REPORT OF THE NEW SOURCE PERFORMANCE TESTING CONDUCTED ON UNIT NO. 1 BOILER AT THE WHITE BLUFF GENERATING STATION

Submitted to:

ARKANSAS POWER AND LIGHT COMPANY
Little Rock, Arkansas

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February 9, 1981

80-816-800

WB_00006255

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1.0 INTRODUCTION

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This report presents the results of the emission testing conducted by Environmental Science and Engineering, Inc. (ESE) on the Unit No. 1 steam generator at Arkansas Power and Light Company's (AP&L) White Bluff Generating Station. The White Bluff Generating Station is located two miles southeast of Redfield, Arkansas which is approximately 23 miles south of Little Rock off Highway 65.

The purpose of the testing was to demonstrate compliance of the emissions from the Unit No. 1 steam generator with the New Source Performance Standards (NSPS) as cited in the Code of Federal Regulations Title 40, Part 60, Subpart D, and revised by 44 FR 33612 June 11, 1979.

The testing was conducted through the midwest office of ESE located in St. Louis, Missouri.

The testing was conducted on two separate occasions, January 15, 1981 and January 20-21, 1981. The first set of tests (1/15/81) were conducted with Unit No. 1 operating at a load of 840 megawatts (gross) and the second set of tests (1/20-21/81) were conducted with Unit #1 at a gross load of 900 mw.

The results of the testing are summarized in Section 2.0 of this report. The testing procedures, equipment, analytical methods, and sample custody are described in Section 3.0, The raw field data, laboratory data, emission calculations, process operation logs, coal analysis data, calibration data, and personnel resumes/qualifications are presented in the Appendices.

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The following is a listing of personnel present during the testing:

1. Andy Polcyn, ESE, Project Manager
2. Steven Neck, ESE
3. Bob Morgan, ESE
4. Roger Lawson, Production Engineer, Arkansas Power and Light--1/15/81 and 1/20/81
5. Tom Reed, Manager of Engineering and Technical Support, Arkansas Power and Light--1/15/81
6. Ken Craven, Plant Engineering Supervisor, Arkansas Power and Light--1/15/81 and 1/20/81
7. Gerald Driggers, Development and Testing Engineer, Combustion Engineering--1/15/81 and 1/20/81
8. Robert Ressel, Engineering Observer, Environmental Protection Agency Region VI (PEDCO Environmental)--1/15/81
9. Paul Means, Chief of Enforcement Branch, State of Arkansas Department of Pollution Control and Ecology--1/15/81
10. Sam McMullen, Air Resources Specialist, State of Arkansas Department of Pollution Control and Ecology--1/15/81
11. Harold Lewis, Air Resources Specialist, State of Arkansas Department of Pollution Control and Ecology--1/15/81

1.1 DESCRIPTION OF FACILITY TESTED

The White Bluff Generating Station consists of two coal-fired steam electric generating units, each unit rated at 900 megawatts (gross). Unit No. 1 was brought on line in August 1980, while Unit No. 2 is still under construction.

Unit No. 1 consists of a General Electric turbine-generator with the boiler and adjacent systems being manufactured by Combustion Engineering, Inc. Flyash removal is effected employing a hot side electrostatic precipitator manufactured by C-E Walther Inc. (a subsidiary of

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Combustion Engineering). Sulfur dioxide emissions are controlled by burning a low sulfur Wyoming Coal. The electrostatic precipitor has a design operating temperature range of approximately 800°-850°F at full load. Upon leaving the precipitator, the flue gases are discharged through a 1000 foot stack. The breeching enters the stack at approximately 275 feet above grade. The stack serves both Units No. 1 and No. 2. The exhaust gases from each unit are vented through separate insulated, steel liners that are housed inside a single concrete shell.

1.2 TESTING CONDITIONS AND TEST SITE DESCRIPTION

All emissions tests were conducted in the stack from the testing platform at the 500 foot level (above grade). The particulate samples were collected through four, four-inch diameter, sample ports located 90° apart along the stack cross-section with each port facing one of the cardinal compass points. Figure 1-1 is a cross-sectional diagram, showing the stack liner dimensions, and the location of the sampling points.

The tests conducted on both dates were performed while Unit No. 1 was operated at normal steady-state conditions at the loads stated earlier. The hourly averages for gross megawatt output and fuel flow are presented in the summary of test results found in Section 2.0. All other pertinent operating data is presented in the Appendices.

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Traverse point No.	Distance (% of diameter)
1	4.4
2	14.6
3	29.6

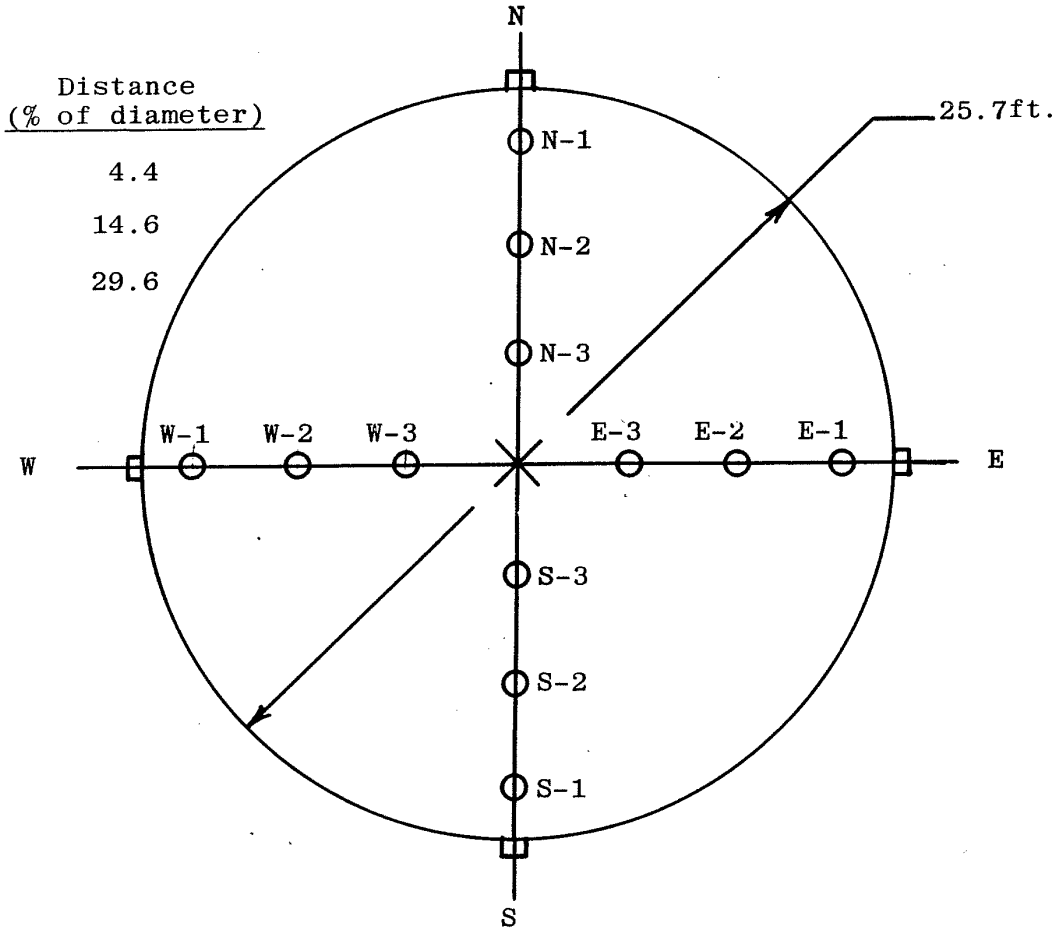

Figure 1-1

CROSS SECTION OF UNIT NO.1 STACK LINER

SHOWING LOCATION OF SAMPLING POINTS

SOURCE: Environmental Science and Engineering

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.

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2.0 SUMMARY OF TEST RESULTS AND DISCUSSION

2.0 SUMMARY OF TEST RESULTS

The summary of the test results for particulates emissions, sulfur dioxide (SO_2) emissions, and nitrogen oxides (NO_x) emissions are presented in Tables 2-1, 2-2, and 2-3, respectively.

The test data show that the emissions for all three pollutants are well within the New Source Performance Standards (NSPS) as cited in the Code of Federal Regulations, Title 40, Part 60, Subpart D, as revised June 11, 1979.

Table 2-1 gives the particulate emission rates for each of the four test runs on 1/15/81 and each of the three test runs on 1/20-21/81. The particulate emission standard of 0.10 $lb/10^6$ Btu was not exceeded during any of the test runs.

Table 2-2 shows the SO_2 emission rates, as calculated from the two samples collected during each of three test runs on 1/15/81. The results again demonstrate that the SO_2 emission standard of 1.2 $lb/10^6$ Btu was not exceeded. Because of the use of low sulfur fuel and the preliminary results of the tesing on 1/15/81, SO_2 testing was deemed unnecessary on the test date of 1/20-21/81.

Table 2-3 shows the average NO_x emission rates as calculated from four samples collected during each of the three test runs on 1/15/81 and 1/20-21/81. Again the NO_x emission standard of 0.70 $lb/10^6$ Btu was not exceeded during any of the test runs.

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Table 2-1 Summary of Particulate Test Results
White Bluff Generating Station Unit No. 1

PARAMETERS	Unit	Test Date 1/15/81				Test Date 1/20-21/81		
		Run #1	Run #2	Run #3	Run #4	Run #1	Run #2	Run #3
Average Generating Load (gross)*	MW	842				899		
Average Fuel Flow*	lb/hr	940,120				1,048,836		
Sample Period	min.	60	60	60	15	60	60	60
Barometric Pressure	in Hg.	29.40	29.38	29.47	29.47	29.2	29.23	29.24
Average Flue Static Pressure	in H_2O	-3.3	-3.3	-3.3	-3.3	-3.5	-3.5	-3.4
Average Flue Gas Temperature	°F	310.3	313.4	315.4	315.7	309.7	312.2	311.7
Average CO_2 in Flue Gas	%	12.2	13.0	13.0	11.8	13.0	13.2	12.8
Average O_2 in Flue Gas	%	6.6	6.0	6.0	7.2	6.2	6.0	6.2
Average CO in Flue Gas	%	0	0	0	0	0	0	0
Average Moisture Content in Flue Gas	%	11.1	11.5	11.3	9.3	12.1	12.1	11.7
Flue Gas Molecular Weight	lb/lb⁻ mole	28.87	28.91	28.94	29.05	28.84	28.87	28.86
Flue Gas Velocity	fps	105.7	105.7	105.6	105.4	108.1	108.9	108.9
Flue Gas Flow Rate								
(actual conditions)	acfm	3,289,913	3,289,595	3,286,113	3,280,836	3,365,502	3,390,134	3,388,919
(standard conditions)	dscfm	1,945,582	1,936,469	1,939,323	1,979,110	1,963,614	1,973,622	1,983,908
Particulate Concentration	gr/scf	1.90×10^{-2}	1.59×10^{-2}	1.59×10^{-2}	4.04×10^{-2}	1.31×10^{-2}	1.36×10^{-2}	2.73×10^{-2}
Particulate Concentration	lb/scf	2.72×10^{-6}	2.28×10^{-6}	2.28×10^{-6}	5.77×10^{-6}	1.87×10^{-6}	1.95×10^{-6}	3.90×10^{-6}
F-factor**	dscf/10^6 Btu	9820	9820	9820	9820	9820	9820	9820
Particulate Emission Rate	lb/10^6 Btu	3.90×10^{-2}	3.10×10^{-2}	3.13×10^{-2}	8.64×10^{-2}	2.62×10^{-2}	2.68×10^{-2}	5.44×10^{-2}
Particulate Emission Rate	lb/hr	319.0	264.9	264.7	684.8	220.8	230.7	464.1
Isokinetic Variation	%	103.28	100.57	101.62	102.6	103.2	97.01	100.34
NSPS Limits for Particulates***	lb/10^6 Btu	0.10	0.10	0.10	0.10	0.10	0.10	0.10

* Data received from Unit No. 1 Control room
Data based on hourly averages during the testing period.

** As cited in the Federal Register per 40 CFR 60, last amended August 15, 1977, 42 FR 41122.

*** As cited in the Federal Register per 40 CFR 60, last amended November 22, 1976, 41 FR 51397.

Source: Environmental Science and Engineering, INc., 1981.

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Table 2-2 Summary of SO_2 Test Results
White Bluff Generating Station Unit No. 1

PARAMETERS	Units	TEST DATE 1/15/81					
		Run #1		Run #2		Run #3	
		Sample A	Sample B	Sample A	Sample B	Sample A	Sample B
Average Generating Load (gross)*	MW	845					
Sampling Period	min.	20	20	20	20	20	20
Barometric Pressure	in Hg	29.40	29.40	29.40	29.40	29.40	29.40
Average Dry Gas Meter Temperature	°F	50	48	46	45	45	46
Volume of Flue Gas Sampled	scf	.3599	.380	.4686	.3118	.370	.3477
Meter Box Correction Factor	unitless	.9134	.9134	.9134	.9134	.9134	.9134
Average CO_2 in Flue Gas	%	12.2	13.4	13.4	13.4	13.4	13.4
Average O_2 in Flue Gas	%	7.0	5.8	5.8	5.8	5.8	5.8
SO_2 Concentration	lb/scf	2.54×10^{-5}	1.17×10^{-5}	8.29×10^{-6}	1.09×10^{-5}	1.56×10^{-5}	8.82×10^{-6}
F-factor**	dscf/10^6 Btu	9,820	9,820	9,820	9,820	9,820	9,820
SO_2 Emission Rate	lb/10^6 Btu	.3756	.1589	.1127	.1479	.2114	.1199
New Source Performance Standard for SO_2***	lb/10^6 Btu	1.2	1.2	1.2	1.2	1.2	1.2

* Data Received from Unit No. 1 Control Room, data based on hourly averages during the test period.

** As cited in Federal Register per 40 CFR 60, amended last August 15, 1977, 42 FR 41122.

*** As cited in Federal Register per 40 CFR 60, last amended June 14, 1974, 39 FR 20790.

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Table 2-3 Summary of NO_x Test Results
White Bluff Generating Station Unit No. 1

PARAMETERS	Units	Test Date 1/15/81			Test Date 1/20-21/81		
		Run #1	Run #2	Run #3	Run #1	Run #2	Run #3
Average Generating Load (gross)*	MW		842			899	
Average Co_2 in Flue Gas	%	13.4	13.7	13.8	13.0	13.2	12.6
Average O_2 Flue Gas	%	6.1	5.9	5.8	6.2	6.0	6.4
Average No_x Concentration**	lb/dscf	3.61×10^{-5}	3.91×10^{-5}	3.238×10^{-5}	3.518×10^{-5}	3.74×10^{-5}	3.929×10^{-5}
Average NO_x Emission Rate**	$lb/10^6$ Btu	.5024	.5364	.4399	.4918	.5151	.5437
F-factor***	$dscf/10^6$ Btu	9,820	9,820	9,820	9,820	9,820	9,820
New Source Performance Standard for Nitric Oxide****	$lb/10^6$ Btu	0.70	0.70	0.70	0.70	0.70	0.70

* Data Received from Unit No. 1 Control Room, data is based on hourly averages during test period.

** As determined by averaging the calculated values from four individual grub samples.

*** As cited in the Federal Register per 40 CFR 60, last amended August 15, 1977, 42 FR 41122.

**** As cited in the Federal Register per 40 CFR 60, last amended March 7, 1978, 43 FR 9278.

Source: Environmental Science and Engineering, Inc., 1981.

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