United States
Environmental Protection
Agency

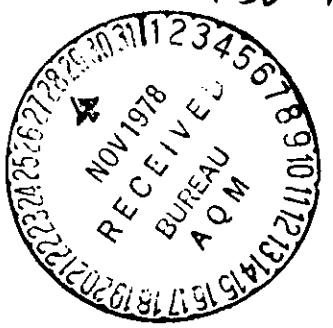
Region 4
345 Courtland Street NE
Atlanta GA 30308

Alabama, Georgia, Florida,
Mississippi, North Carolina,
South Carolina, Tennessee,
Kentucky

EPA

~~Scott Sheets~~
~~Duke Hartley~~
5, 53, 16

PSD-FL-008



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DEPT. OF
ENVIRONMENTAL REGULATION

Dr. J. P. Subramani, P.E., Chief
Bureau of Air Quality Management
Division of Environmental Programs
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32301

Dear Dr. Subramani:

Enclosed for your review and comment are the public notice and Preliminary PSD Determination for the City of Lakeland's proposed Unit 3 at its McIntosh Power Plant. The public notice is to appear in the Lakeland Ledger.

Please let us know if you have any comments on this determination.

Sincerely yours,

Winston A. Smith

Winston A. Smith
Chief
Air Programs Branch

Enclosures

11-29

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Review of a Proposed Air Pollution Source Pursuant to Environmental Protection Agency Rules for the Prevention of Significant Deterioration (PSD)

40 CFR 52.21

McIntosh Unit 3

City of Lakeland, Florida

Roger O. Pfaff

U.S. Environmental Protection Agency
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Conditions of Approval

1. For Particulate Emissions from the Boiler:

The source must meet an emission limit, as measured under part (5) as follows:

A. Particulate matter emitted to the atmosphere from the boiler shall not exceed:

Mode of Firing	lb/10^6 Btu Heat Input
Coal	0.044
Coal/Refuse	0.050
Oil	0.070
Oil/Refuse	0.075

2. For Sulfur Dioxide from the Boiler:

The source must meet an emission limit, as measured under part (5) as follows:

A. Sulfur dioxide emitted to the atmosphere from the boiler shall

I Introduction

The City of Lakeland, Florida, has applied to the U.S. Environmental Protection Agency to construct a fossil fuel and municipal waste-fired steam generator at its C. D. McIntosh, Jr. Power Plant in Lakeland, Florida. The proposed construction is subject to review under 40 CFR 52.21, Regulations for the Prevention of Significant Deterioration (PSD). Under these regulations, a modification to a source of air pollution in any one of 28 specified categories which will increase the emission potential of that source by more than 100 tons per year of any pollutant, is subject to review for each of those pollutants. One of these categories is fossil fuel-fired steam electric plants of more than 250 million BTU per hour heat input, of which the McIntosh Plant is one.

Paragraph (r) of the PSD regulations requires, in part, that EPA issue a Preliminary Determination whether the source should be approved, approved with conditions, or disapproved. It is the decision of EPA that the soruce should be approved with conditions. The conditions are included to insure that the applicant complies with emission control techniques and emission limits which are a part of the application. The conditions of approval follow on the next page.

not exceed 1.2 pound per million Btu heat input derived from solid fossil fuel.

B. A flue gas desulfurization system will be installed to treat all exhaust gases and will operate at a minimum SO_2 removal efficiency of 85 percent.

C. The burning of oil as an emergency fuel will be allowed only when the flue gas desulfurization system malfunctions to the extent that the burning of coal would cause emission limitations to be exceeded. Sulfur dioxide emitted to the atmosphere from the boiler shall not exceed 0.8 pound per million Btu derived from liquid fossil fuel.

3. For Particulate Emissions from Materials Handling Operations:

The applicant shall not cause to be discharged into the atmosphere from any coal processing and conveying equipment, coal storage system, coal transfer and loading system, limestone handling or storage operation, or flyash handling or storage operation, gases which exhibit 20 percent opacity or greater.

4. For NO_x Emissions from the Boiler:

The source must meet an emission limit, as measured under part (5) as follows:

A. NO_x emitted to the atmosphere from the boiler shall not exceed 0.7 pound per million Btu heat input when firing coal or coal/refuse.

B. NO_x emitted to the atmosphere from the boiler shall not exceed 0.3 pound per million Btu heat input when firing oil or oil/refuse.

5. Stack Testing

A. Within 60 days after achieving the maximum production rate at which the facility will be operated, but no later than 180 days after initial startup, the owner or operator shall conduct performance tests and furnish EPA a written report of the results of such performance tests. Performance tests shall be conducted for the 4 modes of boiler operation (i.e., coal, coal/refuse, oil, oil/refuse).

B. Performance tests shall be conducted and data reduced in accordance with methods and procedures specified by EPA. Reference Methods 1 through 5 as published in Appendix A of 40 CFR 60 will be used for particulate tests. Reference Method 6 will be used for SO_2 tests. Reference Method 7 will be used for NO_x tests.

C. Performance tests shall be conducted under such conditions as EPA shall specify based on representative performance of the facility. The owner or operator shall make available to EPA such records as may be necessary to determine the conditions of the performance tests.

D. The owner or operator shall provide EPA 30 days prior notice of the performance test to afford the opportunity to have an observer present.

E. The owner or operator shall provide or cause to be provided, performance testing facilities as follows:

i. Sampling ports adequate for test methods applicable to the facility.

ii. Safe sampling platform(s).

iii. Safe access to sampling platform(s).

iv. Utilities for sampling and testing equipment.

F. Each performance test shall consist of three separate runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified by EPA. For the purpose of determining compliance with an emission limitation, the arithmetic mean of results of the three runs shall apply. In the event that a sample is accidentally lost or conditions occur in which one of the three runs must be discontinued because of forced shutdown, failure of an irreplaceable portion of the sample train, extreme meteorological conditions, or other circumstances beyond the owner or operator's control, compliance may, upon the approval of EPA, be determined by using the arithmetic mean of the other two runs.

6. Continuous Monitoring Requirements

Continuous monitors shall be installed and operated in accordance with 40 CFR 60.45 and 60.13. In addition, a continuous SO_2 monitor shall be installed prior to the flue gas desulfurization system for purposes of calculating SO_2 removal efficiencies.

7. Excess Emission Reporting Requirements

In addition to the requirements of 40 CFR 60.7, each excess emission report shall include the periods of oil consumption due to flue gas desulfurization system malfunction.

II Background

On February 8, 1978, the City of Lakeland submitted a letter and attachments to EPA to apply under the PSD regulations to construct a new unit (Unit 3) at the McIntosh Plant. On February 24, 1978, further information was submitted which completed the application. At that time, PSD applications were reviewed under proposed regulations issued on November 3, 1978. Notice was given by EPA that any PSD permit which was issued after March 1, 1978, would be reviewed under the promulgated regulations due to be issued on March 1. Significant delay was encountered in issuing the new regulations. On June 19, 1978, the new PSD regulations were promulgated. Any source subject to PSD which did not receive a PSD permit before March 1, 1978, was made subject to the new regulations. Thus, the construction of Unit 3 is subject to the new regulations.

III Review Requirements

The pollutants for which potential emissions are greater than 100 tons per year, and therefore subject to review, are particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and hydrocarbons. Review of control technology and ambient impacts is required. For sources applying after August 7, 1978, ambient monitoring is required.

Certain portions of the PSD review may not be required if the proposed modification is subject to EPA's interpretative ruling, or if the source is a nonprofit health or education institution, or if the source has previously received approval under PSD and is only relocating. None of these exemptions applies in this case.

Other exemptions can apply to control technology review and ambient impact review. For control technology review, if allowable emissions of any pollutant are less than 50 tons per year, 1000 pounds per day and 100 pounds per hour, or if a modification is made to an existing facility and the emissions are offset by reductions elsewhere, review may not be required. None of these exemptions applies to Unit 3.

For ambient impact review and monitoring requirements, other exemptions are provided for. In addition to the allowable emission threshold, there are exemptions for temporary sources and for sources whose net emissions, after considering decreases, do not increase. None of these exemptions apply to Unit 3.

The one exemption which does apply is for monitoring. Since a complete application was submitted before August 7, 1978, no preconstruction monitoring is required.

A. Control Technology Review

The applicant is required to install best available control technology (BACT) for each pollutant, taking into account energy, environmental and economic impacts and other costs. EPA concludes that the systems proposed by the applicant represent BACT for particulate, SO_2 and nitrogen oxides. There is currently no applicable technology for reduction of hydrocarbons and carbon monoxide beyond what is accomplished in the boiler.

1. Particulate

The applicant will install a high efficiency electrostatic precipitator (ESP) to control particulate emissions. Emission limits have been specified by EPA for each firing mode. EPA data gathered for the purpose of setting standards of performance for this source type indicate an emission limit of 0.1 lb/mm BTU is achievable. Since the applicant has proposed emission limits more stringent than this, the proposed limits are based on data submitted by the applicant. An analysis of the selected control device, to predict the adequacy in meeting the emission limits, is included as Appendix A to this determination.

Bag filters are to be used to control particulate emissions from fly ash handling. Opacity limitations are imposed to insure proper design and operation.

A combination of liquid spray and bag filter systems will be used to control particulate emissions from coal handling and limestone handling. Opacity limitations are imposed to insure proper design and operation.

2. Sulfur Dioxide

The applicant has proposed the installation of a limestone scrubber which will revove 85% of the sulfur dioxide from the stack gases. At the time the application was submitted, EPA was preparing a proposed revision to the New Source Performance Standards (40CFR60) for power plants. Part of this revision eventually included a requirement for removal of 85% of the SO_2 from the stack gas. This requirement is considered BACT, and is included as a condition of approval. An analysis of the selected control device, to predict the adequacy of the control device, is included in this review as Appendix B.

3. Nitrogen Oxides

At the time the application was submitted to EPA, the current New Source Performance Standard for nitrogen dioxides was 0.7 lb/mm BTU. EPA has proposed (on September 11, 1978) to revise this requirement to 0.6 lb/mm BTU. Although EPA believes 0.6 lb/mm BTU is achievable, the applicant would at this time incur significant time delays in the project if this requirement were imposed, since the boiler design would have to be changed. Therefore, EPA concludes that 0.7 lb/mm BTU, which was proposed by the applicant, represents BACT when costs are considered.

4. Applicability of NSPS

As of this date, EPA has proposed revisions to the New Source Performance Standards for Power Plants. It is not known at this time whether the new standards will apply to Unit 3, or whether the promulgated standards will be different than the proposed standards. In general, the proposed standards are more stringent than the conditions of this approval, while the

current NSPS for power plants are less stringent than the conditions of this approval. Any future promulgation which applies to Unit 3 and is more stringent than any condition of approval will supercede the conditions of approval.

B. Impact Review

The PSD regulations require the following air quality impacts to be assessed by the applicant:

1) National Ambient Air Quality Standards (NAAQS)

2) PSD increments

3) Visibility, soils and vegetation

4) Impacts due to growth caused by proposed source

All these impacts were assessed by the applicant. Air quality modelling showed no violations of the NAAQS with all sources in the area of the McIntosh Plant in operation. Likewise, the PSD increment analysis showed no violations with Unit 3 operating at maximum load.

The percent consumption of the PSD increments caused by Unit 3 is presented in the following table:

Increment	Pollutant	
	Particulate	SO2
Annual	0	20%
24 hour	5%	45%
3 hour	N/A	32%

Impacts on visibility, soils and vegetation and on air quality due to growth were judged to be minimal.

The closest Class I area is Chassahowitzka Wilderness Area, about 100 km from Lakeland. There will be no impact from the proposed Unit 3 on this area.

The closest area where NAAQS is violated is the City of Mulberry, about 20 km away. Although particulate readings violating NAAQS have been recorded here recently, it is not yet designated as nonattainment. In any case, the impact of particulate emissions in this area from Unit 3 will be below the levels EPA considers significant.

Appendix A

Precipitator Review

Review of the precipitator is conducted using the Deutsch-Anderson equation,

$$A = \frac{V \ln \left(\frac{1}{1-E}\right)}{W \times \frac{60}{30.48}}$$

where A = Collection area of ESP, ft^2

E = Fractional removal of ash

W = Migration velocity of ash particles, cm/sec

V = Volumetric flow rate of flue gas, ACFM

The required efficiency is calculated using uncontrolled emission rates and emission rates required as a permit condition. Since the most difficult situation encountered by the precipitator will be when firing coal or coal and refuse, only these firing modes were investigated. Uncontrolled emission factors are calculated as follows:

Coal[1] lb/ton emitted = 17A, where

A = ash content of fuel, %

From the application, A = 15

so lb/ton = 17(15) = 255 lb/ton

Heat content, from application = 11,200 BTU/lb

$$255 \frac{lb}{ton} \times \frac{ton}{2000\ lb} \times \frac{lb}{11{,}200\ BTU} \times 10^6 =$$

11.4 lb/mm BTU uncontrolled

Solid waste [2]: lb/mmBTU = 6.7

Required efficiency for coal firing:

$$100 \times \frac{11.4 - .044}{11.4} = 99.6\%$$

Required efficiency for coal-waste firing:

$$.9(.996) + .1\left(\frac{6.7 - .05}{6.7}\right) = 99.6\%$$

Drift velocities:

For coal, a drift velocity of 12 cm/sec is commonly used for high sulfur coal. For coal and municipal refuse, a value of 4.0 cm/sec is reported as a conservative figure by EPA [2]. For 10% waste firing, the weighted drift velocity is 11.5 cm/sec.

For coal firing, $A = \dfrac{(1{,}125{,}993)\left(\ln \frac{1}{1-.996}\right)}{12 \times \frac{60}{30.48}} =$

$$263{,}192 \text{ ft}^2$$

for coal-waste firing,

$$A = \frac{(965{,}900)\left(\ln \frac{1}{1-.996}\right)}{11.5 \times \frac{60}{30.48}} =$$

$$235{,}587 \text{ ft}^2$$

The area of the selected precipitator is 701,730 ft^2. Therefore, the precipitator should easily meet the required emission limits.

References

1) Compilation of Air Pollutant Emission Factors, Third Edition, U.S. EPA, August, 1977

2) Draft Standards Support and Environmental Impact Statement, An Investigation of the Best Systems of Emission Reduction for Fossil Fuel - Municipal Refuse Fired Steam Generator Units, U.S. EPA, August, 1975

Appendix B

Scrubber Review

The selected scrubber is a wet limestone slurry spray tower enhanced by perforated trays and a venturi contactor. The removal efficiency was calculated by EPA from pilot plant data obtained at the TVA Shawnee Plant in Paducah, Kentucky, on a limestone spray tower.(1) Because of design improvements, the scrubber selected for Unit 3 may be superior in removal efficiency to the pilot plant at TVA. A design equation developed by EPA is as follows:

$$\text{Fractional Removal} = 1 - \exp\left\{-9.8 \times 10^{-5}(L/G)^{0.92} V^{0.19} \exp\left[pHi + 1.35 \times 10^{-4} (Mg)_e - 1.7 \times 10^{-4} (SO_2)i + 1.45 \times 10^{-5} Cl\right]\right\},$$

where:

Cl = dissolved chloride concentration, ppm

L/G = liquid to gas ratio, gal/1000 cf

(Mg)e = effective magnesium ion concentration

(ppm Mg^{++} - ppmCl /2.92)

pHi = scrubber inlet liquor pH

$(SO_2)i$ = inlet gas SO_2 concentration, ppm

V = gas velocity in scrubber, ft/sec

For coal firing, which would be the worst case situation, these values are:

Cl = 3000 (conservative)

L/G = 70 (this discounts venturi portion)

(Mg)e = 0

pHi = 6.0

$(SO_2)i$ = 1953

V = 7.92

Therefore, removal fraction is .888, or 88.8%.

This exceeds the requirement of 85%.

Reference

1) EPA Alkali Scrubbing Test Facility: Advanced Program, Third Progress Report, September, 1977, EPA-600/7-77-105.

Appendix C

Review of NO_x Control

The method for NO_x control is design of the coal burner to limit NO_x formation. The boiler manufacturer, Babcock and Wilcox, has supplied other boilers which meet the 0.7 lb/mm BTU limit using this burner design.