

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32301



BOB GRAHAM
GOVERNOR
VICTORIA J. TSCHINKEL
SECRETARY

January 11, 1982

Mr. Kent Williams, Chief
New Source Review Section
Air Facilities Branch
U.S. Environmental Protection
Agency, Region IV
345 Courtland Street
Atlanta, Georgia 30365

Dear Mr. Williams:

RE: PSD Permit Application - Kissimmee Utilities - PSD-FL-087

Enclosed please find a copy of the proof of publication of the public notice, the public comments and the Department's response to the public comments and Final Determination for the subject project. We recommend that the applicant be granted Authority to Construct, subject to the conditions in the Final Determination.

Sincerely,

C. H. Fancy, P.E.
Central Air Permitting

CHF:caa

SENTINEL STAR

Published Daily
Kissimmee, Osceola County, Florida

ADVERTISING CHARGE \$22.13

State of Florida } ss.
COUNTY OF ORANGE }

Before the undersigned authority personally appeared _____

Betty M. Kinney, who on oath says that

she is the Legal Advertising Representative of the Sentinel Star, a Daily newspaper published at Kissimmee, in Osceola County, Florida; that the attached copy of advertisement, being a Public Notice in the matter of A Modification to an existing air pollution source, etc.

_____ in the _____ Court, was published in said newspaper in the issues of October 28, 1981

Affiant further says that the said Sentinel Star is a newspaper published at Kissimmee, in said Osceola County, Florida, and that the said newspaper has heretofore been continuously published in said Osceola County, Florida, each Week Day and has been entered as second-class mail matter at the post office in Kissimmee in said Osceola County, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he/she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Betty M. Kinney

Sworn to and subscribed before me this 30th day

of December A.D., 1981

Maeoni C. Parks

Notary Public



Notary Public, State of Florida at Large
My Commission Expires Jan. 21, 1984

PUBLIC NOTICE

A modification to an existing air pollution source is being proposed by Kissimmee Utilities located in the City of Kissimmee, Osceola County, Florida. The proposed modification is the construction of a 49.9 MW combined cycle gas turbine. The modification will increase emissions of air pollutants, in tons per year, by the following amounts:

| PM | SO ₂ | NO _x | CO | VOC |
|----|-----------------|-----------------|-----|-----|
| 69 | 1700 | 1095 | 227 | 82 |

The proposed modification has been reviewed by the Florida Department of Environmental Regulation (FDER) under Chapter 403, Florida Statutes, and Federal regulation 40 CFR 52.21, Prevention of Significant Deterioration (PSD). The Department has made a preliminary determination that the construction can be approved provided certain conditions are met. A summary of the basis for the determination and the application for State and Federal permits submitted by Kissimmee Utilities are available for public review at the following offices:

Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

South Florida Subdistrict
Dept. of Environmental Regulation
2745 S. E. Morningside Blvd.
Port St. Lucie, Florida 33452

Kissimmee Public Library
305 E. Broadway
Kissimmee, Florida 32741

The maximum percentages of allowable PSD increments consumed by the proposed modification will be as follows:

| | Annual | 24-Hour | 3-Hour |
|-----------------|------------|------------|--------|
| PM | Negligible | Negligible | NA |
| SO ₂ | 5 | 11 | 9 |

Any person may submit written comments to FDER regarding the proposed modification. All comments, postmarked not later than 30 days from the date of notice, will be considered by FDER in making a final determination regarding approval for construction of this source. Those comments will be made available for public review on request. Furthermore, a public hearing can be requested by any person. Such request should be submitted within 14 days of the date of this notice. Letters should be addressed to:

Mr. C. H. Fancy
Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, Florida 32301

OS-37 Oct. 28, 1981

Response to Public Comment

Kissimmee Utilities

PSD-FL-087

Comments were received from Michael H. Dybevick, Environmental Science and Engineering, Inc. (ESE) and Mr. Tommie Gibbs of U.S. Environmental Protection Agency.

Mr. Dybevick questioned the Department's specific conditions in the Preliminary Determination.

The areas of question and DER's responses are as follows:

Comment

ESE request that condition No. 9 be modified to more nearly reflect the requirements of 40 CFR, Part 60, Subpart GG, Section 60.334 on which it is based. Specifically, they request 1) the requirement for determining the fuel heating value be deleted, 2) the option for developing a custom sampling schedule based on substantiating data be included, and 3) the provision for sampling only on each occasion that fuel is transferred to bulk storage be included.

Response

The Department considered the comments indicated above and modified specific condition No. 9 as follows:

Sulfur and nitrogen content of the fuel being fired in the gas turbine shall be determined and recorded as specified in the NSPS for Gas Turbines 40 CFR 60, Subpart GG, Section 60.334. The records of fuel oil usage will be kept by the company, available for regulatory agency's inspection, for a two year period.

This does not require analysis for fuel heating value. Regarding comment No. 2 and 3, the waiver of compliance test requirements may be accomplished in accordance with section 60.334(b)(1) and (2). Therefore, this option is available to the applicant and no change to the specific conditions is required.

Mr. Gibbs commented on the specific condition 3, plant operation time, and specific condition 7, compliance test.

Page Two

Comment

Continuous operation is 8,760 hours per year.

Response

The specific condition states the plant will be allowed to operate continuously (8,736 hours per year). We believe the statement "operate continuously" expresses the Department's intent that there is no time limitation on the operation of the generator and have not changed the condition in the final determination.

Comment

EPA asked if the required VE test should be a VOC test.

Response

The Department's intent was to require a VE test and thus the specific condition was not changed. The condition stated under what circumstances a VOC test will be requested.

Conclusion

The comments received were considered as indicated above in the development of the Department's Final Determination for the proposed construction of a 49.9 MW Combined Cycle Gas Turbine by Kissimmee Utilities.

Final Determination

Kissimmee Utilities

49.9 MW Combined Cycle Gas Turbine

Federal Permit Number:

PSD-FL-087

Florida Department of Environmental Regulation

Bureau of Air Quality Management

Central Air Permitting

January 11, 1982

| Table of Contents | Page |
|---|------|
| I. Synopsis of Application | 1 |
| A. Applicant Name and Address | |
| B. Source Location | |
| C. Project Description | 2 |
| II. Applicability | |
| A. Federal Regulations | |
| B. State Regulations | |
| III. Source Impact Analysis | 4 |
| A. Emission Limitations | |
| Table 1. Summary of Emissions | 5 |
| Table 2. Allowable Emissions | 6 |
| B. Air Quality Impact | |
| C. Additional Impacts | |
| IV. Conclusions | 8 |
| Appendices | |
| Appendix A | 9 |
| BACT Analysis | |
| Appendix B | 17 |
| Air Quality Analysis | |
| Appendix C | 26 |
| Additional Impacts | |
| Appendix D | 27 |
| Federal general and specific conditions | |
| Attachments | |
| Kissimmee Utilities' permit application | |

I. SYNOPSIS OF APPLICATION

A. Name and Address of Applicant

Kissimmee Utilities
P. O. Box 1608
Kissimmee, Florida 32741

B. Source Location

The proposed source is located at 112 Ruby Street in the City of Kissimmee, in Osceola County, Florida. The UTM coordinates are: Zone 17-460.1 Km East and 3,129.3 Km North.

C. Project Description

The applicant proposes to install and operate a combined cycle combustion gas turbine, with a total net generating capacity of 46.5 megawatts (MW) and a gross generating capacity of 49.9 MW. The turbine will be fired with natural gas. No. 2 fuel oil, having a maximum sulfur content of 0.8 percent, will be used as a standby fuel. The maximum heat input will be 441.7 MMBTU/hr (LHV).

Kissimmee Utilities (KU) currently operates 12 diesel generating units with a total output rated at 26.8 MW at this site.

II. APPLICABILITY

A. Federal Regulations

The proposed project is subject to preconstruction review under federal Prevention of Significant Deterioration (PSD) regulations, Section 52.21 of Title 40 of the Code of Federal Regulations as amended in the Federal Register of August 7, 1980 (45 ~~FR~~^{16/16}). Specifically, Kissimmee Utilities' combined cycle combustion gas turbine is a major stationary source (40 CFR 52.21(b)(1)) located in an area currently designated as attainment in accordance with 40 CFR 81.310 for all criteria pollutants regulated under the Clean Air Act (CAA).

The proposed source will be a major modification (40 CFR 52.21(b)(2)) for particulate matter (PM), sulfur dioxide (SO₂), nitrogen oxides (NO_x), Beryllium (Be), volatile organic compounds (VOC), and carbon monoxide (CO). Emissions of PM, SO₂, NO_x, Be, VOC and CO will increase above the significant criteria set in the PSD regulations. Therefore, the proposed project is subject to PSD review for these pollutants.

This review consists of a determination of Best Available Control Technology (BACT) and unless otherwise exempted, an analysis of the air quality impact of the increased emissions. No air quality impact analysis is required for ozone, even though there will be a significant increase in VOC emissions, because this increase is less than 100 tons per year. The review also includes an analysis of the project's impacts on soils, vegetation and visibility along with air quality impacts resulting from associated commercial, residential and industrial growth.

The proposed project is also subject to the provisions of the federal New Source Performance Standard (NSPS) for gas turbines, 40 CFR 60, Subpart GG.

B. State Regulations

The proposed project is subject to preconstruction review under the provisions of Chapter 403, Florida Statutes, and Chapter 17-2, Florida Administrative Code. Specifically, the proposed source is a major emitting facility for NO_x and SO₂ as defined in Chapter 17-2 because the potential emissions of each pollutant exceed 250 tons per year. The source is located in the area of influence of the Orange County ozone nonattainment area.

This project is subject to the provisions of Subsection 17-2.04(6), Prevention of Significant Deterioration (PSD) review, which requires the use of Best Available Control Technology (BACT). The source is also subject to the provisions of the federal New Source Performance Standards (NSPS) for gas turbines, 40 CFR 60, Subpart GG. This NSPS has been adopted by reference in Section 17-2.21.

The proposed source is exempt from the provisions of Section 17-2.17, New Source Review for Nonattainment Areas, by Section 17-2.17(1)(c)2.a.

III. SOURCE IMPACT ANALYSIS

A. Emissions Limitations

The operation of the proposed combined cycle gas turbine, will produce emissions of particulate matter (PM), sulfur dioxide (SO₂), nitrogen oxides (NO_x), beryllium (Be), Mercury (Hg), carbon monoxide (CO) and volatile organic compounds (VOC) to the atmosphere.

Table 1 summarizes potential to emit of all pollutants regulated under the Act which are affected by the proposed source.

Best Available Control Technology (BACT) has been determined for NO_x, SO₂, PM, VOC, Be and CO. The emission limiting standards selected as BACT and made a condition of the permit are listed in Table 2. Justification for the standards selected is included in Technical Appendix A.

The permitted emissions, including those determined as BACT, are in compliance with New Source Performance Standard (NSPS) requirements of 40 CFR 60, Subpart GG.

B. Air Quality Impacts

An air quality impacts analysis has been performed to evaluate the impact of the proposed project on ambient concentrations of NO_x, SO₂, PM, CO and Be. Dispersion modeling was used to evaluate the impacts.

Results of the analysis provide reasonable assurance that the project, as described in this permit and subject to the conditions herein, will not lead to any violation of National Ambient Air Quality Standards or PSD increments. Details of the analysis are discussed in the Technical Appendix B.

Table 1
SUMMARY OF EMISSIONS
 (tons per year)

| Pollutant | Potential Emissions ^(a) | | | | Significance Level ^(e) |
|--------------------------------|------------------------------------|-----------------|---------------------|-----------------|-----------------------------------|
| | Fuel Oil No. 2 - Fired | | Natural Gas - Fired | | |
| | (Before Control) | (After Control) | (Before Control) | (After Control) | |
| NO _x ^(b) | 2,580 | 1,340 | 2,480 | 1,290 | 40 |
| SO ₂ ^(c) | 1,700 | 1,700 | 21 | 21 | 40 |
| PM | 69 | 69 | 30 | 30 | 25 |
| VOC | 74 | 74 | 82 | 82 | 40 |
| CO | 207 | 207 | 227 | 227 | 100 |
| Mercury ^(d) | 0.002 | 0.002 | 0.02 | 0.02 | 0.1 |
| Beryllium ^(d) | 0.0006 | 0.0006 | - | - | 0.0004 |

(a) Potential emissions in accordance with state and federal definitions as estimated by the applicant.

(b) A 48 percent emission reduction is expected with the proposed water injection technique.

(c) Assumed natural gas has 0.01 percent sulfur content. Fuel oil calculations based on total conversion of 0.8 percent sulfur in fuel oil to sulfur dioxide.

(d) Emissions calculated based on emissions factors from Stationary Conventional Combustion Processes, EPA, -450/2-80-074.

(e) 40 CFR 52.21(b)(23).

Table 2
ALLOWABLE EMISSION LIMITS
49.9 MW Combined Cycle Combustion Turbine

| Pollutant | Standard | Gas Turbine ^(a) | Gas Turbine and Boiler ^(b) | Basis |
|--------------------------------|---|---|---------------------------------------|------------------------|
| NO _x ^(a) | 0.0075 ($\frac{14.4}{Y}$) + F | 129 PPM at 15 percent oxygen on a dry basis | 250 lb/hr | NSPS, BACT |
| SO ₂ | 0.8 percent S by weight 0.015 percent by volume at 15 percent oxygen on a dry basis | 0.8 percent S by weight | 388 lb/hr | NSPS, BACT |
| PM | 20% Opacity | - | 16 lb/hr | BACT, Chapter 17-2 |
| VOC | - | - | 19 lb/hr | BACT |
| CO | - | - | 52 lb/hr | BACT |
| Mercury (Hg) | - | - | 0.0004 lb/hr | Estimated by Applicant |
| Beryllium (Be) | - | - | 0.000145 lb/hr | BACT |

(a) The allowable NO_x emission rate for the gas turbine was determined by the following formula:

$$STD = 0.0075 \left(\frac{14.4}{Y} \right) + F \text{ where:}$$

STD = allowable NO_x emissions (percent by volume at 15 percent oxygen and on a dry basis).

Y = manufacturer's rated heat rate at manufacturer's rated load (kilojoules per watt hour) or, actual measured heat rate based on lower heating value of fuel as measured at actual peak load for the facility. The value of Y shall not exceed 14.4 kilojoules per watt hour. The efficiency factor must be based on the gas turbine efficiency itself, not the overall efficiency of the gas turbine combined with other equipment.

F = NO_x emission allowance for fuel-bound nitrogen as follows:

| Fuel-bound nitrogen (Percent by weight) | F (NO _x percent by volume) |
|--|--|
| N ≤ 0.015 | 0 |
| 0.015 < N ≤ 0.1 | 0.04(N) |
| 0.1 < N ≤ 0.25 | 0.04 + 0.0067(N - 0.1) |
| N > 0.25 | 0.005 |

where: N = the nitrogen content of the fuel (percent by weight)

(b) Emission rates based on continuous firing of 100 percent fuel oil No. 2 as estimated by the applicant.

C. Additional Impact Analysis

An additional impacts analysis has been performed to assess (1) the impact of the proposed project on soils, vegetation, and visibility and (2) any air quality impacts resulting from associated commercial, residential, or industrial growth. No adverse impacts are expected; details of the analysis are discussed in Technical Appendix C.

IV. CONCLUSIONS

Based on review of the data submitted by Kissimmee Utilities for the installation and operation of a 49.9 MW combined cycle gas turbine, the FDER concludes that compliance with all applicable federal and state air quality regulations will be achieved provided certain specific conditions are met. The NSPS emission limits for NO_x, SO₂, and the permitted emissions limits of 0.0004 lb/hr for Hg, 0.000145 lb/hr, for Be, 16 lb/hr for PM, 19 lb/hr for VOC and 52 lb/hr for CO have been determined to be Best Available Control Technology (BACT) for this source. The impact of the emissions from the 49.9 MW combined cycle gas turbine will not cause or contribute to a violation of any ambient air quality standard or PSD increment. Appendix D includes the proposed general and specific conditions in the Federal Permit (PSD-FL-087).

TECHNICAL APPENDIX A
FEDERAL BACT ANALYSIS

The applicant is required, under the provisions of 40 CFR 52.21, as revised August 7, 1980 (45 FR 52676), to apply BACT to all criteria and noncriteria pollutants emitted in significant levels. BACT is determined for each pollutant on a case-by-case review taking into account energy, environmental and economic impacts.

The applicant has proposed BACT for each applicable pollutant and has presented justification for the standards selected. The Department of Environmental Regulation (DER) has reviewed and accepted the technology and emission limits proposed as BACT. The federal PSD permit shall include these limits or any more stringent emission standards that are imposed by the State of Florida. These limits are summarized in Table 2. A discussion of the BACT for each pollutant follows:

PM Control

The BACT limitation proposed for particulate matter (PM), 16 lb/hr, is based upon emission for Stationary Gas Turbines AP-42.

Particulate emissions from stationary gas turbines depend on the ash content of the fuel which are minimal for the proposed fuels. The applicant has reported an ash percentage of less than 0.1 in the fuel oil analysis. Therefore, FDER feels that the applicant proposed 0.0362 lb/MMBTU (16 lb/hr) emission limit for PM is reasonable as BACT.

Carbon Monoxide and Hydrocarbon Control

The applicant proposes emissions levels for carbon monoxide (CO) and volatile organic compounds (VOC) based on emission estimates from Stationary Gas Turbines AP-42.

CO and HC emissions are function of combustion efficiency. The higher the percentage of peak load at which a turbine operates, the more efficient the combustion of the fuel.

HC and CO emissions from stationary gas turbines operating at peak load are relatively low. Gas turbines normally operate at 80 to 100 percent of peak load with HC emission averaging less than 50 ppm and CO emission averaging less than 500 ppm concentration at 15 percent oxygen.

Based on the above facts, FDER agrees that emission limits of 0.1177 lb/MMBTU (52 lb/hr) for CO and 0.043 lb/MMBTU (19 lb/hr) for VOC constitute BACT for the proposed source.

SO₂ Control

The applicant proposes an emission limit of 388 lb SO₂/hr and 0.8 percent sulfur content in the fuel oil. The basis of this proposed emission limit is found in the AP-42 emission factors for Stationary Gas Turbines and NSPS for Gas Turbines.

SO₂ emissions from stationary gas turbines depend on the sulfur content of the fuel since nearly 100 percent of the sulfur is converted to SO₂ during the combustion process. Due to the high volumes of exhaust gases, the cost of flue gas desulfurization (FGD) is considered unreasonable. Therefore, FDER concurs with the applicant NSPS selection of low sulfur oil (0.8%S), and of 0.015 percent SO₂ by volume at 15 percent O₂, on a dry basis as BACT for the proposed source.

NO_x Control

The applicant proposes to control NO_x with a wet control technique (water injection) and limiting the maximum fuel-bound nitrogen content to 0.25 percent.

Total NO_x emissions from any combustion source, including stationary gas turbines, are a function of both thermal NO_x and organic NO_x formation. Thermal NO_x is formed by a high temperature reaction between nitrogen and oxygen from the combustion air. Organic NO_x, however, is formed by the oxidation of fuel-bound nitrogen during combustion.

NO_x formation within a turbine generally increases exponentially with increased pressure and temperature. High efficiency turbines, therefore, generally discharge gases with higher NO_x concentrations than low efficiency turbines. Since the

relative fuel consumption of gas turbines varies linearly with efficiency, an adjustment factor was selected (NSPS) that permitted increased NO_x emissions for the efficient turbines.

Gas turbines with waste heat recovery (combined cycle gas turbine) have a higher overall efficiency than the gas turbine alone. The application of the efficiency adjustment factor to the entire system would permit greater NO_x emission. The efficiency adjustment factor in the selected NSPS must be based on the gas turbine efficiency itself, not the overall efficiency of a gas turbine combined with other equipment. This consideration is discussed at length in the preamble to the selected NSPS for stationary gas turbines.

Based on the above facts, the KU gas turbine would actually be allowed an emission rate of 129 PPM due to the efficiency adjustment factor, which is an increase of the nominal 75 PPM NO_x emission by 5.64%. Therefore, FDER determines that the selected NSPS emission limit of 129 PPM or 0.0075

$\frac{(14)}{Y} + F$ at 15% oxygen on a dry basis (see formula, Table 2) is BACT for this source when using No. 2 fuel oil containing 0.25 percent nitrogen.

Beryllium Control

The applicant proposes an emission limit of 0.00015 lb/hr for beryllium based on the emission factor from Stationary Combustion Processes (EPA 450/2-80-074).

Since beryllium emissions from gas turbines were not selected for control by standards of performance and there is not an applicable National Emission Standards for Hazardous Air Pollutants (NESHAP) for beryllium emission from gas turbines, FDER accepts the applicant's proposed 3.4×10^{-7} lb/MMBTU as BACT for this source.

Best Available Control Technology (BACT) Determination

Kissimmee Utilities

Osceola County

Kissimmee Utilities, Kissimmee, Florida, plans to increase their existing electric generating capability by an additional 49.9 gross megawatts. The proposed supplementary-fired combined cycle gas turbine system is composed of one 400 million Btu/hr heat input gas turbine (30.9 megawatt gross output) from which the exhaust gases discharge into a waste heat boiler. The steam produced will operate two steam turbines each producing 9.5 megawatt gross output. The boiler has a 41.7 million Btu per hour supplemental heat source to generate additional steam.

The system will fire natural gas with No. 2 oil as stand-by fuel. Hourly fuel consumption at maximum firing will be 0.491 million cubic feet of gas or 78 barrels of oil. The system is scheduled to operate 8,760 hours per year.

BACT Determination Requested by the Applicant:

| Pollutant | Emission Limit |
|-----------------|---|
| NO _x | NSPS % by volume = $0.0075 (14.4/Y) + F$ Y = heat rate at peak load (kJ/watt-hr) F = fuel-bound nitrogen allowance |
| SO ₂ | 0.8% maximum fuel sulfur content |

Date of Receipt of a BACT Application:

August 13, 1981

Date of Publication in the Florida Administrative Weekly:

September 4, 1981

Review Group Members:

There have been no significant technology improvements since the promulgation of the applicable NSPS to justify a formal review group. Comments were obtained from the New Source Review Section and the Air Modeling Section.

BACT Determination by DER:

| <u>Pollutant</u> | <u>Emission Limit</u> |
|-------------------|--|
| NO _x | NSPS Subpart GG, subsection 60.332(a)(1). |
| SO ₂ | No. 2 fuel oil with sulfur content not to exceed 0.8%. |
| Visible Emissions | Maximum 20% opacity. |

Justification of DER Determination:

Nitric oxides produced by the combustion of fuel in the gas turbine are formed by the combination of nitrogen and oxygen in the combustion air. NO_x is also formed from the reaction of the nitrogen in the fuel with the oxygen in the combustion air. Formation of the latter NO_x will be minimized by the applicant's use of natural gas or distillate oil as fuel, both of which have low nitrogen content.

NO_x formation is extremely sensitive to flame temperature, therefore injecting water or steam into the gas turbine reaction zone will reduce production of NO_x. The use of the wet control technique to reduce NO_x emissions to or below the NSPS limits is determined to be BACT.

The SO₂ emissions from the gas turbine are strictly a function of the fuel sulfur content. Flue gas desulfurization systems are economically unattractive compared to the cost of low sulfur fuels. The firing of natural gas or No. 2 oil containing a maximum of 0.8% sulfur is determined as BACT.

The reduction of NO_x emissions results in an increase in CO emissions. CO emissions are considered to be a local problem since CO readily reacts to form CO₂. NO_x emissions, however, are linked to the formation of photochemical oxidants and are subject to long range transport. As a result of this trade-off, no emission limit for CO is specified in this determination.

Test methods for NO_x emissions are per NSPS, Subpart GG. Oil analysis by the applicant's fuel supplier or natural gas consumption records can be used to determine compliance with SO₂ emission limit. Compliance with the opacity limitation will be determined in accordance with 40 CFR 60, Appendix A; Method 9.

Page Three

Details of the Analysis May be Obtained by Contacting:

Edward Palagyi, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32301

Recommended By:

Steve Smallwood

Steve Smallwood, Chief, BAQM

Date:

10/2/81

Approved:

Victoria Tschinkel

Victoria Tschinkel, Secretary

Date:

12/5/81

SS:caa

APPENDIX B

AIR QUALITY IMPACT ANALYSIS

A. Summary

The State PSD review for PM and SO₂ requires an air quality impact analysis which includes a PSD increment analysis and a Florida Ambient Air Quality Standards (FAAQS) analysis. The State PSD increment and FAAQS analyses depend on air quality modeling carried out in accordance with FDER-approved methods.

The air quality impact analysis required under federal PSD review for PM, SO₂, CO, NO_x, and Beryllium (Be) includes:

- o An analysis of existing air quality;
- o A PSD increment analysis (for PM and SO₂ only);
- o A National Ambient Air Quality Standards (NAAQS) analysis; and,
- o An analysis of impact on soils, vegetation and visibility and growth-related air quality impacts.

The analysis of existing air quality may require preconstruction monitoring; the PSD and NAAQS analyses depend on air quality modeling carried out in accordance with EPA-approved methods. Federal PSD review also requires a good engineering practice (GEP) stack height evaluation.

Based on these required State and federal air quality impact analyses, FDER has reasonable assurance that the KU modification, as described in this permit and subject to the conditions of approval proposed herein, will not cause or contribute to a violation of any State or federal PSD increment or ambient air quality standard. A discussion of the required analyses follows.

B. Discussion

1. Modeling Methodology

Two FDER and EPA-approved dispersion models were used in the State and federal air quality impact analyses. These were the Single-Source (CRSTER) and Industrial Source Complex (ISC) models.

These models were used to determine the maximum predicted annual concentrations and to identify the absolute worst-case short-term meteorological conditions which would affect emissions from KU after the proposed modification is completed. They were also used to identify days on which meteorological conditions produced worst-case short-term KU impacts in the vicinity of the facility with interacting sources located directly upwind.

The maximum short-term impacts due to emissions from KU and all major interacting sources were analyzed using a refined grid spacing of 0.1 to 0.2 kilometers between receptors and only the days on which worst-case meteorological conditions occurred.

Since worst-case impacts for each pollutant subject to analysis occur under different fuel burning conditions, modeling and analysis for each of these pollutants was performed using the worst-case fuel.

The surface meteorological data used in the models were National Weather Service data collected at Orlando, Florida during the period 1974-78. Upper air meteorological data used in the models were collected during the same time period at Tampa, Florida.

Final stack parameters and emission rates used in evaluating the proposed KU modification are contained in Tables B-1 and B-2.

Table B-1

Stack Parameters for Kissimmee Utilities - Baseline Case

| Emissions Unit | Stack Height (m) | Stack Diameter (m) | Exit Velocity (m/s) | Exit Temperature (K) | Emission Rate (g/sec) | |
|----------------|------------------|--------------------|---------------------|----------------------|-----------------------|------|
| | | | | | SO ₂ | PM |
| Unit #7 | 13.11 | .61 | 16.30 | 466.50 | .87 | .52 |
| Units #8,#9 | 16.15 | .85 | 17.60 | 477.60 | 3.36 | 2.01 |
| Units #10,#11 | 7.01 | .76 | 9.60 | 466.50 | 2.28 | 1.36 |
| Units #14-#18 | 13.41 | .80 | 8.70 | 505.40 | 5.37 | 3.21 |
| Units #19,#20 | 8.69 | .90 | 17.20 | 505.40 | 2.89 | 1.73 |

Table B-2

Stack Parameters for Kissimmee Utilities - Projected Case

| Emissions Unit | Stack Height (m) | Stack Diameter (m) | Exit Velocity (m/s) | Exit Temperature (K) | Emission Rate (g/sec) | | | |
|--------------------|------------------|--------------------|---------------------|----------------------|-----------------------|------|-----------------|------|
| | | | | | SO ₂ | PM | NO _x | CO |
| Unit #7 | 13.11 | .61 | 16.30 | 466.50 | .87 | .52 | 4.46 | .79 |
| Units #8,#9 | 16.15 | .85 | 17.60 | 477.60 | 3.36 | 2.01 | 17.10 | 3.16 |
| Units #10,#11 | 7.01 | .76 | 9.60 | 466.50 | 2.28 | 1.36 | 10.58 | 2.12 |
| Units #14-#18 | 13.41 | .80 | 8.70 | 505.40 | 5.37 | 3.21 | 11.34 | 5.45 |
| Units #19,#20 | 8.69 | .90 | 17.20 | 505.40 | 2.89 | 1.73 | 14.66 | 2.64 |
| Combustion Turbine | 9.14 | 2.44 | 38.03 | 422.00 | 48.9 | 1.98 | 30.70 | 6.53 |

2. Analysis of Existing Air Quality

In order to evaluate existing air quality in the area of a proposed project, FDER may require a period of continuous preconstruction monitoring for any pollutant subject to PSD review. An exemption from this requirement may be obtained if the net emissions increase of the pollutant from the modification would cause an air quality impact less than a certain de minimus level as defined in 40 CFR 52.21(i)(8). Based on the modeling results shown in the following table, this exemption is applicable to the proposed modification for all of the pollutants subject to PSD review. Therefore, no preconstruction monitoring has been required.

Projected Air Quality Impacts From Combustion Turbine

| <u>Pollutant</u> | <u>Averaging Time</u> | <u>Projected Impact (ug/m³)</u> | <u>De Minimus Level (ug/m³)</u> |
|------------------|-----------------------|--|--|
| SO ₂ | 24-hour | 10 | 13 |
| TSP | 24-hour | < 1 | 10 |
| NO _x | 24-hour | 6 | 14 |
| CO | 8-hour | < 6 | 575 |
| Be | 24-hour | < 0.0005 | .0005 |

There are no FDER or EPA-approved TSP, SO₂, NO_x, or CO monitors within 25 kilometers of the KU facility. Since the KU facility is located in a remote area with respect to non-specified sources, FDER has assumed the following pollutant background values: 0 ug/m³ for CO, 20 ug/m³ for SO₂ and NO_x, 40 ug/m³ for TSP. These background values are used for all

averaging times and are consistent with EPA monitoring guidelines. FDER assumed no background value for the non-criteria pollutant, Be.

3. PSD Increment Analysis

Both the State and federal PSD increment analyses pertain to PM and SO₂ for which maximum allowable increases (increments) are defined. The proposed KU modification will be located in an area where the Class II increments apply. The nearest Class I area is more than 100 kilometers away from the proposed site.

The predicted maximum TSP and SO₂ increment consumption is the same in both the State and federal PSD increment analyses. Increment consumption at KU is affected by the construction of the combustion turbine alone.

As shown in the following table, modeling results predict that the maximum TSP and SO₂ increment consumption will not exceed allowable increments. The highest, second-highest short-term predicted concentrations are given in the table since five years of meteorological data were used in the modeling.

Maximum Increment Consumption

(ug/m³)

State and Federal

| <u>Pollutant</u> | <u>Averaging Time</u> | | |
|---|-----------------------|----------------|---------------|
| | <u>3-hour</u> | <u>24-hour</u> | <u>Annual</u> |
| SO ₂ : Maximum KU ² Impact | 44 | 10 | < 1 |
| SO ₂ : Allowable Class II Increment | 512 | 91 | 20 |
| PM: Maximum KU Impact | NA | < 1 | < 1 |
| PM: Allowable Class II Increment | NA | 37 | 19 |

There are other increment consuming sources within the vicinity of KU. Even though these sources consume increment in the area around KU, this consumption is very small. The combined impacts of these sources and KU in the interacting directions are less than the maximum increment consumed by KU only.

The nearest Class I area is Chassahowitza National Wilderness Area which is 125 kilometers away from KU. At this distance, it can be assumed that no Class I increment will be consumed as a result of emissions from KU.

4. Ambient Air Quality Standards Analysis

Both State and federal PSD regulations require the permit applicant to demonstrate that, given existing air quality in an area, a proposed emissions increase subject to PSD review will not cause or contribute to any violation of ambient air quality standards. For the proposed project at KU, an ambient air quality standards analysis is required for PM, SO₂, CO, NO_x, and Be.

As shown in the following table, modeling results predict that maximum ground-level concentrations for each of these pollutants will be below both the FAAQS and NAAQS. The highest, second-highest short-term predicted values are given in this table since five years of meteorological data were used in the modeling.

| <u>Pollutant</u> | <u>Averaging Time</u> | <u>Projected Air Quality*</u> (ug/m ³) | <u>NAAQS</u> (ug/m ³) | <u>FAAQS</u> (ug/m ³) |
|------------------|-----------------------|---|--------------------------------------|--------------------------------------|
| SO ₂ | annual | 40 | 80 | 60 |
| | 24-hour | 155 | 365 | 260 |
| | 3-hour | 392 | 1300 | 1300 |
| TSP | annual | 52 | 75 | 60 |
| | 24-hour | 121 | 150 | 150 |
| NO ₂ | annual | 89 | 100 | 100 |
| CO | 8-hour | < 500 | 10,000 | 10,000 |
| | 1-hour | < 1000 | 40,000 | 40,000 |
| Be | 24-hour | < 0.0005** | N/A | N/A |

*Includes background concentrations of 40 ug/m³ for annual and 24-hour TSP, 20 ug/m³ for SO₂ for all averaging times, and 20 ug/m³ for NO₂.

** Air quality impact calculated for the proposed modification only.

Modeling was also performed to evaluate the impacts of interactions of emissions from other sources with those from KU. Maximum contributions from surrounding sources are very small compared to maximum ground-level concentrations from KU and they occur in non-critical directions. Therefore, no violations are predicted to occur due to interacting sources.

5. Good Engineering Practice Stack Height Evaluation

The stack height proposed for the KU combustion turbine is less than the Good Engineering Practice (GEP) stack height of 65 meters for stacks uninfluenced by structures or terrain. A building downwash analysis was not performed since the new stack will not be within the area of influence of any structure with the potential to cause downwash conditions.

APPENDIX C

ANALYSIS OF IMPACT ON SOILS, VEGETATION AND VISIBILITY AND GROWTH-RELATED AIR QUALITY IMPACTS

The maximum impact of the proposed modification, as demonstrated through the air quality analysis, will be below the national secondary air quality standards for PM and SO₂. These standards were established to protect public welfare related values. Also, the maximum impact of the proposed modification on NO₂, CO, and Be concentrations will be insignificant. Therefore, no adverse effects on soils, vegetation and visibility is expected.

There will be no increase in the number of employees at this site due to the project. Therefore no secondary residential, commercial or industrial growth which will adversely affect air quality in the area is expected.

APPENDIX D
SPECIFIC CONDITIONS

FDER proposes a final determination of approval with conditions for the project (construction of a 49.9 MW combined cycle gas turbine) requested by Kissimmee Utilities in the complete permit applications submitted on August 13, 1981 (federal application) and August 31, 1981 (state application).

Special conditions listed in the State permit AC 49-46521, are adopted as special conditions for the federal permit, PSD-FL-087, for this source.

The attached General Conditions (federal) are also made a part of the proposed federal permit PSD-FL-087.

PERMIT NO.: PSD-FL-087
APPLICANT: Kissimmee Utilities

SPECIFIC CONDITIONS:

1. The new source shall be constructed in accordance with the capacities and specifications stated in the application.
2. The maximum emission rates for the 49.9 MW combined cycle gas turbine shall not exceed the emission limits listed in Table 2 of the preliminary determination.
3. The plant shall be allowed to operate continuously (8736 hours per year).
4. The source shall be allowed to use either natural gas or No. 2 fuel oil.
5. Maximum sulfur (S) content in the oil shall not exceed 0.8 percent S by weight.
6. Maximum No. 2 fuel oil consumption shall be 78 barrels/hr.
7. Before this construction permit expires, the 49.9 MW combined cycle gas turbine will be tested for particulate matter, sulfur dioxide, VE, carbon monoxide and nitrogen oxides. Except as provided under 40 CFR 60.8(b), the performance tests shall be in accordance with the provisions of the following reference methods in Appendix A of 40 CFR 60.
 - a. Method 1. Sample and Velocity Traverses
 - b. Method 2. Volumetric Flow Rate
 - c. Method 3. Gas Analysis
 - d. Reference method 5 must be used to determine the initial compliance status of the unit with respect to the PM standard. Thereafter visible emissions may be used unless 10% opacity is exceeded. In that case compliance must be demonstrated by method 5. Compliance with the opacity limitation will be determined by reference method 9.
 - e. Compliance with the sulfur dioxide emission limits will be determined by reference method 20 or by calculations based on fuel analysis (ASTM D2880-77 and 01072-70) for sulfur content.
 - f. Compliance with carbon monoxide emission limits will be determined by reference method 10.
 - g. Compliance with volatile organic compound emission limits will be assumed provided the CO allowable emission rate is achieved; specific VOC compliance testing is not required.

PERMIT NO.: PSD-FL-087
APPLICANT: Kissimmee Utilities

- h. Compliance with the allowable emissions limits for nitrogen oxides shall be conducted using EPA reference method 20 subpart GG Section 60.335.

During performance tests to determine compliance with the proposed standard, measured NO_x emission at 15 percent oxygen will be adjusted to ISO ambient atmospheric conditions by the following correction factor:

$$NO_x = (NO_{x \text{ obs}}) \left(\frac{P_{\text{ref}}}{P_{\text{obs}}} \right)^{0.5} e^{19 (H_{\text{obs}} - 0.00633) \left(\frac{T_{\text{AMB}}}{288^{\circ}\text{K}} \right)^{1.53}}$$

where:

NO_x = Emissions of NO_x at 15 percent oxygen and ISO standard ambient conditions.

NO_{x obs} = Measured NO_x emission at 15 percent oxygen, ppmv.

P_{ref} = Reference combustor inlet absolute pressure at 101.3 kilopascals (1 atmosphere) ambient pressure.

P_{obs} = Measured combustor inlet absolute pressure at test ambient pressure.

H_{obs} = Specific humidity of ambient air at test.

e = Transcendental constant (2.718)

T_{AMB} = Temperature of ambient air at test.

Test results will be the average of 3 valid runs. The Department will be notified 30 days in advance of the compliance test. The test will be conducted at permitted capacity $\pm 10\%$.

8. A continuous monitoring system shall be installed to monitor and record the fuel consumption and the ratio of water to fuel being fired in the turbine.
9. Sulfur and nitrogen content of the fuel being fired in the gas turbine shall be determined and recorded as specified in the NSPS for Gas Turbines 40 CFR 60, Subpart GG, Section 60.334. The records of fuel oil usage will be kept by the company, available for regulatory agency's inspection, for a two year period.

PERMIT NO.: PSD-FL-087

APPLICANT: Kissimmee Utilities

10. The applicant shall comply with all requirements of 40 CFR 60, Subpart GG, Standards of Performance for stationary gas turbines.
11. Reasonable precautions to prevent fugitive particulate emissions during construction such as coating or spraying roads and construction sites used by contractors will be taken by the applicant.
12. The applicant shall report any delays in construction and completion of this unit to the Department's South Florida Subdistrict Office.
13. The applicant will demonstrate compliance with the conditions of the construction permit, and submit a complete application for an operating permit to the Department's South Florida Subdistrict Office prior to 90 days of the expiration date of the construction permit. The applicant may continue to operate in compliance with all terms of the construction permit until its expiration date or issuance of an operating permit.
14. Upon obtaining an operating permit, the applicant will be required to submit periodic test reports on the actual operation and emissions of the facility. These reports will give the data specified in 40 CFR 60.334.
15. The source shall comply with the provisions and requirements of the attached general conditions.
16. Stack sampling facilities will include the eyebolt and angle described in Chapter 17-2.23, FAC.

GENERAL CONDITIONS

1. The permittee shall notify the permitting authority in writing of the beginning of construction of the permitted source within 30 days of such action and the estimated date of start-up of operation.
2. The permittee shall notify the permitting authority in writing of the actual start-up of the permitted source within 30 days of such action and the estimated date of demonstration of compliance as required in the specific conditions.
3. Each emission point for which an emission test method is established in this permit shall be tested in order to determine compliance with the emission limitation contained herein within sixty (60) days of achieving the maximum production rate, but in no event later than 180 days after initial start-up of the permitted source. The permittee shall notify the permitting authority of the scheduled date of compliance testing at least thirty (30) days in advance of such test. Compliance test results shall be submitted to the permitting authority within forty-five (45) days after the complete testing. The permittee shall provide (1) sampling ports adequate for test methods applicable to such facility, (2) safe sampling platforms, (3) safe access to sampling platforms, and (4) utilities for sampling and testing equipment.
4. The permittee shall retain records of all information resulting from monitoring activities and information indicating operating parameters as specified in the specific conditions of this permit for a minimum of two (2) years from the date of recording.
5. If, for any reason, the permittee does not comply with or will not be able to comply with the emission limitations specified in this permit, the permittee shall provide the permitting authority with the following information in writing within five (5) days of such conditions:
 - (a) description of noncomplying emission(s),
 - (b) cause of noncompliance,
 - (c) anticipated time the noncompliance is expected to continue or, if corrected, the duration of the period of noncompliance,
 - (d) steps taken by the permittee to reduce and eliminate the noncomplying emission,and
 - (e) steps taken by the permittee to prevent recurrence of the noncomplying emission.

Failure to provide the above information when appropriate shall constitute a violation of the terms and conditions of this permit. Submittal of this report does not constitute a waiver of the emission limitations contained within this permit.

6. Any change in the information submitted in the application regarding facility emissions or changes in the quantity or quality of materials processed that will result in new or increases emissions must be reported to the permitting authority. If appropriate, modifications to the permit may then be made by the permitting authority to reflect any necessary changes in the permit conditions. In no case are any new or increased emissions allowed that will cause violation of the emission limitations specified herein.
7. In the event of any change in control or ownership of the source described in the permit, the permittee shall notify the succeeding owner of the existence of this permit by letter and forward a copy of such letter to the permitting authority.
8. The permittee shall allow representatives of the State environmental control agency or representatives of the Environmental Protection Agency, upon the presentation of credentials:
 - (a) to enter upon the permittee's premises, or other premises under the control of the permittee, where an air pollutant source is located or in which any records are required to be kept under the terms and conditions of the permit;
 - (b) to have access to any copy at reasonable times any records required to be kept under the terms and conditions of this permit, or the Act;
 - (c) to inspect at reasonable times any monitoring equipment or monitoring methods required in this permit;
 - (d) to sample at reasonable times any emission of pollutants;and
 - (e) to perform at reasonable times an operation and maintenance inspection of the permitted source.
9. All correspondence required to be submitted by this permit to the permitting agency shall be mailed to:

Chief, Air Facilities Branch
Air and Hazardous Materials Division
U. S. Environmental Protection Agency
Region IV
345 Courtland Street
Atlanta, Georgia 30308

10. The conditions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, shall not be affected thereby.

The emission of any pollutant more frequently or at a level in excess of that authorized by this permit constitute a violation of the terms and conditions of this permit.