95.0	95.0	95.0					
	D	95.5	82.0	82.0	82.0					
	E	97.5	91.0	91.0	91.0					
	F	81.5	73.3	73.3	73.3					
	SYSTEM	94.6	88.1	88.1	86.1		744	744	656	73.6

8/85	A	99.6	92.1	92.1	82.5					
	B	96.0	95.3	95.3	85.3					
	C	97.3	89.4	89.4	80.1					
	D	93.5	85.4	85.4	76.5					
	E	98.7	85.1	85.1	76.2					
	F	94.9	89.9	89.9	80.5					
	SYSTEM	96.7	89.5	89.5	80.2		744	666	597	64.1

9/85	A	97.6	91.9	91.9	90.3					
	B	9.3	84.9	84.9	83.3					
	C	94.8	84.1	84.1	82.6					
	D	92.3	82.3	82.3	80.8					
	E	98.8	92.2	92.2	90.6					
	F	99.3	96.7	96.7	95.0					
	SYSTEM	82.0	88.7	88.7	87.1		720	707	627	72.1

10/85	A	93.7	93.0	93.0	88.6					
	B	89.0	89.8	89.8	85.5					
	C	88.7	93.2	93.2	88.7					
	D	94.5	93.0	93.0	88.6					
	E	92.7	92.6	92.6	88.2					

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

11/85	F	89.1	92.6	92.6	88.2							
	SYSTEM	91.3	92.4	92.4	87.9			744	708	654	73.4	
	A	99.0	90.4	90.4	90.4							
	B	100.0	93.2	93.2	93.2							
	C	97.9	90.4	90.4	90.4							
	D	93.6	86.0	86.0	86.0							
	E	91.1	81.8	81.8	81.8							
	F	90.1	82.6	82.6	82.6							
	SYSTEM	95.3	87.4	87.4	87.4			720	720	629	84.2	
12/85	A	92.6	89.2	89.2	83.5							
	B	86.7	85.3	85.3	79.8							
	C	86.4	91.2	91.2	85.3							
	D	92.9	87.9	87.9	82.3							
	E	92.5	98.8	98.8	92.5							
	F	92.3	97.1	97.1	90.9							
		SYSTEM	90.6	91.6	91.6	85.7			744	696	638	74.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS
OF JULY THROUGH DECEMBER.

1/86	A	91.8									
	B	97.2									
	C	97.8									
	D	91.7									
	E	96.8									
	F	91.7									
	SYSTEM	94.5						744	732		78.6
2/86	A	94.9									
	B	99.1									
	C	92.3									
	D	97.5									
	E	76.8									
	F	94.8									
	SYSTEM	92.6						672	646		80.1
3/86	A	82.1									
	B	88.2									
	C	95.0									
	D	81.3									
	E	99.2									
	F	98.1									
	SYSTEM	90.7						744	744		82.4
4/86	A	84.6									
	B	99.2									
	C	81.1									
	D	95.6									
	E	77.9									
	F	93.2									
	SYSTEM	88.6						720	719		82.7
5/86	A	91.8									
	B	88.6									
	C	93.3									
	D	86.4									
	E	92.6									
	F	89.7									
	SYSTEM	90.4						744	700		73.0

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

6/86	A	93.1									
	B	91.1									
	C	93.3									
	D	93.3									
	E	86.1									
	F	91.3									
	SYSTEM	91.4						720	675		75.6
7/86	A	90.7									
	B	89.2									
	C	92.9									
	D	97.0									
	E	98.5									
	F	94.1									
	SYSTEM	93.8						744	733		72.1
8/86	A	95.0									
	B	87.0									
	C	97.3									
	D	99.6									
	E	91.8									
	F	97.6									
	SYSTEM	94.7						744	744		83.1
9/86	A	36.8									
	B	35.1									
	C	37.5									
	D	36.4									
	E	36.7									
	F	17.6									
	SYSTEM	33.4						720	297		28.6
10/86	A	83.2									
	B	82.4									
	C	83.2									
	D	82.7									
	E	78.8									
	F	82.0									
	SYSTEM	82.0						744	619		65.4
11/86	A	86.0									
	B	87.1									
	C	85.6									
	D	80.4									
	E	82.8									
	F	77.4									
	SYSTEM	83.2						720	630		69.1
12/86	A	98.1									
	B	96.1									
	C	96.8									
	D	98.7									
	E	97.3									
	F	98.9									
	SYSTEM	97.6						744	740		82.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR 1986.

1/87	A	84.1	86.5	86.5	78.5
	B	89.0	96.0	96.0	87.1

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

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

2/87	C	87.5	81.6	81.6	74.1						
	D	84.4	83.6	83.6	75.8						
	E	82.5	90.4	90.4	82.0						
	F	86.6	95.4	95.4	86.6						
	SYSTEM	85.7	88.9	88.9	80.7			744	675	600	66.9
	A	97.6	90.2	90.1	89.7						
	B	99.6	95.7	95.7	95.2						
	C	95.2	85.4	85.4	85.0						
	D	93.5	90.3	90.3	89.9						
	E	95.8	92.3	92.2	91.8						
	F	98.2	96.6	96.6	96.1						
	SYSTEM	96.7	91.7	91.7	91.3			672	669	614	77.7
	A	84.9	85.5	85.5	76.9						
	B	77.7	85.5	85.5	76.9						
C	84.5	86.7	86.7	78.0							
D	81.2	73.1	73.1	65.7							
E	84.7	86.2	86.2	77.6							
F	89.4	90.0	90.0	80.9							
SYSTEM	83.7	84.5	84.5	76.0			744	669	565	63.3	
4/87	A	94.3	88.3	88.3	88.2						
	B	95.8	93.0	93.0	92.9						
	C	99.4	88.9	88.9	88.8						
	D	96.8	77.6	77.6	77.5						
	E	98.5	93.9	93.9	93.8						
	F	97.9	95.5	95.5	95.4						
	SYSTEM	97.1	89.5	89.5	89.4			720	719	644	75.4
5/87	A	89.7	86.5	86.5	79.4						
	B	89.7	93.8	93.9	86.2						
	C	90.7	82.3	82.3	75.5						
	D	69.6	70.6	70.6	64.8						
	E	87.6	88.1	88.1	80.9						
	F	89.9	94.6	94.6	86.8						
	SYSTEM	86.2	86.0	86.0	78.9			744	683	587	66.2
6/87	A	90.0	80.7	80.7	73.8						
	B	83.6	80.7	80.7	73.8						
	C	89.0	88.2	88.1	80.6						
	D	75.4	82.6	82.5	75.4						
	E	85.4	77.9	77.8	71.1						
	F	89.3	88.5	88.4	80.8						
	SYSTEM	85.5	83.1	83.1	75.9			720	658	547	63.1
7/87	A	84.1	86.6	86.7	80.5						
	B	87.8	94.0	94.1	87.4						
	C	91.8	88.8	88.9	82.5						
	D	90.9	97.8	97.8	90.9						
	E	85.5	92.0	92.0	85.5						
	F	80.5	81.1	81.2	75.4						
	SYSTEM	86.8	90.0	90.1	83.7			744	691	623	69.3
8/87	A	87.9	94.0	94.0	87.8						
	B	89.5	91.8	91.8	85.8						
	C	82.4	80.2	80.1	74.9						
	D	84.8	89.2	89.2	83.3						
	E	91.5	94.3	94.2	88.0						
	F	82.7	87.2	87.2	81.5						
	SYSTEM	86.5	89.5	89.4	83.5			744	695	622	68.4
9/87	A	90.3	84.2	84.1	81.1						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 2 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
10/87	B	78.5	79.6	79.5	76.7						
	C	94.4	94.5	95.9	91.1						
	D	88.2	72.8	72.8	70.1						
	E	90.1	85.3	85.3	82.2						
	F	87.9	87.2	87.2	84.0						
	SYSTEM	88.2	83.9	84.1	80.9			720	694	582	66.1
	A	96.4	96.2	96.2	93.0						
	B	81.9	83.2	83.2	80.4						
	C	90.3	86.6	86.6	83.7						
	D	92.5	89.3	89.3	86.3						
	E	96.6	98.0	98.1	94.8						
	F	93.4	85.8	85.8	82.9						
	SYSTEM	91.8	89.9	89.9	86.9			744	719	646	75.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH OCTOBER 1987.

11/87	A	7.1	41.0	41.2	2.9					
	B	7.1	46.8	47.1	3.3					
	C	7.1	0.0	0.0	0.0					
	D	7.1	25.4	25.5	1.8					
	E	7.1	46.8	47.1	3.3					
	F	7.1	31.2	31.4	2.2					
	SYSTEM	7.1	31.9	32.0	2.3		720	51	16	0.5

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT WAS OFF-LINE FOR A SCHEDULED OUTAGE AND RESERVE SHUTDOWN.

12/87	A	97.6	89.5	89.5	89.5					
	B	93.8	87.1	87.1	87.1					
	C	99.5	88.4	88.4	88.4					
	D	96.0	82.7	82.7	82.7					
	E	96.1	93.5	93.5	93.5					
	F	97.8	84.5	84.5	84.5					
	SYSTEM	96.8	87.6	87.6	87.6		744	744	652	75.6

** PROBLEMS/SOLUTIONS/COMMENTS

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

SECTION 13
DESIGN AND PERFORMANCE DATA FOR OPERATIONAL DOMESTIC FGD SYSTEMS

COMPANY NAME	PENNSYLVANIA POWER	
PLANT NAME	BRUCE MANSFIELD	
UNIT NUMBER	3	
CITY	SHIPPINGPORT	
STATE	PENNSYLVANIA	
REGULATORY CLASSIFICATION	C	
PARTICULATE EMISSION LIMITATION - NG/J	32.	(0.075 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	2360	
GROSS UNIT GENERATING CAPACITY - MW	835	
NET UNIT GENERATING CAPACITY W/FGD - MW	800	
NET UNIT GENERATING CAPACITY WO/FGD - MW	825	
EQUIVALENT SCRUBBED CAPACITY - MW	835	

*** UNIT DATA - BOILER AND STACK

BOILER SUPPLIER	FOSTER WHEELER	
BOILER TYPE	PULVERIZED COAL	
BOILER SERVICE LOAD	BASE	
DESIGN BOILER FLUE GAS FLOW - CU.M/S	1580.86	(3350000 ACFM)
BOILER FLUE GAS TEMPERATURE - C	140.6	(285 F)
STACK HEIGHT - M	183.	(600 FT)
STACK SHELL	CONCRETE	
STACK TOP DIAMETER - M	5.9	(19.2 FT)

*** FUEL DATA

FUEL TYPE	COAL	
FUEL GRADE	BITUMINOUS	
AVERAGE HEAT CONTENT - J/G	27912.	(12000 BTU/LB)
RANGE HEAT CONTENT - BTU/LB		****
AVERAGE ASH CONTENT - %	12.50	
RANGE ASH CONTENT - %	11.5-13.5	
AVERAGE MOISTURE CONTENT - %	7.00	
RANGE MOISTURE CONTENT - %	5.5-8.5	
AVERAGE SULFUR CONTENT - %	4.30	
RANGE SULFUR CONTENT - %	3.0-4.0	
AVERAGE CHLORIDE CONTENT - %	*****	
RANGE CHLORIDE CONTENT - %	****	

*** PARTICLE CONTROL

*** MECHANICAL COLLECTOR

NUMBER	0
TYPE	NONE

*** ESP

NUMBER	4	
NUMBER OF SPARES	0	
TYPE	COLD SIDE	
SUPPLIER	LODGE-COTTRELL	
INLET FLUE GAS CAPACITY - CU.M/S	395.2	(837500 ACFM)
INLET FLUE GAS TEMPERATURE - C	140.6	(285 F)
PRESSURE DROP - KPA	0.8	(3. IN-H2O)
PARTICLE REMOVAL EFFICIENCY - %	95.0	

*** 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

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

** GENERAL DATA		
SALEABLE PRODUCT/THROWAWAY PRODUCT	THROWAWAY PRODUCT	
SO2 REMOVAL MODE	WET SCRUBBING	
PROCESS TYPE	LIME	
PROCESS ADDITIVES	NONE	
SYSTEM SUPPLIER	M.W. KELLOGG	
A-E FIRM	GILBERT/COMMONWEALTH ASSOCIATES	
DEVELOPMENT LEVEL	FULL SCALE	
NEW/RETROFIT	NEW	
UNIT DESIGN PARTICLE REMOVAL EFFICIENCY - %	95.00	
UNIT DESIGN SO2 REMOVAL EFFICIENCY - %	92.20	
ENERGY CONSUMPTION - %	3.0	
CURRENT STATUS	1	
COMMERCIAL START-UP	10/1980	
INITIAL START-UP	6/1980	
CONTRACT AWARDED	6/1977	
** DESIGN AND OPERATING PARAMETERS		
DESIGN COAL SULFUR CONTENT - %	4.75	
DESIGN COAL HEAT CONTENT - J/G	27679.4	(11900 BTU/LB)
DESIGN COAL ASH CONTENT - %	19.70	
DESIGN CHLORIDE CONTENT - %	*****	
** QUENCHER/PRESATURATOR		
NUMBER	0	
** ABSORBER		
NUMBER	5	
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	32.5 WIDE X 15 HIGH X 112.8 LONG	
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	NONE	
NUMBER OF CONTACTING ZONES	6	
LIQUID RECIRCULATION RATE - LITER/S	4158.	(66000 GPM)
L/G RATIO - L/CU.M	10.5	(78.8 GAL/1000 ACF)
GAS-SIDE PRESSURE DROP - KPA	0.4	(1.5 IN-H2O)
SUPERFICAL GAS VELOCITY - M/SEC	6.7	(22.0 FT/S)
INLET GAS FLOW - CU. M/S	395.22	(837500 ACFM)
INLET GAS TEMPERATURE - C	140.6	(285 F)
SO2 REMOVAL EFFICIENCY - %	92.5	
PARTICLE REMOVAL EFFICIENCY - %	90.0	
** 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	
MANUFACTURER	HEIL	
CONFIGURATION	VERTICAL	
NUMBER OF STAGES	1	
NUMBER OF PASSES PER STAGE	3	
SUPERFICAL GAS VELOCITY - M/S	6.1	(20.0 FT/S)
CONSTRUCTION MATERIAL GENERIC TYPE	ORGANIC	
CONSTRUCTION MATERIAL SPECIFIC TYPE	POLYPHENYLENE	
WASH WATER SOURCE	THICKENER OVERFLOW	

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

** 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	4
NUMBER OF SPARES	0
DESIGN	CENTRIFUGAL
SUPPLIER	WESTINGHOUSE
FUNCTION	UNIT
APPLICATION	FORCED DRAFT
SERVICE	DRY
CONSTRUCTION MATERIAL GENERIC TYPE	CARBON STEEL
** DAMPERS	
NUMBER	5
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	5
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	4
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	8
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	4
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
** DUCTWORK	
LOCATION	INLET UP TO DAMPER
SHELL GENERIC MATERIAL TYPE	CARBON STEEL

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

SHELL SPECIFIC MATERIAL TYPE	AISI 1110
LINER GENERIC MATERIAL TYPE	NONE
LINER SPECIFIC MATERIAL TYPE	N/A
** DUCTWORK	
LOCATION	DAMPER TO ABSORBER
SHELL GENERIC MATERIAL TYPE	HIGH ALLOY
SHELL SPECIFIC MATERIAL TYPE	NICKEL BASE/CHROMIUM-IRON-MOLYBDENUM
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
LINER SPECIFIC MATERIAL TYPE	GLASS FLAKE-FILLED POLYESTER
** REAGENT PREPARATION EQUIPMENT	
FUNCTION	SLAKER
DEVICE	DETENTION
DEVICE TYPE	N/A
MANUFACTURER	DORR OLIVER
** TANKS	
SERVICE	NUMBER
-----	-----
ABSORBER RECYCLE	****
REAGENT PREP PRODUCT	****
THICKENER OVERFLOW	****
LIME TRANSFER	****
FLY ASH & THICKENER UNDERFLOW	****
** PUMPS	
SERVICE	NUMBER
-----	-----
SLURRY RECIRCULATION	6
SLURRY TRANSFER FROM STORAGE TANK	****
SLURRY TRANSFER FROM SLAKER	****
THICKENER UNDERFLOW	****
THICKENER OVERFLOW	****
MIST ELIMINATOR WASH	****
** SOLIDS CONCENTRATING/DEWATERING	
DEVICE	THICKENER
NUMBER	1
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	REACTION TANK BLEED
FEED STREAM CHARACTERISTICS	10% SOLIDS
OUTLET STREAM CHARACTERISTICS	30-40% SOLIDS
OUTLET STREAM DISPOSITION	SLUDGE TREATMENT TANK
OVERFLOW STREAM DISPOSITION	MIST ELIMINATOR WASH TANK
*** SALEABLE BYPRODUCTS	
NATURE	NONE
DISPOSITION	N/A
*** SLUDGE	
** TREATMENT	
METHOD	FIXATION
DEVICE	MIX TANK
PROPRIETARY PROCESS	DRAVO 'CALCILOX!
INLET QUALITY - %	10.0

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

PROBLEMS WITH MIST CARRYOVER HAVE RESULTED IN THE INSTALLATION OF BAFFLES AT THE MIST ELIMINATOR TROUGHS.

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

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

SINCE STARTUP PROBLEMS HAVE OCCURRED AS A RESULT OF H2S GAS GENERATION IN DEAD SPOTS OF THE REACTION TANKS. THE TANK AGITATORS ARE BEING RELOCATED.

1/81 SYSTEM 744

2/81 SYSTEM 672

3/81 SYSTEM 744

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE FIRST QUARTER 1981 THE UTILITY REPORTED THAT THE FGD SYSTEM AVAILABILITY WAS 99.92%.

4/81 SYSTEM 720

5/81 SYSTEM 744

6/81 SYSTEM 97.8 720 614

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT THE YEAR TO DATE UNIT AVAILABILITY WAS 80.9 %.

DURING THE SECOND QUARTER NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED. THE UTILITY REPORTED THAT THE YEAR TO DATE FGD SYSTEM AVAILABILITY WAS 96.5 %.

7/81 SYSTEM 744

8/81 SYSTEM 99.1 744

9/81 SYSTEM 99.6 720

** PROBLEMS/SOLUTIONS/COMMENTS

OVERALL FGD SYSTEM AVAILABILITY WAS NOT REPORTED FOR THE MONTH OF JULY. THE MAJOR PROBLEM ENCOUNTERED DURING THE THIRD QUARTER WAS MIST ELIMINATOR BUILDUP RESULTING IN DOWN TIME FOR CLEANING.

THE YEAR TO DATE AVAILABILITY OF THE FGD SYSTEM (THROUGH AUGUST) WAS REPORTED TO BE 97.2%.

10/81 SYSTEM 99.2 744

11/81 SYSTEM 100.0 720

** PROBLEMS/SOLUTIONS/COMMENTS

DURING THE END OF SEPTEMBER AND PART OF OCTOBER THE BOILER WAS TAKEN OFF-LINE FOR SCHEDULED MAINTENANCE.

12/81 SYSTEM 100.0 744

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO FGD-RELATED PROBLEMS OCCURRED DURING DECEMBER

1/82 SYSTEM 99.9 744

2/82 SYSTEM 100.0 672

3/82 SYSTEM 99.9 744

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 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 FGD SYSTEM PERFORMANCE WAS OUTSTANDING FOR THE FIRST QUARTER 1982.

4/82	A	99.9							
	B	99.9							
	C	99.9							
	D	99.9							
	E	99.9							
	SYSTEM	100.0	100.0		85.8	720	618	618	62.6
5/82	A	100.0							
	B	100.0							
	C	100.0							
	D	64.3							
	E	93.2							
	SYSTEM	100.0	100.0		90.5	744	673	673	58.9
6/82	A	100.0							
	B	100.0							
	C	100.0							
	D	37.4							
	E	100.0							
	SYSTEM	100.0	100.0		100.0	720	720	720	72.2

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER OF 1982.

7/82	A	96.5							
	B	100.0							
	E	96.8							
	D	96.0							
	E	74.1							
	SYSTEM	100.0	100.0		100.0	744	744	744	82.6
8/82	A	99.3							
	B	89.4							
	C	100.0							
	D	100.0							
	E	100.0							
	SYSTEM	100.0	100.0		97.4	744	725	725	71.7
9/82	A	96.5							
	B	100.0							
	C	100.0							
	D	82.3							
	E	100.0							
	SYSTEM	100.0	100.0		99.3	720	715	715	66.3

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1982.

10/82	A	100.0							
	B	95.3							
	C	94.8							
	D	100.0							
	E	100.0							
	SYSTEM	100.0	100.0		99.6	744	741	741	66.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 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-RELATED PROBLEMS WERE REPORTED DURING OCTOBER.

11/82	A	14.4							
	B	14.4							
	C	14.4							
	D	14.4							
	E	14.4							
	SYSTEM	18.0	100.0		14.4		720	104	104 5.2

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED BOILER OUTAGE OCCURRED DURING NOVEMBER.

12/82	A	98.0							
	B	99.3							
	C	92.6							
	D	100.0							
	E	100.0							
	SYSTEM	100.0	100.0		52.4		744	390	390 26.0

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD-RELATED PROBLEMS WERE REPORTED DURING DECEMBER.

1/83	A	94.3							
	B	99.3							
	C	99.1							
	D	100.0							
	E	100.0							
	SYSTEM	100.0	100.0		94.8		744	705	705 58.5

2/83	A	100.0							
	B	95.4							
	C	100.0							
	D	87.4							
	E	96.4							
	SYSTEM	100.0	100.0		100.0		672	672	672 62.5

3/83	A	97.7							
	B	94.5							
	C	96.0							
	D	100.0							
	E	100.0							
	SYSTEM	100.0	100.0		90.6		744	674	674 59.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE FIRST QUARTER OF 1983.

4/83	A	91.4							
	B	97.2							
	C	99.9							
	D	96.3							
	E	99.9							
	SYSTEM	100.0	100.0		91.7		720	660	660 61.7

5/83	A	91.0							
	B	100.0							
	C	100.0							

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	D	100.0									
	E	100.0									
	SYSTEM	100.0	100.0		100.0			744	744	744	64.7
6/83	A	80.9									
	B	97.5									
	C	96.7									
	D	97.4									
	E	74.6									
	SYSTEM	100.0	100.0		100.0			720	720	720	71.3
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE SECOND QUARTER OF 1983.											
7/83	A	100.0									
	B	98.1									
	C	100.0									
	D	100.0									
	E	100.0									
	SYSTEM	100.0						744	744		72.9
8/83	A	75.1									
	B	100.0									
	C	88.3									
	D	93.2									
	E	96.9									
	SYSTEM	100.0						744	667		62.5
9/83	A	88.7									
	B	100.0									
	C	87.7									
	D	88.8									
	E	97.3									
	SYSTEM	100.0						720	720		61.1
** PROBLEMS/SOLUTIONS/COMMENTS											
THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE THIRD QUARTER OF 1983.											
10/83	A	75.9									
	B	100.0									
	C	100.0									
	D	100.0									
	E	100.0									
	SYSTEM	100.0						744	658		52.0
** PROBLEMS/SOLUTIONS/COMMENTS											
NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING OCTOBER.											
11/83	A	100.0									
	B	100.0									
	C	38.8									
	D	100.0									
	E	95.2									
	SYSTEM	100.0						720	718		65.6

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 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 MODULE C MIST ELIMINATORS WERE REPLACED DURING OCTOBER.

12/83	A	96.5						
	B	100.0						
	C	100.0						
	D	91.2						
	E	80.9						
	SYSTEM	100.0			744	637		55.8
1/84	A	98.2						
	B	100.0						
	C	100.0						
	D	95.9						
	E	96.2						
	SYSTEM	100.0			744	712		62.3
2/84	A	33.1						
	B	33.1						
	C	33.1						
	D	33.1						
	E	33.1						
	SYSTEM	41.4			696	230		21.4

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD-RELATED PROBLEMS WERE REPORTED DURING THE PERIOD OF DECEMBER FEBRUARY 1984.

3/84	A	0.0		0.0				
	B	0.0		0.0				
	C	0.0		0.0				
	D	0.0		0.0				
	E							
	SYSTEM	0.0		0.0	744	0	0	0.0

** PROBLEMS/SOLUTIONS/COMMENTS

UNIT 3 WAS OFF LINE DUE TO A SCHEDULED OUTAGE ON THE TURBINE-GENERATOR.

4/84	A	43.3						
	B	43.3						
	C	43.3						
	D	43.3						
	E	43.3						
	SYSTEM	54.1			720	240		15.8

** PROBLEMS/SOLUTIONS/COMMENTS

BRUCE MANSFIELD 3 ENDED A SCHEDULED TURBINE OUTAGE ON APRIL 17, 1984.

5/84	A	100.0						
	B	100.0						
	C	95.6						
	D	92.0						
	E	93.0						
	SYSTEM	100.0			744	707		73.3
6/84	A	100.0						
	B	86.2						
	C	50.9						

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

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

	D	100.0					
	E	100.0					
	SYSTEM	100.0			720	682	73.6
7/84	A	91.3					
	B	86.4					
	C	74.8					
	D	93.6					
	E	89.3					
	SYSTEM	100.0			744	678	66.8
8/84	A	100.0					
	B	85.3					
	C	100.0					
	D	84.4					
	E	100.0					
	SYSTEM	100.0			744	744	78.6

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD RELATED PROBLEMS WERE REPORTED FROM MAY THROUGH AUGUST 1984.

9/84	A	86.4					
	B	73.6					
	C	100.0					
	D	89.8					
	E	85.4					
	SYSTEM	100.0			720	720	80.2
10/84	A	96.6					
	B	86.1					
	C	89.8					
	D	91.7					
	E	89.4					
	SYSTEM	100.0			744	745	85.7
11/84	A	100.0					
	B	85.0					
	C	100.0					
	D	88.8					
	E	85.0					
	SYSTEM	100.0			720	622	71.3
12/84	A	100.0					
	B	100.0					
	C	100.0					
	D	89.1					
	E	76.6					
	SYSTEM	100.0			744	724	77.5

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT NO MAJOR FGD-RELATED PROBLEMS WERE ENCOUNTERED DURING THE MONTHS OF SEPTEMBER THRU DECEMBER 1984.

1/85	A	100.0					
	B	56.8					
	C	76.4					
	D	100.0					
	E	96.5					
	SYSTEM	100.0			744	744	83.8
2/85	A	100.0					

-----PERFORMANCE DATA-----										
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2 PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	89.2								
	C	82.2								
	D	100.0								
	E	73.7								
	SYSTEM	89.0					672	630		70.3

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS OF JANUARY OR FEBRUARY.

3/85	A	2.5								
	B	25.4								
	C	25.4								
	D	25.4								
	E	25.4								
	SYSTEM	20.8					744	189		18.0

** PROBLEMS/SOLUTIONS/COMMENTS

THE UTILITY REPORTED THAT A SCHEDULED BOILER/SCRUBBER OUTAGE BEGAN ON MARCH 8.

4/85	A	92.6								
	B	99.9								
	C	37.5								
	D	94.8								
	E	92.8								
	SYSTEM	83.5					720	701		73.8
5/85	A	94.2								
	B	88.3								
	C	79.2								
	D	92.6								
	E	93.3								
	SYSTEM	89.5					744	743		74.5
6/85	A	100.0								
	B	100.0								
	C	100.0								
	D	84.3								
	E	100.0								
	SYSTEM	100.0					720	618		60.0
7/85	A	91.2								
	B	100.0								
	C	90.5								
	D	95.0								
	E	81.8								
	SYSTEM	100.0					744	744		78.8
8/85	A	100.0								
	B	87.3								
	C	88.3								
	D	100.0								
	E	100.0								
	SYSTEM	100.0					744	744		76.5
9/85	A	79.9								
	B	100.0								
	C	100.0								
	D	100.0								
	E	100.0								
	SYSTEM	100.0					720	669		69.4

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

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

10/85	A	93.3									
	B	100.0									
	C	86.4									
	D	85.1									
	E	84.4									
	SYSTEM	100.0						744	744		78.2
11/85	A	100.0									
	B	65.6									
	C	100.0									
	D	100.0									
	E	87.6									
	SYSTEM	100.0						720	720		82.3
12/85	A	92.7									
	B	88.6									
	C	93.4									
	D	100.0									
	E	58.5									
	SYSTEM	100.0						744	744		86.7

** PROBLEMS/SOLUTIONS/COMMENTS

NO FGD SYSTEM-RELATED PROBLEMS WERE REPORTED BY THE UTILITY FOR THE MONTHS
OF APRIL THROUGH DECEMBER.

1/86	A	69.4								
	B	80.6								
	C	78.5								
	D	88.7								
	E	84.7								
	SYSTEM	100.0					744	660		74.2
2/86	A	66.1								
	B	85.6								
	C	87.8								
	D	87.8								
	E	76.9								
	SYSTEM	100.0					672	590		70.8
3/86	A	66.8								
	B	77.4								
	C	83.7								
	D	85.3								
	E	85.3								
	SYSTEM	99.7					744	635		77.3
4/86	A	99.9								
	B	80.4								
	C	99.9								
	D	99.9								
	E	75.3								
	SYSTEM	100.0					720	719		92.7
5/86	A	89.1								
	B	92.3								
	C	84.9								
	D	58.7								
	E	88.4								
	SYSTEM	100.0					744	708		80.6
6/86	A	100.0								

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

-----PERFORMANCE DATA-----											
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART.	PER HOURS	BOILER HOURS	FGD HOURS	CAP. FACTOR
	B	97.1									
	C	69.0									
	D	96.1									
	E	85.7									
	SYSTEM	100.0						720	720		88.2
7/86	A	81.7									
	B	96.2									
	C	93.0									
	D	84.8									
	E	89.9									
	SYSTEM	100.0						744	716		80.3
8/86	A	81.3									
	B	92.7									
	C	97.0									
	D	97.0									
	E	74.6									
	SYSTEM	100.0						744	722		83.4
9/86	A	75.3									
	B	74.0									
	C	96.7									
	D	96.7									
	E	90.0									
	SYSTEM	100.0						720	696		75.8

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE PERIOD JANUARY THROUGH SEPTEMBER 1986.

10/86	A	54.6								
	B	43.3								
	C	42.2								
	D	48.7								
	E	36.2								
	SYSTEM	56.2					744	405		45.2
11/86	A	56.1								
	B	44.9								
	C	56.1								
	D	56.1								
	E	56.1								
	SYSTEM	67.3					720	404		42.4

** PROBLEMS/SOLUTIONS/COMMENTS

A SCHEDULED BOILER OUTAGE BEGAN IN OCTOBER AND LASTED UNTIL NOVEMBER.

12/86	A	97.8								
	B	95.2								
	C	97.8								
	D	85.8								
	E	97.8								
	SYSTEM	100.0					744	728		79.3

** PROBLEMS/SOLUTIONS/COMMENTS

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

1/87 A 78.8

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	B	78.8							
	C	78.8							
	D	78.8							
	E	78.8							
	F	78.8							
	SYSTEM	94.5					744	586	62.0
2/87	A	1.2							
	B	1.2							
	C	1.2							
	D	1.2							
	E	1.2							
	SYSTEM	1.5					672	8	0.0
** PROBLEMS/SOLUTIONS/COMMENTS									
A SCHEDULED BOILER OUTAGE OCCURRED FROM JANUARY TO FEBRUARY 1987.									
3/87	A	91.1							
	B	91.1							
	C	91.1							
	D	91.1							
	E	91.1							
	SYSTEM	100.0					744	678	62.5
4/87	A	96.0							
	B	72.5							
	C	96.0							
	D	94.4							
	E	90.6							
	SYSTEM	100.0					720	691	76.1
5/87	A	100.0							
	B	96.2							
	C	100.0							
	D	100.0							
	E	100.0							
	SYSTEM	100.0					744	744	84.8
6/87	A	100.0							
	B	100.0							
	C	80.4							
	D	100.0							
	E	78.9							
	SYSTEM	100.0					720	720	84.8
7/87	A	93.7							
	B	81.2							
	C	87.2							
	D	87.6							
	E	93.7							
	SYSTEM	100.0					744	697	82.8
8/87	A	88.4							
	B	74.1							
	C	88.4							
	D	88.4							
	E	37.4							
	SYSTEM	94.2					744	658	68.6
9/87	A	75.8							
	B	58.1							
	C	84.6							

UTILITY FGD SURVEY: JANUARY - DECEMBER 1987

PENNSYLVANIA POWER: BRUCE MANSFIELD 3 (CONT.)

-----PERFORMANCE DATA-----									
PERIOD	MODULE	AVAILABILITY	OPERABILITY	RELIABILITY	UTILIZATION	% REMOVAL SO2	PART. HOURS	PER BOILER HOURS	FGD CAP. HOURS FACTOR
	D	76.7							
	E	81.5							
	SYSTEM	94.2					720	609	68.9
10/87	A	88.6							
	B	100.0							
	C	85.8							
	D	100.0							
	E	97.0							
	SYSTEM	100.0					744	745	88.5
11/87	A	97.2							
	B	85.0							
	C	70.1							
	D	80.7							
	E	97.5							
	SYSTEM	100.0					720	714	79.2
12/87	A	99.6							
	B	90.6							
	C	99.6							
	D	99.6							
	E	99.6							
	SYSTEM	100.0					744	741	77.5

** PROBLEMS/SOLUTIONS/COMMENTS

NO MAJOR FGD SYSTEM-RELATED PROBLEMS WERE REPORTED FOR THE MONTHS OF MARCH THROUGH DECEMBER 1987.