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United States Department of the Interior
FISH AND WILDLIFE SERVICE

MAILING ADDRESS:
Post Office Box 25486
Denver Federal Center
Denver, Colorado 80225

STREET LOCATION:
134 Union Blvd.
Lakewood, Colorado 80228

IN REPLY REFER TO:
RW AIR QUALITY
MAIL STOP 60130

JUL 01 1988

RECEIVED
JUL 05 1988
DER - BAQM

Pradeep Raval
Bureau of Air Quality Management
Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Raval:

We have reviewed the Orlando Utilities Commission's Prevention of Significant Deterioration application to add gas turbines to the Indian River Plant. The proposed project would be located 175 km east of Chassahowitzka National Wildlife Refuge, a class I area administered by the U.S. Fish and Wildlife Service. The source, under Prevention of Significant Deterioration regulations, would be a major source of carbon monoxide, nitrogen oxides, and sulfur dioxide, and a significant emitter of total particulates, PM-10 and volatile organic compounds. Considering the long distance of the Orlando Utilities source to Chassahowitzka National Wildlife Refuge, we do not anticipate emissions from this source having any adverse impacts on resources at the refuge.

We would like to take this opportunity to thank the Florida Department of Environmental Regulation for the letter of May 6, 1988, regarding the Pasco County resource recovery facility and look forward to receiving the list of sources within 100 kilometers of Chassahowitzka you are developing per our request in our Pasco County application response. In our response to the Pasco County application we also requested a revised modeling analysis of the class I sulfur dioxide increment consumption since the application indicated that 98 percent of the maximum allowable 24-hour sulfur dioxide increment had been consumed. Because the revised modeling analysis indicated that the 24-hour sulfur dioxide increment consumption was reduced from 98 percent to 52 percent, we feel confident that the class I increment is not being exceeded at the Chassahowitzka National Wildlife Refuge. However, since there appears to be a large number of sulfur dioxide sources in the area around Chassahowitzka, we would like to request that the State perform regional scale modeling and monitoring of sulfur dioxide to determine current total sulfur dioxide levels at the refuge.

If you have any questions, please contact Miguel Flores at 303-969-2072.

Sincerely,

for Ty Berry

Nelson B. Kverno
Assistant Regional Director
Refuges and Wildlife, Region 6

cc: Sam Rogers
Mary Lou
Barry Andrews
CHF/EST

06/21/88 11:27 B&V PWR DIV 913 339 7218 001

file

6/21 called 1:40 pm
6/24 called

BLACK & VEATCH
ENGINEERS-ARCHITECTS

TEL. (913) 339-2000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS P.O. BOX NO.
KANSAS CITY, MISSOURI 64114

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DATE 6/21/88

TRANSMIT TO: NAME BARRY ANDREWS

COMPANY FLORIDA DEM

NUMBER OF PAGES TRANSMITTED INCLUDING THIS COVER SHEET 4

TELEPHONE NUMBER OF RECEIVING EQUIPMENT 904-487-3618

IF AUTOMATIC, VERIFICATION TELEPHONE NUMBER

FROM JOHN COCHRAN

LOCATION PAC TELEPHONE NUMBER 913-339-2190

PROJECT NAME OUC - INDIAN RIVER

PROJECT NUMBER 14137031 PHASE

NOTE TO RECEIVING OPERATOR: IN THE EVENT TRANSMISSION IS NOT COMPLETE, PLEASE CALL (913) 339-7218

BLACK & VEATCH FAX (913) 339-2934

copied Barry
Pradeep
Max
T. Sanicki
W. Aronson
CHF/BT

6-23-88 PR

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Owner _____ Computed By _____
Plant _____ Unit _____ Date _____
Project No. _____ File No. _____ Checked By _____
Title _____ Date _____
_____ Page _____

6/21/88

Barry,

Here are the calculations necessary to convert NOx ppm to lb/hr. Gas flows are based on information from General Electric for a Frame 6 based on a 59 F inlet temperature. Gas flows change substantially for changes in inlet temperature. If you have any further questions please call me at 913-339-2190.

Sincerely

John Cochran

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PGN-1724

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Owner DUC
Plant Indian River Unit
Project No. 14137 File No.
Title NO_x Emissions

Computed By
Date 6/20
Checked By
Date 6/21
Page

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Natural Gas Fired Frame 6:

Exhaust Analysis - 42 ppm NO_x Emission Rate

	% Vol	mol/hr	mol/hr Corrected to 15% O_2 - Dry
Nitrogen	72.55	28997	31,170
Oxygen	13.02	5186	5790
Carbon Dioxide	3.25	1294	1294
Water	10.31	—	—
Argon	0.87	347	347
Total	100.00	35,724	38601
Flue Gas Flow	1,126,000 lb/hr		
Molecular Weight	28.27 lb/mol		

$$NO_x, \text{ lb/hr} = \left(\frac{42 \text{ mol } NO_x}{10^6 \text{ mol F.G.}}\right)\left(38601 \frac{\text{mol F.G.}}{\text{hr}}\right)\left(46 \frac{\text{lb } NO_x}{\text{mol}}\right) = 75$$

FON-172A

BLACK & VEATCH ENGINEERS-ARCHITECTS

Owner OUC
Plant Indian River Unit
Project No. 4137 File No.
Title NO_x Emissions

Computed By S
Date 6/20
Checked By M.E.
Date 6/21
Page

DO NOT WRITE IN THIS SPACE

Fuel Oil Fired Frame 6:

Exhaust Analysis – 65 ppm NO_x Emission Rate

	% Vol	mol/hr	Corrected to 15% O_2 - Dry mol/hr
Nitrogen	73.50	28877	31,652
Oxygen	13.24	5202	5,940
Carbon Dioxide	4.23	1662	1,662
Water	8.15	—	—
Argon	0.88	346	346
Total	100.00	36,087	39,600
Flue Gas Flow	1,126,000 lb/hr		
Molecular Weight	28.66 lb/mol		

$$NO_x,\ lb/hr = \left(\frac{65\ mol\ NO_x}{10^6\ mol\ FG}\right)\left(39{,}600\ \frac{mol\ FG}{hr}\right)\left(46\ \frac{lb\ NO_x}{mol\ NO_x}\right) = 118\ lb/hr$$

P-GN-1724

BARRY,

6/15/00

ATTACHED PLEASE FIND A DRAFT OF THE NEW HAZARDOUS AIR POLLUTANTS SECTION FOR THE OUC INDIAN RIVER PERMIT, ALSO WRITTEN ON TABLE 4-4 IS THE METHODLOGY USED TO CALCULATE EMISSIONS. I WILL CALL TOMORROW TO SEE IF YOU HAVE ANY FURTHER QUESTIONS.

SINCERELY JOHN COCK

particulate. A review of the EPA's BACT/LAER Clearinghouse documents did not reveal any post combustion particulate control technologies being used on gas/oil fueled combustion turbines. The natural gas and distillate oil fuels to be used in the proposed combustion turbines will only contain trace quantities of particulate. Therefore, OUC's standard operating procedures will ensure as complete combustion of the fuel as possible and is the proposed BACT for [illegible] suspended particulate, and particulate matter smaller than 10 microns (PM_{10}).

4.5 OTHER CRITERIA AND NON-CRITERIA POLLUTANT EMISSIONS

Section 4.3 addressed removal of other criteria and non-criteria pollutants as a part of flue gas desulfurization. It was determined in Section 4.3 that based on energy, environmental, and economic considerations flue gas desulfurization was not an appropriate choice for the OUC Indian River Combustion Turbine Project.

Table 4-4 lists the estimated emission of other criteria and non-criteria pollutants based on good combustion of the fuel and the inherent quality of the fuel. Emission estimates indicate that significance levels are exceeded for beryllium and sulfuric acid mist. Significance levels do not represent emission limitations, but rather are indicators of whether a BACT review is necessary.

Other than flue gas desulfurization, there are no identified methods for controlling the emission of these pollutants, other than complete combustion of the fuel and the inherent quality of the fuel. Sulfuric acid mist emissions are a direct function of the sulfur content of the fuel. As discussed in Section 4.3, the sulfur content of the fuel oil will be controlled to 0.3 percent. Therefore, based on the results of Section 4.3, BACT regarding beryllium and sulfuric acid mist is complete combustion of the fuel and the inherent quality of the fuel.

FROM
BLACK & VEATCH
ENGINEERS-ARCHITECTS
P.O. BOX 8405 KANSAS CITY, MO. 64114

Mr. Barry Andrew
Department of Environmental Regulations
2600 Blair STone Road
Tallahassee, FL 32399-2400

TABLE 4-4. OTHER CRITERIA AND NON-CRITERIA POLLUTANT EMISSIONS

PRELIMINARY

Pollutant	Emission Rate lb/MBtu	Annual Emission* tpy	ppm
Antimony	5.1 E-7	3.9 E-3	0.01
Arsenic	2.9 E-6	0.022	0.058
Barium	2.5 E-8	1.9 E-4	0.005
Beryllium**	2.3 E-7	1.8 E-3	0.0046
Cadmium	1.7 E-4	1.3	3.3
Chlorine	7.5 E-5	0.57	1.47
Chromium	1.2 E-4	0.92	2.3
Cobalt	1.5 E-5	0.11	0.30
Copper	1.5 E-5	0.11	0.30
Fluoride**	5.6 E-5	0.44	1.1
Formaldehyde	1.9 E-4	1.5	37
Lead**	9.5 E-6	0.07	0.19
Manganese	1.4 E-6	0.010	0.027
Mercury**	1.1 E-5	0.084	0.22
Nickel	1.1 E-5	0.084	0.224
Sulfuric Acid Mist**	0.023	176	
Vanadium	8.4 E-3	64	165

*Annual emissions are total for four combustion turbines, and are based on 100 percent capacity factor burning distillate fuel oil.

**The following are the PSD significance levels for the remaining criteria pollutants.

-- Beryllium 0.0004 tpy
-- Fluoride 3 tpy
-- Lead 0.6 tpy
-- Mercury 0.1 tpy
-- Sulfuric acid mist 7 tpy

$$\text{lb/MBtu Emission} = \left(\text{ppm}, \frac{\text{lb}}{10^6\ \text{lb Coal}}\right)\left(\frac{\text{lb Coal}}{19700\ \text{BTU}}\right)\left(10^6\ \frac{\text{BTU}}{\text{MBtu}}\right)$$

$$\text{tpy Emission} = \left(\text{Emission}, \frac{\text{lb}}{\text{MBtu}}\right)\left(4 \times 436\ \frac{\text{MBtu}}{\text{hr}}\right)\left(8760\ \frac{\text{hr}}{\text{yr}}\right)\left(\frac{\text{ton}}{2000\ \text{lb}}\right)$$

CC: CHF/BT
Pradeep Raval
6-16-88 Max Linn
T. Sawicki - CFDC
061488

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AC 05-144482

BLACK & VEATCH

ENGINEERS-ARCHITECTS

TEL. (913) 339-2000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS P.O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

Orlando Utilities Commission
Indian River Plant
PSD Permit No. 05-144482

B&V Project 14137.031
B&V File 22.0400
June 10, 1988

RECEIVED
JUN 13 1988
DER - BAQM

Bureau of Air Quality - Florida DER
2600 Blair Stone ROad
Tallahassee, FL 32399-2400

Attention: Mr. Barry Andrews

Gentlemen:

Values for sulfur dioxide emissions when burning natural gas as listed in Table 3-1 of the Indian River permit are in error. The correct SO_2 emission estimates based on use of emission factors contained in AP-42 are as follows.

Maximum SO_2 Emissions Per Unit = 0.34 lb/hr
Potential Annual SO_2 Emissions = 1.5 tpy/unit
Total Plant Potential SO_2 Emission = 6.0 tpy (4 units)

We are sorry for any confusion that these erroneous emission estimates have caused during your review of the Indian River permit. If you have any other questions, please call either myself (913-339-2880) or John Cochran (913-339-2190). Thank you for your time and efforts in the review of our permit.

Very truly yours,

BLACK & VEATCH

S. M. Day/BDS

Steven M. Day

JRC:jrc
cc: W. H. Herrington, OUC
J. S. Crall, OUC
T. D. Slepow, OUC
Janet Hayward, EPA Region IV
Chun (Gary) NG, EPA Region IV

CHF/BT
Rackley Ferrell
Max Linn
Barry Andrews
T. Sawicki - CF Dist

6.14.88

FROM
BLACK & VEATCH
ENGINEERS-ARCHITECTS
P.O. BOX 8405 KANSAS CITY, MO. 64114

Bureau of Air Quality - Florida DER
Attention: Mr. Barry Andrews
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

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ENGINEERS-ARCHITECTS

TEL. (913) 339-2000

1500 MEADOW LAKE PARKWAY
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KANSAS CITY, MISSOURI 64114

Orlando Utilities Commission
Indian River Plant
PSD Permit No. 05-144482

RECEIVED
MAY 18 1988
DER - BAQM

B&V Project 14137.031
B&V File 22.0400
May 17 ,1988

Mr. Barry Andrews
Bureau of Air Quality - Florida DER
2600 Blair Stone Road
Tallahassee, FL 32399-2400

FEDERAL EXPRESS

Dear Mr. Andrews:

We hope that information submitted to your office on Friday May 13, 1988 is helpful in your consideration of our BACT submittal. The NO_x abatement information by General Electric should be especially beneficial for the review of any combustion turbine permit.

During our review of OUC's revised BACT analysis we have found an error. The volatile organic compound (VOC) emission rate stated in the permit application and the BACT analysis does not match the guarantee in OUC's contract agreement with GE. Emission guarantees from GE assure that VOC emissions will be no greater than 7 ppmvw from the Frame 6 combustion turbines. This emission corresponds to an emission rate of 0.009 lb/MBtu or 4.0 lb/hr, rather than the 5 ppmvd stated in the permit application. General Electric is unwilling to guarantee VOC emissions below 7 ppmvw. The application already correctly specifies 4.0 lb/hr as the maximum emission rate, and therefore, Table 3-1 requires no modification.

BACT/LAER Clearinghouse documents do not list any combustion turbine projects with more stringent emission requirements than 0.013 lb/MBtu. Therefore, the use of combustion turbines designed to meet a VOC emission rate of 7 ppmvw at 15 percent oxygen (lower than any other Clearinghouse limit) is proposed as BACT, rather than the previously incorrectly specified 5 ppmvd.

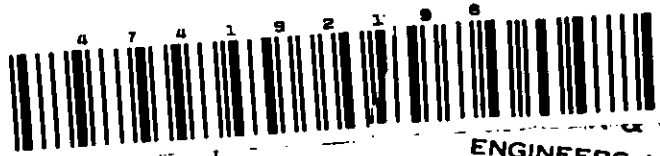
If you have any questions regarding VOC emissions or any other topics pertaining to the review of our BACT analysis please call either myself (913-339-2880) or John Cochran (913-339-2190). Thank you for your time and efforts in the review of our permit.

Very truly yours,

BLACK & VEATCH

Steven M. Day

JRC:jrc
cc: Janet Hayward, EPA Region IV
Chun (Gary) NG, EPA Region IV
J. S. Crall, OUC
W. H. Herrington, OUC
T. D. Slepow, OUC



& VEATCH
ENGINEERS-ARCHITECTS
P.O. BOX 8405
KANSAS CITY, MO. 64114

Mr. Barry Andrews
Bureau of Air Quality - Florida DER
2600 Blair Stone Road
Tallahassee, FL 32399-2400

66643

Hand Delivered
From B Andrews
Rec'd 5.19.88

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ORLANDO UTILITIES COMMISSION
500 SOUTH ORANGE AVENUE • P. O. BOX 3193 • ORLANDO, FLORIDA 32802 • 305/423-9100

May 13, 1988

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MAY 13 1988
DER-BAQM

Bureau of Air Quality Management
Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32304

ATTN: Barry Andrews

Subject: Orlando Utilities Commission
Indian River Plant CT. Project
PSD Permit No. 05-144482

Dear Mr. Andrews:

I was pleased with the favorable comments expressed by the Department, during our meeting of May 9,, regarding the top-down BACT determination as performed by our consultant Black & Veatch. As you recommended, I requested GE supply test data for the MS 6000 CT equating combustion dome erosion life to water flow rate, to achieve NOx emissions at both 25 ppmvd and 42 ppmvd, as performed by another applicant for the LM 2500/5000 CT.

I contacted GE on May 10 and they stated:

1. The combustor dome life characteristics with water injection, as exists for the LM 2500 and LM 5000, is not applicable to the GE heavy duty turbines.

2. GE will not guarantee the MS 6000 if additional water necessary to reach 25 ppmvd (natural gas fuel at 15% O_2) is used. They addressed not only the potential of unacceptable reduction in the life of the combustion chamber seals and other internal components, but, a special problem that exists with splashdown on the hot combustion liner metal. GE is unwilling to supply specific test data regarding this problem and considers it proprietary.

3. GE also provided a list of MS 6000's operating in the United States with respective NO_x levels.

A copy of GE's letter regarding these points is attached for your review.

As stated in S.M. Day's letter of May 5, 1988 to Clair Fancy, the scheduled start construction date is October 3, 1988. I will need an affirmative on this permit no later than August in order to receive Commission Approval so as not to delay the project. As you are aware the permit was submitted in January, the Department did the completeness review March 10 and we have answered all questions including the top-down BACT. Our consultants and I are willing to cooperate in any way necessary to expedite issuance.

Sincerely,

J.S. Crall
Director
Environmental Division

JSC:sp

Attachments

xc: W.H. Herrington
K.P. Ksionek
T.D. Slepow
C.F. Fancy, Deputy Chief BQAM (DER)
Don Schultz, B&V
Steve Day, B&V
T.J. Schoenholz, GE

Turbine Technology Department
One River Road
Schenectady, NY 12345

Copied: Pradeep Raval
Max Finn
Barry Andrews
T. Salwicki - CF Dist.
CHF1BT
} 5.19.88

GENERAL ELECTRIC

TURBINE TECHNOLOGY DEPARTMENT • TURBINE BUSINESS OPERATIONS
GENERAL ELECTRIC COMPANY • ONE RIVER ROAD • SCHENECTADY, NEW YORK 12345 • (518) 385-4523

May 12, 1988

Orlando Utilities Commission
500 South Orange Avenue
Orlando, Florida 32802

Attention: J. S. Crall
Environmental Division

Subject: Orlando Utilities Commission
Indian River CT Project
Combustion Turbine Project
B&V File 14137.62.1001.02

Message No.: GES/OUC/TJS/L-018

Dear Mr. Crall:

This letter will document our discussions on May 10, 1988 concerning the NOx abatement capability of the MS6000 gas turbines that are being provided for the Indian River combustion turbine project in Titusville, Florida.

A. The Combustor Dome (Life Characteristics with Water Injection - LM2500 & LM5000) curve you Panafaxed to me on May 10, 1988 is not applicable to GE heavy duty gas turbines.

B. GE's capability for NOx reduction burning natural gas fuel with water injection is 42 ppmvd (reference 15% O_2). The allowable level of water injection is established by balancing the required NOx emission level, carbon monoxide emissions, and mechanical life of combustion chamber seals and components affected by dynamic pressure oscillations. The mechanical life for standard single fuel nozzle diffusion flame combustor system internals may be shortened to an unacceptable degree when water injection is further increased to reduce NOx below 42 ppmvd (reference 15% O_2) due to liquid water splashing on hot combustion liner metal. GE is unable to supply any engineering or test data due to its proprietary nature.

C. GE's capability for NOx reduction burning No. 2 distillate fuel oil is 42 ppmvd (reference 15% O_2) with water injection. This level of water injection, however, adversely impacts the CO emissions. In addition, GE's concerns with regard to water splashing on the combustion liners (albeit to a lesser extent than on natural gas above) requires that the first combustion inspection be at 1500 fired hours. GE is unable to supply any engineering or test data due to its proprietary nature.

D. Lower NOx emission levels can be achieved with an MS7001EA equipped with a multi-fuel nozzle "quiet combustor" system. However, this gas turbine model was ruled out by Orlando Utilities Commission because it did not meet your project objectives.

Please call me if you need additional information regarding this subject.

Regards,

Terry J. Schoenholz

Terry J. Schoenholz
Senior Engineer

/wb/4123w

cc: TD Slepow, Orlando Utilities
KP Ksionek, Orlando Utilities
DD Schultz, Black & Veatch (2)
BW Goche, GE - Kansas City
MD Morris, GE - Kansas City
CH Nelson, GE - Schenectady 273-450
WG Gibbons, GE - Schenectady 2-230C

EMMISIONS GUARANTEES AND ESTIMATES FOR 6001'S IN THE U.S.

S.DATE	O.DATE	I/N	NAME LOCATION	FUEL	NOX CONTROL	NOX GUAR.PPMVD(@7%O2)
1978___		#245169	MONT DAK UTIL	OIL	NONE	225
1981___		#202030	CTY LITTLE ROCK N.LITTLE ROCK,ARK	NG OIL	WTR WTR	75 75
1982___		#202115	CROWN ZELLE ANTIOCH,CA	NG OIL	STM STM	42 42
1983___		#202195	TEXACO/BECHTEL HOUSTON,TEXAS	NG	NONE	150
1984___	0502___	#202522	AMOCO CHEMICALS TEXAS CITY,TX	NG	STM	75
1984___		#202527	INLAND CONTAINER	NG OIL	WTR WTR	42 65
1985___		#202612	ALASKA ELEC SOLDOTNA,ALASKA	NG OIL	WTR WTR	75 75
1985___		#202569	AMOCO CHEM CO CHOCOLATE BAYOU,TX	NG	STM	75
1985___		#202566	BASF WYAND GEISMAR,LA	NG	NONE	150
1986___		#295208	BORDEN CHEM GEISMAR,LA	NG	STM	75
1986___	0652___	#295235	BORDEN CHEM GEISMAR,LA	NG	STM	75
1986___		#295301	CHEVRON EL SEGUNDO,CA	NG BUT PROP	STM STM STM	42 65 63
1986___		#295302	CHEVRON EL SEGUNDO,CA	NG BUT PROP	STM STM STM	42 65 63
1986___		#295187	KAISER/GE SAN JOSE,CA	NG OIL	STM STM	42 65
1986___		#295214	UNIVER.ENERGY TAFT,CA	NG	WTR	42
1987___	0822___	#295342	ANR VENTURE HARTFORD,CT	NG OIL	STM STM	42 62
1987___	0899___	#295326	COGEN TECH BAYONNE,NJ	NG DIST	WTR WTR	42 65
1987___	0899___	#295327	COGEN TECH BAYONNE,NJ	NG DIST	WTR WTR	42 65
1987___	0899___	#295328	COGEN TECH BAYONNE,NJ	NG DIST	WTR WTR	42 65
1987___	0812___	#295346	KOCH REFIN CORPUS CHRISTI,TX	CASE BASE	STM	42
1987___		#295324	UNION CARBIDE SEADRIFT,TX	NG OIL	STM STM	75 75
1987___		#295325	UNION CARBIDE SEADRIFT,TX	NG OIL	STM STM	75 75
1988___	0852___	#295424	CELANESE BISHOP,TX	NG OIL	STM STM	42 65
1988___		#295359	ENCOGEN ONE	NG	STM	42
1988___	0911___	#295361	EXXON CHEM CO BAYTOWN,TX	NG	STM	42
1988___	0911___	#295362	EXXON CHEM CO BAYTOWN,TX	NG	STM	42
1988___	0911___	#295363	EXXON CHEM CO BAYTOWN,TX	NG	STM	42.
1988___	0999___	#295357	FINA OIL CO PORT ARTHUR,TX	NG RG	STM STM	50 65
1988___	0951___	#295429	ORLANDO UTIL INDIAN RIV,FLA	NG	WTR	42
1988___	0959___	#295430	ORLANDO UTIL INDIAN RIV,FLA	NG	WTR	42
1988___	0849___	#295358	PRITCHARD/F BAKERSFIELD,CA	NG	WTR	42
1988___	1989___	#295364	SOUTHEAST PAPER DUBLIN,GA	NG OIL	STM STM	100 100

Blue info sheet missing. Do other w/ to on envelope

Overnight Express

BLACK & VEATCH
ENGINEERS-ARCHITECTS

TEL. (913) 339-2000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS P.O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

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MAY 05 1988
DER - BAQM

Orlando Utilities Commission
Indian River Plant
PSD Permit No. 05-144482

B&V Project 14137.031
B&V File 22.0400
May 5, 1988

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality
Florida Dept of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

FEDERAL EXPRESS

Dear Mr. Fancy:

Enclosed are five copies of the revised BACT analysis for the OUC Indian River Plant Combustion Turbine Project PSD permit application. This revised BACT analysis has been prepared to comply with your request for a "top-down" BACT analysis. It is intended to completely replace the former Section 4.0 of the PSD application.

Construction of this facility is scheduled to begin on October 3 of this year. We are, therefore, most anxious for your review for completeness of the application. It is our understanding that this BACT analysis was the only outstanding issue necessary for your completeness determination.

OUC has requested that we meet with you next week at your offices to develop a mutually agreeable schedule for the remainder of the processing of this application. I will be calling to arrange a date and time for this meeting.

If you have any questions regarding this application, please call me at 913-339-2880 or Jim Crall of OUC at 305-423-9141.

Very truly yours,

BLACK & VEATCH

Steven M. Day

SMD:lar
Enclosure

cc: Janet Hayward, EPA Region IV (Federal Express)
Chun (Gary) Ng, EPA Region IV (Federal Express)
W. H. Herrington, OUC
T. D. Slepow, OUC
J. S. Crall, OUC
K. Kzionek, OUC

Copied. Pradeep Raval
Tom Rogers
Barry Andrews
CHF/BT
Tom Sowicki
5-6-88

4.0 BEST AVAILABLE CONTROL TECHNOLOGY

Previous sections of this application concluded that the project's emissions of nitrogen oxides, sulfur dioxide, carbon monoxide, volatile organic compounds, and particulate were subject to the provisions of the PSD Program. Consequently, this discussion of the appropriate best available control technology (BACT) for the project addresses control technologies/practices for these pollutants. In addition, an evaluation of non-criteria pollutants is included.

Under the federal Clean Air Act, BACT represents the maximum degree of pollutant reduction determined on a case-by-case basis after consideration of energy, environmental, and economic factors. However, BACT cannot be less stringent than the emission limits established by any applicable new source performance standard (NSPS). This BACT analysis follows the general requirements listed in the EPA Region 4 and 9 draft BACT guidance documents.

4.1 COMBUSTOR TECHNOLOGY REVIEW

A primary objective for installation of the Indian River Combustion Turbines is for operating reserves. As a member of the Florida Coordinating Group (FCG), OUC is required to maintain approximately 45 MW of operating reserves. Up to 75 percent of these operating reserves can be supplied by quick start capacity which must be capable of providing the specified capacity to the grid within 10 minutes. The proposed General Electric (GE) Frame 6 combustion turbines have a startup time from cold start to full load of 9 minutes 40 seconds, and therefore, meet FCG requirements for nonspinning reserves. Each GE Frame 6, rated at approximately 35 MW, can individually meet the quick start or spinning operating reserve requirement of 34 MW.

If the GE Frame 6 combustion turbines are not installed, OUC would be required to meet FCG operating reserve requirements by committing additional steam generating capacity to spinning reserve. This additional committed capacity requires units to be operated at reduced loads resulting

in greater fuel consumption per kWh and higher total air emissions than by meeting these reserves with idle quick start capacity.

The GE "quiet combustor" was screened as a potential BACT alternative. However, the quiet combustor technology is not available on the GE Frame 6. It is available on the larger GE Frame 7, but the startup time for the GE Frame 7 combustion turbine is 20 minutes 30 seconds (disqualifying it for use as nonspinning operating reserves). Consequently, the GE Frame 7 (and thus the quiet combustor) was eliminated from consideration as BACT since it fails to meet a primary objective for the facility. Therefore, only GE Frame 6 combustion turbines will be considered in detail for this BACT analysis.

4.2 NITROGEN OXIDE, CARBON MONOXIDE, AND VOC EMISSIONS

Due to the formation characteristics or kinetics of nitrogen oxides (NO_x), carbon monoxide (CO), and volatile organic compounds (VOC) it is necessary to consider BACT concurrently for these emissions. Volatile organic compounds emissions from combustion turbines are typically expressed as total non-methane hydrocarbons.

During combustion, two types of NO_x are formed; fuel NO_x and thermal NO_x. Fuel NO_x emissions are formed through the oxidation of a portion of the nitrogen contained in the fuel. Thermal NO_x emissions are generated through the oxidation of a portion of the nitrogen contained in the combustion air. Nitrogen oxides formation can be limited by lowering combustion temperatures, and staging combustion (a reducing atmosphere followed by an oxidizing atmosphere).

Carbon monoxide and VOC are formed by incomplete combustion of the fuel. High combustion temperatures, adequate excess air and good fuel/air mixing during combustion will minimize emissions of CO and VOC. Carbon monoxide and VOC formation are limited by ensuring complete efficient combustion of the fuel in the turbines. Therefore, staging combustion and lowering combustion temperatures for NO_x emissions control can be counterproductive with regard to CO and VOC emissions.

4.2.1 Nitrogen Oxides Emission Reduction Systems

A review of the EPA's BACT/LAER Clearinghouse - A Compilation of Control Technology Determinations (1985 edition) and its May 1986 and 1987 supplements indicated that the lowest NO_x emission limit established to date for a combustion turbine is 4.5 ppmvd at 15 percent oxygen for a combustion turbine with a heat recovery steam generator located in California. That permit value was based on the use of water injection in the combustion turbine and a selective catalytic reduction (SCR) system following the heat recovery steam generator (combined cycle operation). Therefore, the most stringent emissions control alternative established for use with combustion turbines regarding NO_x emissions is established as water injection with an SCR system.

Selective catalytic reduction is a post-combustion method for control of NO_x emissions. The SCR process combines vaporized ammonia with NO_x in the presence of a catalyst to form nitrogen and water. The vaporized ammonia is injected into the exhaust gases prior to passage through the catalyst bed. The SCR process can achieve up to 90 percent reduction of NO_x with a new catalyst. An aged catalyst will provide a maximum of approximately 86 percent NO_x reduction.

Table 4-1 presents the capital and annual costs for an SCR system installed on the four combustion turbines. An SCR system designed for an overall NO_x reduction rate of 86 percent would add approximately $17 million (1989 dollars) to the capital cost and $4.4 million to the annual cost of the four combustion turbines (assuming continuous full load operation firing distillate fuel).

The optimum flue gas temperature range for SCR operation is approximately 700 to 850 F. Flue gas from the combustion turbines will be approximately 1,000 F. Therefore, the gas must be cooled prior to injection of ammonia. The most economical method to reduce the flue gas temperature is through humidification of the flue gas with water. The water quality for humidification must be mostly free of sodium and salt deposits to protect the catalyst. The existing onsite water treatment system will be operated at rated capacity to supply the water needed for turbine water injection. Therefore, a new water treatment facility would

TABLE 4-1. SELECTIVE CATALYTIC REDUCTION CAPITAL AND ANNUAL COSTS

	Capital Cost x $1,000
Reactor System	6,400
Ammonia Storage and Injection	1,600
Flue Gas Supply and Exhaust	700
Water Treatment and Injection	2,800
Differential Balance of Plant	300
1988 Capital Cost	11,800
Contingency (10%)	1,180
Total Direct Capital Cost	12,980
Escalation (5%)	650
Direct Capital Cost	13,630
Indirects (15%)	2,040
Interest During Construction (10%)	1,570
Total Capital Cost	17,240

	Annual Cost* x $1,000
Operation and Maintenance	1,500
Additive	310
Energy	620
Fixed Charges on Capital (13.7%)	2,000
Total Levelized Annual Cost	4,430

*Annual costs are based on a 100 percent capacity factor.

be required to demineralize water prior to injection upstream of the SCR catalyst.

Capital costs for the selective catalytic reduction system include catalytic reactors, ammonia additive injection system, balance of plant costs, water treatment facilities, and incremental fan costs. Annual costs include fixed charges on capital investment, operating personnel, maintenance, ammonia additive, spent catalyst replacement, and steam and electric energy.

A levelized annual cost of $4.4 million results in an incremental removal cost of approximately $2,500 per additional ton of NO_x reduction (1,800 tons per year). This is based on continuous full load operation of the combustion turbines (a capacity factor of 100 percent). Basing the economics on a 100 percent capacity factor gives the lowest potential incremental cost for this control alternative. A more realistic operating assumption would be that the combustion turbine would operate with less than a 20 percent capacity factor. Assuming a capacity factor of 20 percent, incremental removal costs would increase to approximately $6,900 per additional ton of NO_x reduced (360 tons per year).

The energy requirements of the SCR system would reduce the output of the combustion turbines by approximately one percent.

The use of an SCR system would result in a negative environmental impact of releasing significant quantities of unreacted ammonia to the atmosphere. This is due to SCR system NO_x reduction reaction inefficiencies resulting in incomplete use of the ammonia additive. In addition, catalytic elements are toxic. Because they have to be replaced periodically, hazardous waste disposal procedures must be followed.

SCR is the only effective post combustion NO_x reduction control alternative available. The temperatures at the outlet of a simple cycle combustion turbine are too low (1,000 F) for selective non-catalytic reduction systems (Thermal DeNOx). A Thermal DeNOx system requires gas temperatures of at least 1,500 F for NO_x reduction. Since this would require supplemental heating of the flue gas, thereby, increasing total emissions from the plant due to increased fuel usage this alternative is judged technically unacceptable for application on a combustion turbine.

4.2.2 Nitrogen Oxide Emission Combustion Controls

Use of water or steam injection in the combustion zones of a Frame 6 combustion turbine can limit the amount of NO_x formed. Thermal NO_x formation is avoided due to lower combustion temperatures resulting from the water or steam injection. The degree of reduction in NO_x formation is somewhat proportional to the amount of water injected into the turbine.

New source performance standards for combustion turbines imposes a 75 ppmvd (plus heat rate adjustment) emission limit at 15 percent oxygen for nitrogen oxide (NO_x). Compliance with the 75 ppmvd NO_x emission limit requires either water or steam injection.

Since the combustion turbine NSPS was last revised in 1982, combustion turbines have improved their tolerance to the water necessary to control NO_x emissions below the new source level. However, there is still a point where the amount of water injected into the turbine seriously degrades its reliability and operational life. This generally occurs at NO_x emission levels of about 65 ppmvd (with no heat rate adjustment) on oil and 42 ppmvd on natural gas. These NO_x emission levels can be achieved with little additional cost and with little impact on reliability or power output over those costs required to comply with the NSPS.

Use of the 65/42 ppmvd NO_x emission level is supported by the EPA BACT/LAER Clearinghouse documents since no combustion turbine projects outside of California are limited to NO_x emission levels below these levels.

The consideration of environmental factors also supports the selection of water/steam injection combustion controls as BACT for NO_x. Areas surrounding the proposed location of the combustion turbines are all classified as attainment areas for NO_x. In addition, modeling analysis at the proposed NO_x emission rates of 65/42 ppmvd resulted in ambient impacts below significant impacts criteria. Therefore, the lower NO_x emissions from use of SCR technology will not result in any quantifiable improvement in environmental impacts.

Use of an SCR system will result in the emission of various amine compounds formed by the unreacted ammonia exiting the SCR system. This represents a potential adverse human health effect since many amine

compounds are suspected or known carcinogens. Although, ammonia emissions are not regulated nationally, at least one district in California recently set a limit of 10 ppm. Unreacted ammonia emissions from an SCR system should average 7 to 10 ppm, and could create objectionable odor and health hazards.

All of the previously mentioned considerations indicate that there are no potential cost benefits to use of an SCR system for the Indian River Plant. Therefore, based on economic, energy and environmental considerations, NO_x BACT for this simple cycle combustion turbine facility is the use of water or steam injection to achieve NO_x emissions of 65 ppmvd or 42 ppmvd at 15 percent oxygen when burning distillate fuel or natural gas, respectively.

4.2.3 Carbon Monoxide and Volatile Organic Compound Emission

The BACT/LAER Clearinghouse documents do not list any combustion turbine projects with more stringent emission requirements than 10 ppmvd and 5 ppmvd for CO and VOC emissions, respectively. As previously discussed, CO and VOC emissions from combustion turbines are minimized by ensuring as complete combustion as possible. Water injection for the control of NO_x emissions tends to raise CO and VOC emission levels. However, due to advances in combustion turbine design made in the last few years, the increase is not significant at the levels of water injection necessary to achieve NO_x emissions at the proposed BACT level. Therefore, the use of combustion turbines designed to meet CO and VOC emission rates of 10 ppmvd and 5 ppmvd at 15 percent oxygen, respectively is proposed as BACT.

Clearinghouse documents do list combustion turbine facilities that use a catalytic reduction system to reduce CO and VOC emissions. The process is a straight catalytic reaction requiring no additives. Permits requiring the use of these catalytic reactors have CO and VOC emission limits greater than or equal to the proposed limits. It is difficult to evaluate any improvements that might be made through use of this technology. Equipment manufacturers expect that emissions may be reduced, but that this improvement may not be quantifiable due to the measurement accuracy of

continuous emissions monitors and stack testing methods. The potential advantages of this system does not outweigh uncertainties regarding its effectiveness.

4.3 SULFUR DIOXIDE AND OTHER CRITERIA AND NON-CRITERIA POLLUTANT EMISSIONS

Review of BACT/LAER Clearinghouse documents did not list any distillate or gas fired combustion turbines that were required to use flue gas desulfurization (FGD) systems to meet sulfur dioxide (SO_2) emission requirements. Most of the permits for distillate fuel fired combustion turbines have limits for maximum allowable fuel sulfur contents.

4.3.1 Flue Gas Desulfurization

To comply with the requirements for a "top-down" BACT analysis, a wet limestone scrubber FGD system will be considered for use downstream of the combustion turbines. Wet limestone scrubbers have been successfully used to meet SO_2 emission requirements for a great number of coal fired boilers. It is widely recognized as the most stringent SO_2 control technology available.

Wet limestone scrubber modules serve as a contact zone where the slurried alkaline limestone additive contacts and absorbs the SO_2 from the flue gas. The gaseous SO_2 combines with calcium in the slurried limestone to form a wet calcium sulfate/sulfite reaction product. Reaction products are subsequently dewatered and disposed of in a pond, or solid waste disposal landfill.

A wet limestone system designed for 70 percent SO_2 removal would add a total of approximately $40 million (1989 dollars) to the capital cost and $12 million to the annual cost of the four combustion turbines (assuming continous full load operation on distillate fuel). Capital costs include costs for additive preparation, flue gas desulfurization (scrubber modules, reaction tanks, pumps, piping, etc.), flue gas supply and exhaust, waste separation and storage, and waste disposal systems for a complete FGD system. Annual costs include fixed charges on capital investment, operating personnel, additive, maintenance, and energy and demand costs.

TABLE 4-2. WET LIMESTONE SCRUBBER FGD SYSTEM CAPITAL AND ANNUAL COSTS

	Capital Costs x $1,000
Additive Preparation	2,000
FGD System	20,000
Flue Gas Supply and Exhaust	2,500
Waste Separation and Storage	1,700
Waste Disposal	800
1988 Capital Cost	27,000
Contingency (10%)	2,700
Total Direct Capital Cost	29,700
Escalation (5%)	1,500
Direct Capital Cost	31,200
Indirects (15%)	4,700
Interest During Construction (10%)	3,600
Total Capital Cost	39,500

	Annual Costs* x $1,000
Operating Personnel	400
Maintenance	2,400
Additive	50
Energy	2,800
Waste Disposal	770
Fixed Charges on Capital	5,400
Total Levelized Annual Cost	11,820

*Annual costs are based on combustion of fuel oil only and a 100 percent capacity factor.

A detailed listing of capital and annual operating costs are presented on Table 4-2.

A levelized annual cost of $12 million results in an incremental removal cost of approximately $7,000 per additional ton of SO_2 removed (1,700 tons per year). Basing the economics on burning distillate oil at a 100 percent capacity factor gives the lowest potential incremental cost for this control alternative. Since it is anticipated that natural gas will be the primary fuel, a more realistic operating assumption would be that the units would operate with less than a 10 percent capacity factor on distillate fuel. Assuming a capacity factor of 10 percent incremental removal costs would increase to approximately $36,000 per additional ton of SO_2 removed (170 tons per year).

The energy requirements of the FGD system would reduce the output of the combustion turbines by four percent. Solid wastes formed as part of the desulfurization process would also require disposal.

An additional benefit of an FGD system is the removal of hazardous air pollutants from the flue gas stream. Removal occurs either due to absorption by the scrubbing liquor, or condensation of the substance from the flue gas. Table 4-3 lists estimated controlled and uncontrolled emissions of other criteria and non-criteria pollutants identified as potential hazardous air pollutants from combustion turbines in the EPA publication entitled Compiling Air Toxics Emission Inventories (EPA-450/4-86-010). Uncontrolled emission estimates for the criteria pollutants indicate that significance levels are exceeded for beryllium and sulfuric acid mist. Significance levels do not represent emission limitations, but rather are indicators of whether a BACT review is necessary during the permit process.

Uncontrolled emission estimates are developed based on manufacturer information and on information contained in both the EPA document and a publication entitled Trace Elements in Petroleum, by Vlado Valkovic (PPE Books, 1978). FGD removal rates are based on a variety of wet limestone scrubber characterization tests for trace element removal. Emissions are total for four combustion turbines based on a 100 percent capacity factor burning distillate fuel oil. Estimated emissions listed on the table

TABLE 4-3. TRACE ELEMENTS AND OTHER NON-CRITERIA POLLUTANT EMISSIONS

Pollutant	Uncontrolled Emission Rate lb/MBtu	Uncontrolled Annual Emission* tpy	FGD System Removal percent	Controlled Emission Rate lb/MBtu	Controlled Annual Rate tpy
Antimony	5.1 E-7	3.9 E-3	99	5.1 E-9	3.9 E-5
Arsenic	2.9 E-6	0.022	93	2.0 E-7	1.5 E-3
Barium	2.5 E-8	1.9 E-4	99	2.5 E-10	1.9 E-6
Beryllium**	2.3 E-7	1.8 E-3	99	2.3 E-9	1.8 E-5
Cadmium	1.7 E-4	1.3	94	1.0 E-5	0.076
Chlorine	7.5 E-5	0.57	89	8.3 E-6	0.063
Chromium	1.2 E-4	0.92	91	1.1 E-5	0.084
Cobalt	1.5 E-5	0.11	98	3.0 E-7	2.3 E-3
Copper	1.5 E-5	0.11	99	1.5 E-7	1.1 E-3
Fluoride**	5.6 E-5	0.44	99	5.6 E-7	4.3 E-3
Formaldehyde	1.9 E-4	1.5	90	1.9 E-5	0.15
Lead**	9.5 E-6	0.07	98	1.9 E-7	1.5 E-3
Manganese	1.4 E-6	0.010	98	2.8 E-8	2.1 E-4
Mercury**	1.1 E-5	0.084	23	8.5 E-6	0.065
Nickel	1.1 E-5	0.084	93	7.7 E-7	5.9 E-3
Sulfuric Acid Mist**	0.023	176	50	0.012	88
Vanadium	8.4 E-3	64	98	1.7 E-4	1.3

*Annual emissions are total for four combustion turbines, and are based on 100 percent capacity factor burning distillate fuel oil.

**The following are the PSD significance levels for the remaining criteria pollutants.

-- Beryllium 0.0004 tpy
-- Fluoride 3 tpy
-- Lead 0.6 tpy
-- Mercury 0.1 tpy
-- Sulfuric acid mist 7 tpy

indicate that an an FGD system would remove significant quantities of beryllium, sulfuric acid mist, and vanadium. However, as indicated by the previously mentioned costs for an FGD system, removal of these elements and compounds are considerable.

4.3.2 Distillate Fuel Sulfur Content Control

The sulfur content of the distillate fuel can also be limited to minimize SO_2 emissions. New Source Performance Standards for combustion turbines require that SO_2 emissions be limited to below 0.8 lb/MBtu. OUC can obtain a distillate fuel that would meet an SO_2 emission limit of 0.30 lb/MBtu (approximately 0.30 percent sulfur distillate fuel) with little additional cost over the oil used to comply with the NSPS limitation of 0.8 lb/MBtu. Therefore, the emission of SO_2 from the combustion turbines can be controlled by limiting the distillate fuel sulfur content to 0.30 percent by weight. The resulting SO_2 emission is 60 percent more stringent than the requirements of the NSPS for combustion turbines.

The consideration of environmental factors also supports selection of fuel sulfur content control as BACT for SO_2 emissions. Areas surrounding the proposed location of the combustion turbines are all classified as attainment areas for SO_2. In addition, modeling analysis at the proposed SO_2 emission rate of 0.30 lb/MBtu resulted in ambient impacts below significant impacts criteria. The lower SO_2 emissions from the use of an FGD system will not result in any quantifiable improvement in environmental impacts. An FGD system would have the additional negative environmental impact of solid waste disposal, and groundwater consumption.

Therefore, based on economic, energy, and environmental considerations limitation of the fuel sulfur content to 0.30 percent by weight, and an emission limit of 0.30 lb/MBtu is proposed as BACT for the OUC Indian River Combustion Turbine Project.

4.3 PARTICULATE EMISSIONS

The emission of particulates from the combustion turbine facility will be controlled by ensuring as complete combustion of the fuel as possible. The NSPS for combustion turbines do not establish an emission limit for

particulate. A review of the EPA's BACT/LAER Clearinghouse documents did not reveal any post combustion particulate control technologies being used on gas/oil fueled combustion turbines. The natural gas and distillate oil fuels to be used in the proposed combustion turbines will only contain trace quantities of particulate. Therefore, OUC's standard operating procedures will ensure as complete combustion of the fuel as possible and is the proposed BACT for total suspended particulate, and particulate matter smaller than 10 microns (PM_{10}).

CM P744 170 274

15 April 1988
Orlando, FL

Tom

ORLANDO UTILITIES COMMISSION
500 SOUTH ORANGE AVENUE • P. O. BOX 3193 • ORLANDO, FLORIDA 32802 • 305/423-9100

CERTIFIED RETURN RECEIPT REQUESTED

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APR 18 1988
DER-BAQM

April 11, 1988

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality Management
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Combustion Turbine Facility
Permit No. AC05-144482, PSD-FL-130

Dear Mr. Fancy:

In response to your letter dated March 10, 1988, I would like to submit the requested information for points 1 through 5 as follows:

1. We submitted an additional $3000 on March 16, 1988 plus the initial $1000 for a total of $4000 for the permit.

2. Black and Veatch has revised table 3-1 and submitted this information to the Department. I have attached a corrected copy to this correspondence.

3. Both start and black start capability for the combustion turbines will be provided by an 800 HP internal combustion diesel on each unit. This engine typically runs for 4½ minutes during a start and consumes 2.19 gallons of No. 2 fuel oil. This is followed by a five minute cool down idle that consumes 0.1 gallons for a total of 2.29 gallons. Emissions would be expected to be less than 0.1 lbs SO_2 per unit per start. We anticipate that each unit would make approximately 130 starts per year.

   The 1 MW diesel generator from the Lake Highland Plant was evaluated to see if it had black start capability for the combustion turbines and was therefore mentioned in the application. However, it has been determined not capable and will not be technically associated with the combustion turbine project.

4. We do not anticipate any other sources of air pollution associated with this project other than those previously mentioned.

5. The water-fuel ratio required to achieve the specified NO_x emission limits will be determined during the initial testing and startup of the combustion turbines. For design purposes, Black & Veatch is using a water-fuel ratio (at base rating) as follows:

   - Natural gas — 31.6 GPM water/7230 CFM gas
   - No. 2 fuel oil — 26.8 GPM water/51 GPM oil

Black & Veatch, our consultant, is in the process of evaluating BACT using the top down approach. I expect their analysis to be ready within the next two weeks.

If you have any questions, please call me at (305)423-9141 or Steve Day (Black & Veatch) at (913)339-2880.

Sincerely,

J. S. Crall
Director
Environmental Division

JSC:ch
Attachment

xc: W. H. Herrington
F. F. Haddad
T. D. Slepow
S. M. Day (B&V)
Pradeep Raval
Tom Rogus
Barry Andrews
CHF/BT
Tom Sawicki, CF Dist
4.19.88

TABLE 3-1. SUMMARY OF AIR EMISSIONS FROM GENERAL ELECTRIC FRAME 6 COMBUSTION TURBINES

Pollutant	Fuel	Maximum Emissions Per Unit lb/h	Potential Annual Emissions* 1 Unit t/yr	Potential Annual Emissions* 4 Units t/yr	Significant Emission Rate t/yr	
Carbon Monoxide	Gas	10.0	43.8	175	100	
	Oil	10.1	44.2	177	100	
Nitrogen Oxides (as NO_2)	Gas	75.1	329	1,320	40	Revised 021088
	Oil	118.3	518	2,070	40	
Sulfur Dioxide	Gas	25.4	111	445	40	
	Oil	142.7	625	2,500	40	
Total Particulate	Gas	2.5	11	44	25	
	Oil	10.0	43.8	175	25	
PM_{10}	Gas	2.5	11	44	15	Revised 021088
	Oil	10.0	43.8	175	15	
VOC	Gas	4.0	18	70	40	
	Oil	4.0	18	70	40	

*Based on 8,760 hours of full load operation per year.

NOTE: The emissions are for operation at sea level and 59 F.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

March 18, 1988

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. William H. Herrington
Orlando Utilities Commission
500 South Orange Avenue
Orlando, Florida 32802

Dear Mr. Herrington:

Re: Combustion Turbine Facility,
Permit No. AC 05-144482, PSD-FL-130.

Please respond to the comments from U.S. EPA on the above referenced project (letter attached), at the time you respond to DER's letter requesting additional information dated March 10, 1988.

If you have any questions please call Barry Andrews (BACT), Pradeep Raval (permitting), or Max Linn (modeling) at (904) 488-1344 or write to me at the above address.

Sincerely,

C.H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CF/PR/ss

cc: T. Sawicki, CF Dist.
M. Flores, NPS
J. Crall, OUC
S. Day, Black & Veatch

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET
ATLANTA, GEORGIA 30365

MAR 14 1993
4APT/APB

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MAR 17 1993

DER - BAQM

Margaret V. Janes, Planner
Bureau of Air Quality Management
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: Orlando Utilities Commission (PSD-FL-130)

Dear Ms. Janes:

This is to acknowledge receipt of the copy of the permit application submitted by the Orlando Utilities Commission. After reviewing the document, we have some questions concerning the BACT analyses. Our comments are as follows:

1. Overall, the BACT analyses lack the necessary documentation to substantiate the company's statements. Specifically, the analyses lack emission calculations and a copy of the units' original specifications. This data is needed to substantiate the proposed emission rates. Please request the applicant to provide you with this information. The applicant should also provide a detailed cost analysis comparing different control strategies for each applicable pollutant. Then, the applicant should take into consideration the various environmental and economic impacts before making the final BACT decision. As a minor note, on page 3-2, the "potential annual emissions" reflect only half of the "maximum emissions per unit." Please ask the applicant to correct this error.

2. With regard to the NO_x BACT determination, please ask the applicant to provide a detailed cost analysis for the mentioned control methods (i.e., water injection, selective catalytic reduction, etc.). However, the proposed NO_x concentration limits for both gas and oil fuel do appear to be reasonable.

3. With regard to the SO_2 BACT determination, the applicant should quantify the addressed potential hazardous air pollutants (HAPs) (i.e., vanadium, acid gases, etc.) which could be emitted during the combustion of distillate oil. Since the applicant does not make clear the amount of oil that is to be used, one may assume that the applicant could, in theory, burn oil for the whole year. If this were the case, the amount of HAPs emitted could be significant and the applicant should address those emissions when determining the proper BACT for SO_2. As mentioned in comment one, a detailed cost analysis should be provided addressing the various control strategies (i.e., wet sodium scrubber, venturi scrubber, and so

forth). Finally, any significant HAPs should to be taken into consideration when making the final BACT decision.

4. In accordance with the December 1, 1987, Potter memorandum, we sugnest that the applicant perform the mentioned BACT determinations in a "top-down" manner.

Thank you for the opportunity to provide you with our comments. Please ask the applicant to address the above issues before making your preliminary determination. If you have any additional information or comments, please feel free to contact me or Gary Ng of my staff at (404) 347-2864.

Sincerely yours,

Bruce P. Miller, Chief
Air Programs Branch
Air, Pesticides, and Toxics
Management Division

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

March 10, 1988

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. William H. Herrington
Orlando Utilities Commission
500 South Orange Avenue
Orlando, Florida 32802

Dear Mr. Herrington:

Re: Completeness Review, Combustion Turbine Facility,
Permit No. AC 05-144482, PSD-FL-130.

The Department has received and reviewed your application packages dated January 18 and February 10, 1988. The application is deemed incomplete. Please submit the following information needed to resume the review:

1. Please submit the appropriate application fee (Re: DER letter dated February 15, 1988).

2. Please revise Table 3-1, if necessary, to reflect the number of turbines you wish permitted taking into consideration the environmental and operating conditions which would result in the maximum emissions.

3. Describe the black start capability of the turbines. What will be its associated air emissions? Will the black start capability be provided by the 1 MW diesel generator that is to be relocated from the Lake Highland Plant? What will be the air emissions and fuel consumption of this generator (for inventory purposes only)?

4. Will any other sources of air pollutants be involved in the proposed project other than the ones discussed above? What will be their emissions?

5. At what water-fuel or steam-fuel ratio do you intend to set the NOx control system?

6. In accordance with recent EPA policy developments regarding Best Available Control Technology (BACT) determinations and non-regulated pollutants, the following areas need to be addressed:

   a. Top down BACT: BACT is now being evaluated from a top down approach. In using this approach, BACT is initiated using LAER as a starting point. BACT is then determined based on the economic, environmental, and energy impacts of each control alternative beginning with the emission level/control technology associated with LAER. If the control/emission rate associated with LAER is not justified by these constraints, a lesser degree of control is selected and the analysis is repeated until the level of control that is justified is reached.

In accordance with this top down concept, the economics and corresponding emission reduction achieved by using selective catalytic reduction must be addresed. The same type of analysis should also be provided for water/steam injection at levels higher than those which were originally proposed in the application.

All toxic air pollutants that may be emitted by these turbines need to be addressed with respect to the proposed control technology. For gas/oil fired turbines, the toxic air pollutants are identified in the publications entitled, "Compiling Air Toxics Emission Inventories", EPA-450/4-86-010 and "Control Technologies for Hazardous Air Pollutants", EPA/625/6- 86-014. In accordance with these publications, the pollutants dioxin, formaldehyde, and polycyclic organic matter (POM) need to be addressed.

If you have any questions please call Barry Andrews (BACT), Pradeep Raval (permitting), or Max Linn (modeling) at (904) 488-1344 or write to me at the above address.

Sincerely,

Willard Hanks
for

C. H. Fancy, P.E.
Deputy Chief
Bureau of Air Quality
Management

CF/PR/ss

cc: T. Sawicki, DER
W. Aronson, EPA
M. Flores, NPS
J. Crall, OUC
S. Day, Black & Veatch

PM
8 March 1988
Orlando, FL

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500 SOUTH ORANGE AVENUE • P. O. BOX 3193 • ORLANDO, FLORIDA 32802 • 305/423-9100

CERTIFIED RETURN RECEIPT REQUESTED

March 7, 1988

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DER - BAQM

Mr. Pradeep Raval
Bureau of Air Quality Management
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Mr. Raval:

Per our telephone discussion and your letter of February 15, 1988, please find enclosed a check for $3000 which represents the balance of our application fee in order to permit all four proposed combustion turbine units at our Indian River Plant.

I understand that with this additional fee we will receive a permit that covers the construction of all four units and further additional air permitting for this project will not be necessary if the required schedule for phased construction is met.

Unit #2 = AC 05 - 146749
Unit #3 = AC 05 - 146750
Unit #4 = AC 05 - 146751

Cordially,

J. S. Crall
Director
Environmental Division

JSC:ch
Enclosure

xc: W. H. Herrington

Copied. Pradeep Raval
Tom Rogers
Barry Andrews
T. Scheckle
3.16.88

1031

ORLANDO UTILITIES
COMMISSION

P. O. BOX 3193
ORLANDO, FLORIDA 32802

Mr. Pradeep Raval
Bureau of Air Quality Management
Florida Department of
Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Orlando Utilities Commission

63-215
631

ORLANDO, FLORIDA

"Where Electricity Powers Progress"

2268 No. 014108

PAY TO THE ORDER OF: ORLANDO UTILITIES $3000and00cts

NOT VALID AFTER 180 DAYS

FLORIDA DEPARTMENT OF ENVIRONMENTAL REGULATION
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

DATE MAR. 7 '88

3,000.00

SUN BANK, N.A.
MAIN OFFICE:
ORLANDO, FLORIDA 32801

AUTHORIZED SIGNATURE

"014108" :063102152: 100140805"

ORLANDO UTILITIES COMMISSION P.O. BOX 3193 ORLANDO, FLORIDA 32802 No. 014108

INVOICE DATE	VENDOR INVOICE NUMBER	VOUCHER NUMBER		AMOUNT
	Balance of application fee to construct all four combustion turbine units at Indian River Plant submitted Jan. 8, 1988.			3,000.00

DISB #	VENDOR NO.	CHECK DATE	TOTAL	

Extra

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

February 15, 1988

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. William H. Herrington
Orlando Utilities Commission
500 South Orange Avenue
Orlando, Florida 32802

Dear Mr. Herrington:

Re: Permit Processing Fee Requirements
Permit No. AC 05-144482, PSD-FL-130

In reference to my conversation with Mr. Jim Crall on February 12, 1988, the appropriate application fee for each turbine is $1000.00, since the potential emissions from each turbine (source) is greater than 100 tons per year for a single pollutant.

If you wish to apply for permits for only two units at this time, you will need to send an additional $1000.00 (since we have $1000.00 submitted by you on January 20, 1988).

Enclosed is information which will help you evaluate the fee schedule in accordance with the Florida Administrative Code. If you have any questions please call me at (904)488-1344 or write to me at the above address.

Sincerely,

for Pradeep Raval
Engineer
Bureau of Air Quality
Management

PR/ks

enclosure

cc: J. Crall, OUC
T. Sawicki, DER

The above listed exemptions do not relieve the named installation, facility or equipment from any other requirements of the Florida Pollution Control Act or rules and regulations of the Department.
Specific Authority: 403.061, 403.805, F.S. Law Implemented: 253.123, 253.124, 403.021, 403.031, 403.061, 403.087, 403.088, 403.802, 403.805, 403.813, F.S. History: Formerly 17-4.03(2), F.A.C.; New 3-4-72; Revised 5-17-72; Amended 8-7-73, 6-10-75, 10-26-75, 7-8-76, 7-13-78, 3-1-79; Joint Administrative Procedures Committee Objection Withdrawn - See FAW Vol. 3, No. 30, 7-29-77; Amended 3-11-81, 7-8-82, 3-31-83, 3-15-84, 12-10-84.

17-4.05 Procedure to Obtain Permit; Application.

(1) Any person desiring to obtain a permit from the Department shall make application on forms prescribed by the Department and shall submit such information as the Department may require. The Department may require such person to submit any additional information reasonably necessary for proper evaluation.

(2) All applications and supporting documents shall be filed in quadruplicate with the Department.

(3) To ensure protection of public health, safety, and welfare any construction, modification, or operation of an installation which may be a source of pollution or a public drinking water supply shall be in accordance with good professional engineering practices pursuant to Chapter 471, Florida Statutes. Therefore, all applications for a Department permit shall be certified by a professional engineer registered in the State of Florida except when the applicant is a salaried officer of the government of the United States or a salaried engineer employed by such government while engaged within the State in the practice of professional engineering solely for the United States government or where professional engineering is not required by Chapter 471, F.S.

(4) Each application for a permit shall be accompanied by a processing fee, except for applications filed by departments of the executive branch established pursuant to Chapter 20, F.S., and water management districts established pursuant to Chapter 373, F.S. The check shall be made payable to the Department of Environmental Regulation. The processing fee is nonrefundable except as provided for in Section 120.60, F.S, and in this section. Processing fees are as follows:

(a) Air Pollution Source Permits

1. Construction Permit for a source having potential emissions of more than 100 tons per year of any single pollutant $1000

2. Construction Permit for a source having potential emissions of more than 75 tons per year of any single pollutant $750

3. Construction Permit for a source having potential emissions of more than 50 tons per year of any single pollutant $500

4. Construction Permit for a source having potential emissions of more than 25 tons per year of any single pollutant $250

5. Construction Permit for a source having potential emissions of less than 25 tons per year of any single pollutant $100

State of Florida
DEPARTMENT OF ENVIRONMENTAL REGULATION

INTEROFFICE MEMORANDUM

For Routing To District Offices And/Or To Other Than The Addressee		
To: _____	Locn.: _____	
To: _____	Locn.: _____	
To: _____	Locn.: _____	
From: _____	Date: _____	
Reply Optional [ ]	Reply Required [ ]	Info. Only [ ]
Date Due: _____	Date Due: _____	

TO: District/Subdistrict Managers

THRU: Bill Buzick

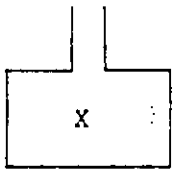
FROM: Clair Fancy

DATE: July 16, 1982

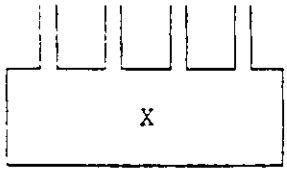
SUBJ: Permit Fees

The following is CAPS interpretation of the term "source" as it will relate to charging permit fees. This is based on past practices, and I feel is the most logical way to interpret the term. We are looking for consistency in assessing fees among the Districts and CAPS, and hopefully this will help bring this goal about. This will be one of the topics for discussion at the August District Air Engineers Meeting. If you have any questions or comments prior to that time, please feel free to call me.

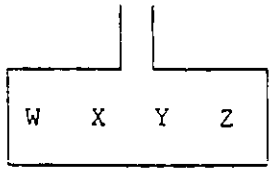
<u>One source for fee purposes</u>:



any single process (e.g., boiler, incinerator, degreaser)

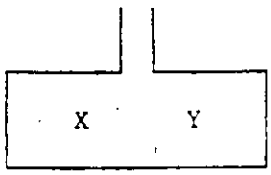


any single process (e.g., drying oven, conveyor system)

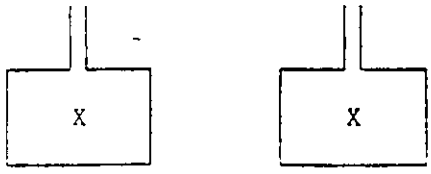


small, similar or dissimilar operations (e.g., plating, degreasing, paint dipping, sanding, painting, grinding)

<u>Two sources for fee purposes</u>:



2 large processes with one stack (e.g., 2 boilers; boiler, kiln)



2 processes, similar or dissimilar, each with one stack (e.g., degreasers, cement silos, boilers, spray booths)

CF/pa
cc: Steve Smallwood
Marti Hall
Marshall Mott-Smith
Bill Thomas
Larry George

dissolvers, viscosity reducers, or cleaning agents.

(175) "Solvent Metal Cleaning" - The process of cleaning soil from metal surfaces by cold cleaning or open top vapor degreasing or conveyorized degreasing.

(176) "Source" or "Stationary Source" - An identifiable piece of equipment (or the smallest integral combination of pieces of equipment, structures, and necessary appurtenances) that is used as a complete unit to accomplish a specific purpose or to produce a specific product; and which:

(a) Includes at least one activity or operation which is the point of origin of an air pollutant, in that it separates or allows the separation of a pollutant from process or other materials or accomplishes the conversion of all or part of various materials or fuels into a pollutant;

(b) Has at least one emission or discharge point; and

(c) Exists at or is designed to be operated as a unit at a fixed location, although parts of the source may move while the source is in operation.

(177) "Stack" - A pipe, duct, chimney, or other functionally equivalent device that confines and conveys air pollutants from a source or group of souces into the atmosphere through an emission point designed to discharge air pollutants into the atmosphere.

(178) "Stagnant Atmospheric Condition" - The atmospheric and meteorological conditions which cause a reduction in the diffusion and dispersement of air pollutants in the atmosphere.

(179) "Standard Sulfur Pellets" - Any generally spherical form of solid sulfur (such as air or water-formed prills, or granules, or hemispherical forms such as Sandvick rotoform, but not including aglomerates, popcorn, slate or crushed bulk sulfur) that meets all of the following specifications. All required tests shall be performed on sulfur pellets that have been allowed to stand a minimum of 20 days after being formed. All test results shall be the arithmetic average of three test runs, each on a separate representative composite sample of the shipment or lot being tested.

(a) Not more than 20 percent retained on a 1/4 inch U.S. (6.3 mm) screen, determined in accordance with SUDIC Test Method S2-77: Sieve Analysis of Sulfur Forms, as adopted in Rule 17-2.700, FAC.

(b) Less than six percent additional fines (minus 50 U.S. screen) generated under SUDIC's standard Stress Level II test (Method S5-77: Determination of Friability of Sulfur Forms - 28 inch (700 mm) Diameter Tumbler Test).

(180) "State Implementation Plan (SIP)" or "Implementation Plan" - The EPA approved plan which Section 110 of the Act requires a state to submit to the Administrator.

(181) "Standard Conditions" - A temperature of 68° Fahrenheit (20°C) and a pressure of 14.7 pounds per square inch absolute (760 mm Hg).

(182) "Startup" - The commencement of operation of any source which has shutdown or ceased operation for a period of time sufficient to cause temperature, pressure, chemical, or pollution control device imbalances, which result in excess emissions.

(183) "Straight Kraft Recovery Furnace" - A furnace used to recover

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

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BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

February 12, 1988

Mr. Miguel Flores, Chief
Permit Review and Technical
Support Branch
National Park Service-Air
Post Office Box 25287
Denver, Colorado 80225

Dear Mr. Flores:

RE: Orlando Utilities Commission
State Permit Number: AC 05-144482
Federal Permit Number: PSD-FL-130

Enclosed for your review and comment is the permit application for the above referenced company. If you have any comments or questions, please contact Pradeep Raval or Max Linn at the above address or at (904)488-1344.

Sincerely,

M. V. Janes

Margaret V. Janes
Planner
Bureau of Air Quality
Management

/mj

cc: Pradeep Raval
Max Linn
T. Sawicki, CF Dist.

STATE OF FLORIDA

DEPARTMENT OF ENVIRONMENTAL REGULATION

TWIN TOWERS OFFICE BUILDING
2600 BLAIR STONE ROAD
TALLAHASSEE, FLORIDA 32399-2400

BOB MARTINEZ
GOVERNOR

DALE TWACHTMANN
SECRETARY

February 12, 1988

Mr. Wayne Aronson, Chief
Program Support Section
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30365

Dear Mr. Aronson:

RE: Orlando Utilities Commission
State Permit Number: AC 05-144482
Federal Permit Number: PSD-FL-130

Enclosed for your review and comment is the permit application for the above referenced company. If you have any comments or questions, please contact Pradeep Raval or Max Linn at the above address or at (904)488-1344.

Sincerely,

M. V. Janes

Margaret V. Janes
Planner
Bureau of Air Quality
Management

/mj

cc: Pradeep Raval
Max Linn
T. Sawicki, CF Dist.

PM
Mailed in Fed Ex envelop - no blue sheet no stamp PM

File Copy

BLACK & VEATCH
ENGINEERS-ARCHITECTS
TEL. (913) 339-2000

1500 MEADOW LAKE PARKWAY
MAILING ADDRESS P.O. BOX NO. 8405
KANSAS CITY, MISSOURI 64114

DER
FEB 11, 1988
BAQM

Orlando Utilities Commission
Indian River Plant
PSD Permit Application

B&V Project 14137
B&V File 22.0400
February 10, 1988

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality
Florida Dept of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

FEDERAL EXPRESS

Dear Mr. Fancy:

Enclosed are two additional copies of the OUC Indian River Plant Application to Construct which were submitted January 18, 1988. Also enclosed are six copies of revised Table 3-1, Summary of Air Emissions from General Electric Frame 6 Combustion Turbines. The emission rates in pounds per hour were all correct on the original table but most of the annual emissions were incorrectly calculated based on 4380 hours per year of operation rather than the desired 8760 hours per year. The enclosed revised Table 3-1 corrects this error. Please accept our apology for any confusion this may have caused. All other portions of the application are already based on the revised Table 3-1 and need no further correction.

An additional question has come up regarding the modeling attached to the report. The modeling was conducted based on an emission rate assuming an oil with an 0.8 percent sulfur content. The actual proposed oil will have a maximum sulfur content of 0.30 percent. Reported results for SO_2 impacts were obtained by multiplying the modeled impacts by the ratio of .3/.8 or 0.375 (not the rounded 0.38 stated on pages 5-2 and A-2).

If you have any questions regarding this application, please call me at 913-339-2880 or Jim Crall of OUC at 305-423-9141.

Very truly yours,

BLACK & VEATCH

Steven M. Day

SMD:lar
Enclosure

cc: W. H. Herrington
T. D. Slepow
J. S. Crall, w/2 copies of application and revised Table 3-1

Copied: Pradeep Raval
Wayne Aronson, EPA
Barry Andrews
Max Lunn
File
Miguel Flores, NPS

Rev

FROM

BLACK & VEATCH

ENGINEERS-ARCHITECTS

P.O. BOX 8405

KANSAS CITY, MO. 64114

Mr. C. H. Fancy, Deputy Chief
Bureau of Air Quality
Florida Dept of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

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envelop - no blue slip
NO PM stamp

file copy

TABLE 3-1. SUMMARY OF AIR EMISSIONS FROM GENERAL ELECTRIC FRAME 6 COMBUSTION TURBINES

Pollutant	Fuel	Maximum Emissions Per Unit lb/h	Potential Annual Emissions* 1 Unit t/yr	Potential Annual Emissions* 4 Units t/yr	Significant Emission Rate t/yr	
Carbon Monoxide	Gas	10.0	43.8	175	100	
	Oil	10.1	44.2	177	100	
Nitrogen Oxides (as NO_2)	Gas	75.1	329	1,320	40	Revised 021088
	Oil	118.3	518	2,070	40	
Sulfur Dioxide	Gas	25.4	111	445	40	
	Oil	142.7	625	2,500	40	
Total Particulate	Gas	2.5	11	44	25	
	Oil	10.0	43.8	175	25	
PM_{10}	Gas	2.5	11	44	15	Revised 021088
	Oil	10.0	43.8	175	15	
VOC	Gas	4.0	18	70	40	
	Oil	4.0	18	70	40	

DER

FEB 11 1988

BAQM

*Based on 8,760 hours of full load operation per year.

NOTE: The emissions are for operation at sea level and 59 F.