KBN

November 2, 1992

Mr. Clair H. Fancy
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Subject: Polk County - A.P.
Polk Power Partners, L.P. - Mulberry Cogeneration Project
Permit Application AC 53-211670 and PSD-FL-187

Dear Clair:

We appreciate the efforts that your staff made to issue the draft permit for the Mulberry Cogeneration Project. After receipt of the draft permit, Bob McCann and I suggested to John Reynolds several minor clarifications which he indicated would be made in the final permit. These clarifications involved:

1. Specific Condition No. 2

After the first three years of operation, the emissions for the facilities shall not exceed the following limits:

		Emission Limits		
Pollutant	Source	Fuel	lbs/hr	tons/yr
NOx	HRSG Stack	Oil	164.0	59.0
	CO_2 Plant Stack	Oil	23.4	8.4
SO_2	HRSG Stack	Oil	0.1 % Sulfur Max.	
	CO_2 Plant Stack	Oil	0.1 % Sulfur Max.	
VE	HRSG Stack	Oil	20 % Opacity*	
	CO_2 Plant Stack	Oil	20 % Opacity*	

* Except for one 6-minute period per hour of not more than 27% opacity.

RECEIVED

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Division of Air
Resources Management

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KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

2. Specific Condition No. 3

The cogeneration facility shall be permitted to fire natural gas permanently and No. 2 fuel until December 31, 1997. After which time the primary fuel will be natural gas and No. 2 fuel oil can be used as backup for no more than 30 days per year. Fuel consumption rates and hours of operation for the turbine and duct burner shall not exceed those listed below (based on operation at 20 °F ambient temperature):

	Natural Gas			No. 2 Fuel Oil		
	M ft^3/hr	MM ft^3/yr	hrs/yr	M lb/hr	M lb/yr	hrs/yr
Turbine	1013.4	8877.4	8760	55.6	379.9	6833
Duct Burner	104.2	912.8	8760	0	0	0

3. Best Available Control Technology (BACT) Determination

   a. On page 1 under the heading, BACT Determination by the Department, the BACT for NO_x emissions will be changed to: Dry Low NO_x Combustion with future potential SCR capability

   b. Under the heading, BACT Determination Rationale for NO_x on page 5 of 6, the last paragraph will be changed to:

First sentence- The Department will revise the allowable BACT limit for this project, if necessary, no later than 4/30/97.

Last sentence- If the 15 (gas)/ 42 (oil) ppmvd emission rates cannot be met, SCR may be required no later than December 31, 1997.

I appreciate the opportunity to provide these comments to you and your staff in preparing the final permit conditions for this project.

Sincerely,

Kennard F. Kosky

Kennard F. Kosky, P.E.
President

cc: Mr. William Malenius, Ark Energy, Inc.
Mr. Ward Marshall, Central and South West Services, Inc.
John Reynolds, FDER
C. Holladay

RCM/mlb
B. Thomas, SW Dist.
G. Harper, EPA
B. Mitchell, NPS
W. Martin, Polk Co.
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JCB/PL

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

OCT 23 1992

4APT-AEB

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Polk Power Partners,
Mulberry Cogeneration Project (PSD-FL-187)

Dear Mr. Fancy:

This is to acknowledge receipt of the preliminary determination and draft Prevention of Significant Deterioration (PSD) permit for the above referenced facility, by your letter dated September 22, 1992. The proposed facility will be an integrated cogeneration facility, producing approximately 120,000 kilowatts net power to the transmission system and approximately 150 tons per day of liquid CO_2. The cogeneration project consists of one General Electric PG 7111EA combustion turbine, with a primary heat recovery steam generator (HRSG), a secondary HRSG, and a steam turbine generator. The CO_2 equipment includes two, 75 ton per day CO_2 recovery units.

Your determination proposes to limit NO_x emissions from the combustion turbine through water injection and dry low-NO_x combustion technology (through 4/30/97), to limit NO_x emissions from the combustion turbine through advanced dry low-NO_x combustion technology or selective catalytic reduction (after 4/30/97), to limit SO_2 and H_2SO_4 Mist emissions from the combustion turbine through limiting the sulfur content of the No. 2 distillate fuel oil, to limit CO emissions from the combustion turbine and duct burner through efficient combustion, to limit VOC emissions through efficient combustion for the combustion turbine and through a scrubber for CO_2 absorber exhausts, and to limit PM/PM_{10}, Be, and As emissions from the combustion turbine through combustion control and the use of clean fuels.

We have reviewed the package as submitted and have no adverse comments. Thank you for the opportunity to review and comment on this package. If you have any questions or comments, please contact Mr. Scott Davis of my staff at (404) 347-5014.

Sincerely yours,

for Gregg M. Worley

Brian D. Beals, Chief
Source Evaluation Unit
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc: J. Reynolds
C. Holladay
B. Thomas, SW Dist
B. Mitchell, NPS
O. Martin, Polk Co.
K. Kosky, KBN
JB/PL

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

September 22, 1992

CERTIFIED MAIL-RETURN RECEIPT REQUESTED

Mr. William R. Malenius
Senior Program Manager
Polk Power Partners
23293 South Pointe Drive
Laguna Hills, California 92653

Dear Mr. Malenius:

Attached is one copy of the Technical Evaluation and Preliminary Determination and proposed permit for Polk Power Partners to construct a cogeneration and CO_2 recovery facility in Polk County.

Please submit any written comments you wish to have considered concerning the Department's proposed action to Mr. Preston Lewis of the Bureau of Air Regulation.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/JR/plm

Attachments

c: B. Thomas, SWD
J. Harper, EPA
C. Shaver, NPS
K. Kosky, KBN
D. Martin, Polk Co.

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION

CERTIFIED MAIL

In the Matter of an
Application for Permit by:

DER File No. AC 53-211670
PSD-FL-187

Polk Power Partners
23293 South Pointe Drive
Laguna Hills, California 92653
_______________________________/

INTENT TO ISSUE

The Department of Environmental Regulation gives notice of its intent to issue a permit (copy attached) for the proposed project as detailed in the application specified above, for the reasons stated in the attached Technical Evaluation and Preliminary Determination.

The applicant, Polk Power Partners, applied on April 6, 1992, to the Department of Environmental Regulation for a permit to construct a cogeneration and CO_2 recovery facility 3.7 miles southwest of Bartow in Polk County, Florida.

The Department has permitting jurisdiction under the provisions of Chapter 403, Florida Statutes and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The project is not exempt from permitting procedures. The Department has determined that a construction permit is required for the proposed work.

Pursuant to Section 403.815, Florida Statutes and Rule 17-103.150, F.A.C., you (the applicant) are required to publish at your own expense the enclosed Notice of Intent to Issue Permit. The notice shall be published one time only within 30 days in the legal ad section of a newspaper of general circulation in the area affected. For the purpose of this rule, "publication in a newspaper of general circulation in the area affected" means publication in a newspaper meeting the requirements of Sections 50.011 and 50.031, F.S., in the county where the activity is to take place. Where there is more than one newspaper of general circulation in the county, the newspaper used must be one with significant circulation in the area that may be affected by the permits. If you are uncertain that a newspaper meets these requirements, please contact the Department at the address or telephone number listed on the fourth page. The applicant shall provide proof of publication to the Department's Bureau of Air Regulation, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within seven days of publication. Failure to publish the notice and provide proof of publication within the allotted time may result in the denial of the permit.

The Department will issue the permit with the attached conditions unless a petition for an administrative proceeding (hearing) is filed pursuant to the provisions of Section 120.57, F.S.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400. Petitions filed by the permit applicant and the parties listed below must be filed within 14 days of receipt of this intent. Petitions filed by other persons must be filed within 14 days of publication of the public notice or within 14 days of their receipt of this intent, whichever first occurs. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information;

(a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed;
(b) A statement of how and when each petitioner received notice of the Department's action or proposed action;
(c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action;
(d) A statement of the material facts disputed by Petitioner, if any;
(e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action;
(f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and
(g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this intent. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of receipt of this intent in the Office of General Counsel at the above address of the Department.

Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

C. H. Fancy, P.E., Chief
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399
904-488-1344

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this INTENT TO ISSUE and all copies were mailed by certified mail before the close of business on 9-25-92 to the listed persons.

Clerk Stamp

FILING AND ACKNOWLEDGMENT
FILED, on this date, pursuant to §120.52(11), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Clerk 9-25-92
Date

Copies furnished to:

B. Thomas, SWD
J. Harper, EPA
C. Shaver, NPS
K. Kosky, KBN

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF INTENT TO ISSUE PERMIT

The Department of Environmental Regulation gives notice of its intent to issue a permit to Polk Power Partners, 23293 South Pointe Drive, Laguna Hills, California 92653, to construct a cogeneration and CO_2 recovery facility 3.7 miles southwest of Bartow, Polk County, Florida. A determination of Best Available Control Technology (BACT) is required. The proposed project is subject to Prevention of Significant Deterioration (PSD) regulations and federal new source performance standards. Modeling results show that increases in ground-level concentrations are less than PSD significant impact levels. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

A person whose substantial interests are affected by the Department's proposed permitting decision may petition for an administrative proceeding (hearing) in accordance with Section 120.57, Florida Statutes. The petition must contain the information set forth below and must be filed (received) in the Office of General Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florida 32399-2400, within 14 days of publication of this notice. Petitioner shall mail a copy of the petition to the applicant at the address indicated above at the time of filing. Failure to file a petition within this time period shall constitute a waiver of any right such person may have to request an administrative determination (hearing) under Section 120.57, Florida Statutes.

The Petition shall contain the following information; (a) The name, address, and telephone number of each petitioner, the applicant's name and address, the Department Permit File Number and the county in which the project is proposed; (b) A statement of how and when each petitioner received notice of the Department's action or proposed action; (c) A statement of how each petitioner's substantial interests are affected by the Department's action or proposed action; (d) A statement of the material facts disputed by Petitioner, if any; (e) A statement of facts which petitioner contends warrant reversal or modification of the Department's action or proposed action; (f) A statement of which rules or statutes petitioner contends require reversal or modification of the Department's action or proposed action; and (g) A statement of the relief sought by petitioner, stating precisely the action petitioner wants the Department to take with respect to the Department's action or proposed action.

If a petition is filed, the administrative hearing process is designed to formulate agency action. Accordingly, the Department's final action may be different from the position taken by it in this

Notice. Persons whose substantial interests will be affected by any decision of the Department with regard to the application have the right to petition to become a party to the proceeding. The petition must conform to the requirements specified above and be filed (received) within 14 days of publication of this notice in the Office of General Counsel at the above address of the Department. Failure to petition within the allowed time frame constitutes a waiver of any right such person has to request a hearing under Section 120.57, F.S., and to participate as a party to this proceeding. Any subsequent intervention will only be at the approval of the presiding officer upon motion filed pursuant to Rule 28-5.207, F.A.C.

The application is available for public inspection during normal business hours, 8:00 a.m. to 5:00 p.m., Monday through Friday, except legal holidays, at:

Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Department of Environmental Regulation
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Any person may send written comments on the proposed action to Mr. Preston Lewis at the Department's Tallahassee address. All comments received within 30 days of the publication of this notice will be considered in the Department's final determination.

Further, a public hearing can be requested by any person. Such requests must be submitted within 30 days of this notice.

Technical Evaluation
and
Preliminary Determination

Polk Power Partners
Cogeneration/CO_2 Recovery Project
Polk County, Florida

Permit No. AC 53-211670
PSD-FL-187

Department of Environmental Regulation
Division of Air Resources Management
Bureau of Air Regulation

September 22, 1992

I. Application Information

A. Applicant

Polk Power Partners
23293 South Pointe Drive
Laguna Hills, Florida 92653

B. Request

The applicant submitted an application on April 6, 1992, for a permit to construct a 126 megawatt (MW) combined cycle cogeneration/CO_2 recovery facility near Bartow, Florida. The Department received incompleteness items which made the application complete on July 9, 1992. However, on August 14, 1992, the applicant submitted a letter proposing new NO_x emission limits. This had the effect of moving up the completion date to August 14, 1992.

C. Classification/Location

The proposed facility (SIC Codes 4911 and 2813) will be located on County Road 555 approximately 3.7 miles southwest of Bartow, Polk County, Florida. Latitude and longitude are 27°50'56"N and 81°52'38.9"W, respectively. The UTM coordinates of the site are: Zone 17, 413.6 km E and 3,080.6 km N.

II. Project Description/Emissions

The applicant proposes to construct a 126 MW combined cycle cogeneration power plant along with a 150 ton per day carbon dioxide (CO_2) plant that will recover CO_2 from the power plant flue gas. Cogeneration equipment will include a General Electric combustion turbine (CT), a non-auxiliary fired primary and an auxiliary-fired secondary heat recovery steam generator (HRSG), and a steam turbine generator. CO_2 plant equipment consists of two identical 75 TPD recovery units, each including a CO_2 absorber using monoethanolamine (MEA) solvent, MEA stripper, potassium permanganate ($KMnO_4$) scrubber, carbon adsorption tower, CO_2 compression and refrigeration equipment.

The permanent fuel for the power plant will be natural gas, although the plant will not have a firm contact for natural gas until the fourth year of operation. During the first three years, natural gas will provide a minimum of 22% of fuel requirements with the balance supplied by distillate fuel oil. About two-thirds of the facility's power output will come from the gas turbine generator. Steam from the primary and secondary HRSG will drive a steam turbine to generate the other third of the power output.

Combustion gases from the turbine will be routed to the primary HRSG which provides steam for additional power generation. Part of the turbine exhaust will go to the secondary HRSG to be burned with natural gas forming CO_2-rich feed gas for the CO_2 recovery plant.

The CO_2-enriched flue gas is compressed and scrubbed with MEA solvent to absorb most of the CO_2. MEA is then stripped off the absorbed CO_2 in a steam-heated reboiler with the CO_2 being released through the stripper tower overhead. Purification of the stripped CO_2 is accomplished by scrubbing first with recirculating $KMnO_4$ to remove remaining MEA, then with water to remove soluble impurities. Activated carbon provides the final purification step. The purified CO_2 is compressed, cooled and dried before being liquified in an ammonia refrigeration system. Final products include liquid, solid and gaseous CO_2.

Emission estimates below are based on the initial three-year operation using a 22% gas/78% oil fuel mix followed by natural gas as the permanent fuel. Annual estimates are based on full load operation at 59°F and 0.1% sulfur content of the fuel oil.

Projected Emissions (TPY)

	First 3 yrs (22% Gas/78% Oil)(1)			After First 3 yrs (100% Gas)(2)		
	HRSG Stack	CO_2 Plant Stack	Total	HRSG Stack	CO_2 Plant Stack	Total
NO_x	644.8	99.1	743.9	230.7	80.0	310.7
SO_2	327.4	16.4	343.8	11.4	1.8	13.2
PM/PM_{10}	58.0	28.9	86.9	30.7	27.7	58.4
CO	298.6	57.1	355.7	187.8	52.0	239.8
VOC	37.7	79.3	117.0	28.2	78.8	107.0
H_2SO_4	26.4	1.3	27.7	0.9	0.1	1.0
Be	.008	--	.008	--	--	--
As	.013	--	.013	--	--	--

(1) Based on 25 ppm NO_x (gas) and 42 ppm NO_x (oil).
(2) Based on 15 ppm NO_x (gas).

III. Rule Applicability

The construction permit application is subject to review under Chapter 403, Florida Statutes, and Florida Administrative Code (F.A.C.) Chapters 17-2 and 17-4. The proposed facility is subject to the provisions of F.A.C. Rule 17-2.500, Prevention of Significant Deterioration (PSD). The facility is located in an area classified as attainment for all regulated air pollutants. The proposed emissions exceed the significant levels set forth in Table 500-2 of F.A.C. Rule 17-2.500. Preconstruction review must include a determination of Best Available Control Technology (BACT), good-engineering practice stack height, ambient impact analysis, impact on soils, vegetation and visibility. Applicable emission limit rules are F.A.C. Rules 17-2.660, Table 660-1, Section 60.330, New Source Performance Standards (NSPS) for Stationary Gas Turbines, Subpart GG, and F.A.C. Rule 17-2.600(b), Fossil Fuel Steam Generators with Less than 250 Million Btu per Hour Heat Input. Contrary to the applicant's analysis, the emission limits under Subpart Dc of the federal NSPS do not apply to the duct burner since this rule requires only recordkeeping and reporting for natural gas applications. BACT limits will be based on the turbine manufacturer's performance guarantees since they are more stringent than the NSPS limits.

IV. Air Quality Analysis

a. Introduction

The operation of the proposed facility will result in emissions increases which are projected to be greater than the PSD significant emission rates for the following pollutants: NO_x, SO_2, PM, PM_{10}, Be, CO, VOC, inorganic arsenic, and H_2SO_4 mist. Therefore, the project is subject to the PSD NSR requirements contained in F.A.C. Rule 17-2.500(5) for these pollutants. Part of these requirements is an air quality impact analysis for these pollutants, which includes:

- An analysis of existing air quality;
- A PSD increment analysis (for SO_2, PM, PM_{10}, and NO_2);
- An ambient Air Quality Standards analysis (AAQS);
- An analysis of impacts on soils, vegetation, visibility a growth-related air quality impacts; and,
- A Good Engineering Practice (GEP) stack height determination.

The analysis of existing air quality generally relies on preconstruction monitoring data collected in accordance with EPA-approved methods. The PSD increment and AAQS analyses are based on air quality dispersion modeling completed in accordance with EPA guidelines.

Based on these required analyses, the Department has reasonable assurance that the proposed project, as described in this report and subject to the conditions of approval proposed herein, will not cause or contribute to a violation of any PSD increment or ambient air quality standard. A brief description of the modeling methods used and results of the required analyses follow. A more complete description is contained in the permit application on file.

b. Analysis of the Existing Air Quality

Preconstruction ambient air quality monitoring may be required for pollutants subject to PSD review. However, an exemption to the monitoring requirement can be obtained if the maximum air quality impact resulting from the projected emissions increase, as determined through air quality modeling, is less than a pollutant-specific de minimus concentration. The predicted maximum concentration increase for each pollutant subject to PSD (NSR) is given below:

	SO_2	TSP & PM_{10}	NO_2	CO	Be
PSD de minimus Concentra. (ug/m^3)	13	10	14	575	.001
Averaging Time	24-hr	24-hr	Annual	8-hr	24-hr
Maximum Predicted Impact (ug/m^3)	15.5	2.8	0.85	23.6	0.00038

There are no monitoring de minumus concentrations for H_2SO_4 mist and inorganic arsenic. Preconstruction monitoring may be required for ozone concentrations when the maximum potential VOC emissions from a proposed source are projected to be greater than 100 tons per year. The applicant projected emissions from VOCs to be greater than 100 tons per year based on 100% fuel oil firing. The Department is limiting VOC emissions to 79.6 TPY; therefore, no preconstruction monitoring is required. As shown above, the predicted impacts for TSP/PM_{10}, NO_2, CO, and Be are all less than the corresponding de minimus concentrations; therefore, no preconstruction monitoring is required for these pollutants. However, since the predicted SO_2 impact is greater than the de minimus concentration, a preconstruction ambient monitoring analysis is required for SO_2. The Department determined that the use of existing FDER air quality monitoring data collected in 1991 from the Mulberry SO_2 monitoring site in Polk County would be appropriate to satisfy the ambient monitoring analysis requirement. Background SO_2 values of 176 ug/m^3, 3-hr average; 40 ug/m^3, 24-hr average; and 12 ug/m^3, annual average, were based on these data. This site is located 9.7 km away from the project.

c. Modeling Method

The EPA-approved Industrial Source Complex Short-Term (ISCST) dispersion model was used by the applicant to predict the impact of the proposed project on the surrounding ambient air. All recommended EPA default options were used. Downwash parameters were used because the stacks were less than the good engineering practice (GEP) stack height. Five years of sequential hourly surface and mixing depth data from the Tampa, Florida National

Weather Service (NWS) station collected during 1982 through 1986 were used in the model. Since five years of data were used, the highest-second-high (HSH) short-term predicted concentrations are compared with the appropriate ambient air quality standards or PSD increments. For the annual averages, the highest predicted yearly average was compared with the standards.

d. Modeling Results

The applicant first evaluated the potential increase in ambient ground-level concentrations associated with the project to determine if these predicted ambient concentration increases would be greater than specified PSD significant impact levels for SO_2, CO, NO_x, PM and PM_{10}. This evaluation was based on the proposed facility operating at maximum load conditions and 20°F and 100°F design temperatures. Maximum load conditions along with these two design temperatures were used because the highest emissions and flow rate occur at the 20°F design condition while the lowest emissions and flow rate occur at the 100°F design condition. This approach ensured that the maximum impacts from the proposed facility were obtained either for the maximum emission condition or minimum flow rate condition. The applicant modeled emissions based on the use of fuel oil with a maximum sulfur content of 0.1%. Dispersion modeling was performed with receptors placed along the 36 standard radial directions (10 degrees apart) surrounding the proposed units at the following downwind distances: (1) the first 36 receptors were located at the plant property boundaries; (2) subsequent receptors were located at distances of 0.3, 0.5, 0.7, 1.0, 1.5, 2.0, 3.0, 4.0 and 5.0 km from the facility, all of which are off plant property. The results of this modeling presented below show that the increases in ambient ground-level concentrations for all averaging times are less than the PSD significant impact levels for CO, NO_x, PM and PM_{10}.

	SO_2			NO_2	CO		PM and PM_{10}	
Avg. Time	Annual	3-hr	24-hr	Annual	1-hr	8-hr	Ann.	24-hr
PSD Signifi. Level (ug/m^3)	1.0	25.0	5.0	1.0	2000	800	1.0	5.0
Ambient Concen. Increase (ug/m^3)	0.3	42.5	15.5	0.9	58.9	23.6	0.2	2.8

Therefore, further dispersion modeling for comparison with AAQS and PSD increment consumption were not required for CO, NOx, PM and PM_{10}. However, the results also show that the increases in maximum ambient ground level concentrations for the 3-hr and 24-hr averaging times for SO_2 were greater than the PSD significant impact levels, thus requiring the applicant to do a full impact analysis for SO_2. The significant impact area for the facility was determined to be 0.7 km; therefore, all sources within 51 km of the facility were evaluated by the applicant. Screening analyses were performed to predict maximum SO_2 concentrations for comparison to the PSD Class II increments and the AAQS using the same receptor grid described above. Refined AAQS and PSD Class II analyses were based on modeling the years during which the overall HSH 3-hour and HSH 24-hour concentrations were predicted in the screening analyses. The refined 3-hr and 24-hr modeling was conducted using a receptor grid centered on the receptor which had the HSH 3-hr or 24-hr concentration determined from the screening analysis. These receptors were located at intervals of 200m between the distances considered in the screening phase, along 9 radials spaced at 2-degree increments centered on the radial along which the maximum concentration was predicted. The results of these analyses for SO_2 and their comparison with the appropriate standards and increments are summarized in the following tables. The tables show that the maximum predicted SO_2 concentrations are all less than the appropriate AAQS and PSD increments.

AAQS Analysis (all values in ug/m^3)

Avg. Time	Annual	3-hr	24-hr
Maximum Predicted Concentration	42	837	234
Includes Background Value	12	176	40
AAQS	60	1300	260

Cumulative PSD Class II
Increment Analysis (all values in ug/m^3)

Avg. Time	Annual	3-hr	24-hr
Max. Predicted Consumption Concen.	-0.42	139	39
Increment	20	512	91

The nearest PSD Class I area is the Chassahowitzka National Wilderness Area located 120 km from the facility. The predicted impact of the proposed project on this area was evaluated by first using the ISCST model to predict maximum increment consumptions by the source alone and by comparing these predicted values to the appropriate recommended significance levels to determine whether further modeling was necessary. The significance levels used by the Department were the more stringent National Park Service (NPS) recommended levels. The predicted maximum PM/PM_{10} and NO_2 increment consumptions for all applicable averaging times were less than these significance levels. Therefore, no further modeling for PM/PM_{10} and NO_2 was required. In addition, the predicted maximum SO_2 annual average increment consumption by the source alone was also below the NPS significance level. However, the predicted maximum SO_2 24-hour and 3-hour concentrations were predicted to be greater than the NPS levels. The Department and the NPS directed the applicant to further evaluate the SO_2 short term impacts on the Class I area. The applicant used ISCST and modeled the inventory of all PSD increment consuming and expanding sources using 1982-1986 Tampa meteorological data. The applicant also modeled the proposed facility's impacts during this time period and compared the results to the NPS significance levels. Results of this evaluation show that on the days and at the location of significant impacts due to the proposed facility, total 3-hour and 24-hour SO_2 impacts at Chassahowitzka were predicted to be less than the allowable 3-hour and 24-hour PSD Class I increments except for one case. In that case, the total 24-hour concentration was predicted to be 5.22 ug/m^3 with the proposed source contributing 0.09 ug/m^3. The allowable 24-hour Class I increment is 5.0 ug/m^3 and the NPS significance level is 0.07 ug/m^3. However, the NPS has stated by verbal communication that they do not expect the proposed facility to adversely impact the Class I area since the maximum predicted impacts were based on the use of fuel oil and the applicant is committed to using and will be limited by the Department to using natural gas as the permanent fuel after the first three years.

Sulfuric acid mist, beryllium and inorganic arsenic are noncriteria pollutants, which means that neither national AAQS nor PSD Significant Impacts have been defined for these pollutants. However, the Department does have a draft Air Toxics Permitting Strategy, which defines no threat levels for these pollutants. The Department and the applicant have used the same modeling procedure described above for the screening analysis to evaluate the maximum increase in ground level concentration of these pollutants for comparison with the no-threat levels. The results of this analysis are shown below:

Avg. Time	H_2SO_4 Mist 24-hr	Be Annual	As Annual
No Threat-Level (ug/m^3)	2.38	0.00042	0.00023
Max. Concen. Increase	1.24	0.00001	0.00001

All of these values are less than their respective no-threat levels.

e. Additional Impacts Analysis

A Level-1 screening analysis using the EPA model, VISCREEN was used to determine any potential adverse visibility impacts on the Class I Chassahowitzka National Wilderness Area located about 120 km away. Based on this analysis, the maximum predicted visual impacts due to the proposed project are less than the screening criteria both inside and outside the Class I area. A comprehensive air quality related values (AQRV) analysis for this Class I area was performed by the applicant.

In addition, the maximum predicted concentrations from NOx, CO, SO_2, PM and PM_{10} are predicted to be less than the AAQS, including the national secondary standards designed to protect public welfare-related values. As such, no harmful effects on soil and vegetation are expected in the area of the project. Also, the proposed modification will not significantly change employment, population, housing or commercial/industrial development in the area to the extent that a significant air quality impact will result.

VI. Conclusion

Based on the information provided by Polk Power Partners, L.P., the Department has reasonable assurance that the proposed installation, as described in this evaluation, and subject to the conditions proposed herein, will not cause or contribute to a violation of any air quality standard, PSD increment, or any other technical provision of Chapter 17-2 of the Florida Administrative Code.

P Preston Lewis #41755

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

PERMITTEE:
Polk Power Partners, L.P.
23293 South Pointe Drive
Laguna Hills, CA 92653

Permit Number: AC 53-211670
PSD-FL-187
Expiration Date: December 31, 1994
County: Polk
Latitude/Longitude: 27°50′56″N
81°52′39″W
Project: Mulberry Cogeneration Project

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Chapters 17-2 and 17-4. The above named permittee is hereby authorized to perform the work or operate the facility shown on the application and approved drawings, plans, and other documents attached hereto or on file with the Department and made a part hereof and specifically described as follows:

For the construction of a 126 Megawatt cogeneration unit along with a 150 ton per day CO_2 recovery plant. The facility will be located off County Road 555 approximately 3.7 miles southwest of Bartow in Polk County, Florida. UTM coordinates of the site are: Zone 17, 413.6 km E and 3080.6 km N.

Particulate emissions shall be controlled by using clean fuels and good combustion practices. CO emissions shall be controlled by proper combustion techniques. NO_x emissions shall be initially controlled by water injection and Low NO_x Burners. Future control technology for NOx (SCR) will depend on whether the Low NO_x Burners can achieve the levels specified by this permit.

The source shall be constructed in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

<u>Attachments are listed below:</u>

1. DER letter dated May 5, 1992.
2. KBN letter dated April 15, 1992.
3. KBN letter dated June 2, 1992.
4. EPA letter dated July 1, 1992.
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6. KBN letter dated July 29, 1992.
7. KBN letter dated August 12, 1992.
8. DER letter dated August 13, 1992.
9. KBN letter dated August 26, 1992.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth in this permit are "Permit Conditions" and are binding and enforceable pursuant to Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of these conditions.

2. This permit is valid only for the specific processes and operations applied for and indicated in the approved drawings or exhibits. Any unauthorized deviation from the approved drawings, exhibits, specifications, or conditions of this permit may constitute grounds for revocation and enforcement action by the Department.

3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

GENERAL CONDITIONS:

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

a. Have access to and copy any records that must be kept under the conditions of the permit;

b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

PERMITTEE:
Polk Power Partners, L.P.

Permit Number: AC 53-211670
PSD-FL-187
Expiration Date: December 31, 1994

GENERAL CONDITIONS:

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

(x) Determination of Best Available Control Technology (BACT)
(x) Determination of Prevention of Significant Deterioration (PSD)
(x) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;

GENERAL CONDITIONS:

- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. Unless otherwise indicated, the construction and operation of the subject facilities shall be in accordance with the capacities and specifications stated in the application.

2. Emissions from these facilities shall not exceed the limits listed below (based on operation at 59°F):

Pollutant	Source	Fuel	1st Three Years lbs/hr	1st Three Years tons/yr	After 1st Three Years** lbs/hr	After 1st Three Years** tons/yr
NOx	HRSG Stack	Gas	87.8	384.5	52.7	230.7
	CO_2 Plant Stack	Gas	19.9	87.1	18.3	80.0
	HRSG Stack	Oil	164.0	718.2	--	--
	CO_2 Plant Stack	Oil	23.4	102.4	--	--
SO2	HRSG Stack	Oil	0.1% Sulfur Max.		--	--
	CO_2 Plant Stack	Oil	0.1% Sulfur Max.		--	--
VE	HRSG Stack	Gas	10% Opacity*		10% Opacity*	
	CO_2 Plant Stack	Gas	10% Opacity*		10% Opacity*	
	HRSG Stack	Oil	20% Opacity*		--	
	CO_2 Plant Stack	Oil	20% Opacity*		--	
VOC	CO_2 Plant Stack	--	18.2	79.6	17.7	77.6
CO	HRSG Stack	Gas	42.9	187.8	42.9	187.8
	CO_2 Plant Stack	Gas	11.9	52.0	11.9	52.0
	HRSG Stack	Oil	75.3	329.9	75.3	329.9
	CO_2 Plant Stack	Oil	13.4	58.5	13.4	58.5

*Except for one 6-minute period per hour of not more than 27% opacity.
**Based on 15 ppmvd NO_x.

SPECIFIC CONDITIONS:

3. The cogeneration facility shall be permitted to fire natural gas permanently and No. 2 fuel oil for the first three years of operation. Fuel consumption rates and hours of operation for the turbine and duct burner shall not exceed those listed below:

	Natural Gas			No. 2 Fuel Oil		
	M ft3/hr	MM ft3/yr	hrs/yr	M lb/hr	M lb/yr	hrs/yr
Turbine	914.5	8011.0	8760	55.6	372.6	6701
Duct Burner	104.2	912.8	8760	0	0	0

4. Before this construction permit expires, the cogeneration facility and CO_2 Recovery Plant stacks shall be sampled or tested as applicable according to the emission limits in Specific Condition No. 2. Annual compliance tests shall be conducted each year thereafter. Compliance tests shall be run at 96% to 100% of the maximum capacity achievable for the average ambient temperature during the compliance tests. The turbine manufacturer's capacity vs. temperature (ambient) curve shall be included with the compliance test results. Tests shall be conducted using the following reference methods:

NO_x: EPA Method 20
SO_2: Fuel supplier's sulfur analysis
VE: EPA Method 9
CO: EPA Method 10
VOC: EPA Method 25A

5. The DER Southwest District office shall be notified at least 30 days prior to the compliance tests. Compliance test results shall be submitted to the DER Southwest District office in Tampa and the DER Bureau of Air Regulation office in Tallahassee (third annual compliance test only) within 45 days after completion of the tests. Sampling facilities, methods, and reporting shall be in accordance with F.A.C. Rule 17-2.700 and 40 CFR 60, Appendix A.

6. A continuous operations monitoring system shall be installed, operated, and maintained in accordance with 40 CFR 60.334. The natural gas, fuel oil and water injection flows to the cogeneration turbine along with the power output of the generators shall be metered and continuously recorded. The data shall be logged daily and maintained so that it can be provided to DER upon request.

7. The permittee shall have the option of including, in the initial construction, adequate modules and other provisions

PERMITTEE:
Polk Power Partners, L.P.

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SPECIFIC CONDITIONS:

necessary for future installation of state-of-the-art catalytic abatement or equivalent NOx control systems. Within 90 days of receipt of the third annual compliance test results, the Bureau of Air Regulation shall, if NO_X emission limits are not met, review the need for making a revised determination of Best Available Control Technology. If test results show that it is unlikely that NO_X limits can be met, a revised BACT determination shall be made. The Department may revise the BACT determination to require installation of such technology if so indicated by the revised BACT cost/benefit analysis. The retrofit costs associated with not making provisions for such technology initially shall not be considered by the Department in the retrofit cost analysis.

8. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (F.A.C. Rule 17-4.090).

9. An application for an operation permit must be submitted to the Southwest District office at least 90 days prior to the expiration date of this construction permit. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rules 17-4.055 and 17-4.220).

Issued this ______ day
of ______________, 1992

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

____
Carol M. Browner, Secretary

Best Available Control Technology (BACT) Determination
Mulberry Cogeneration Project
Polk County

The applicant proposes to install a 126 MW combined cycle cogeneration unit along with a 150 TPD carbon dioxide plant that will recover CO_2 from the power plant flue gas. The Polk County facility will consist of a General Electric PG7111EA Gas Turbine Generator exhausting through a primary heat recovery steam generator which will produce steam for the steam-electric cycle. Initially, the turbine will be fired by natural gas and No. 2 fuel oil, with natural gas becoming the permanent fuel after the first three years of operation. A secondary heat recovery steam generator will be auxiliary-fired by natural gas to provide a CO_2-enriched flue gas feed to the CO_2 recovery plant.

Date of Receipt of a Complete Application

August 14, 1992

BACT Determination Requested by Applicant

NO_x	- Dry Low NO_x Combustion
CO	- Combustion Design
H_2SO_4/SO_2	- Low Sulfur Fuel Oil (0.1%S)
VOC	- Combustion Design for CT Scrubber for CO_2 Absorber Exhaust
PM/PM_{10}	- Combustion Design/Clean Fuel

BACT Determination by the Department

NO_x	- Dry Low NO_x Combustion with future SCR capability
CO	- Combustion Design
H_2SO_4/SO_2	- Low Sulfur Fuel Oil (0.1%S)
VOC	- Combustion Design for CT Scrubber for CO_2 Absorber Exhaust
PM/PM_{10}	- Combustion Design/Clean Fuel

Proposed Emission Limits (tons per year)

	First 3 yrs (22% Gas/78% Oil)			After First 3 yrs (100% Gas)			PSD
	HRSG	CO_2 Plant	Total	HRSG	CO_2 Plant	Total	
NO_x	644.8	99.1	743.9	230.7	80.0	310.7	40.0
SO_2	327.4	16.4	343.8	11.4	1.8	13.2	40.0
PM/PM_{10}	56.0	28.9	86.9	30.7	27.7	58.4	25/15
CO	298.6	57.1	355.7	187.8	52.0	239.8	100.0
VOC	37.7	79.3	117.0	28.2	78.8	107.0	40.0
H_2SO_4	26.4	1.3	27.7	0.9	0.1	1.0	7.0
Be	.008	--	.008	--	--	--	0.0004
As	.013	--	.013	--	--	--	0.0

These limits assume that 4.6% of the turbine exhaust mass flow is diverted to the CO_2 plant. Emissions for the first three years are based on firing 22% gas - 78% oil in the turbine for 8,760 hours/yr at 1016 MMBtu/hr and natural gas in the duct burner for 8,760 hours/yr at 99 MMBtu/hr. Emissions after the first three years are based on firing only natural gas at 868.8 MMBtu/hr. Turbine performance under natural gas firing is based on NO_x emissions of 25 ppm (corrected to 15 percent O_2) for the first three years and 15 ppm thereafter. Performance on oil firing is based on NO_x emissions of 42 ppmvd (corrected to 15 percent O_2). SO_2 emissions are based on 0.1 percent sulfur.

BACT Determination Procedure

In accordance with Florida Administrative Code Chapter 17-2, Air Pollution, this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that in making the BACT determination the Department shall give consideration to:

(a) Any Environmental Protection Agency determination of Best Available Control Technology pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources) or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants).

(b) All scientific, engineering, and technical material and other information available to the Department.

(c) The emission limiting standards or BACT determinations of any other state.

(d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically or economically infeasible for the source in question, than the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

BACT Determination Rationale

Particulate Matter (PM/PM_{10})

Particulate emissions will be minimized by combustion control and the use of clean fuels. The particulate emissions from the combustion turbine when burning natural gas and fuel oil will not cause visible emissions to exceed 10% and 20% opacity, respectively.

Arsenic and Berylium (As, Be)

The Department agrees that there are no feasible methods to control beryllium and arsenic except by specifying the quality of the fuel.

Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

The majority of BACT emissions limitations have been based on controlling carbon monoxide and volatile organic compounds through efficient combustion. Advanced control is achievable through the use of catalytic oxidation. Catalytic oxidation is a postcombustion control that has been employed in CO nonattainment areas where regulations have required CO emission levels to be less than those associated with wet injection. These installations have been required to use LAER technology and typically have CO limits in the 10-ppm range (corrected to dry conditions).

In an oxidation catalyst control system, CO emissions are reduced by allowing unburned CO to react with oxygen at the surface of a precious metal catalyst such as platinum. Combustion of CO starts at about 300°F, with efficiencies above 90 percent occurring at temperatures above 600°F. Catalytic oxidation occurs at temperatures 50 percent lower than that of thermal oxidation, which reduces the amount of thermal energy required. For CT/HRSG combinations, the oxidation catalyst can be located directly after the CT or in the HRSG. Catalyst size depends upon the exhaust flow, temperature, and desired efficiency.

Due to the oxidation of sulfur compounds and excessive formation of H_2SO_4 mist emissions, oxidation catalyst systems are not considered to be technically feasible for gas turbines fired with fuel oil. Catalytic oxidation has not been demonstrated on a continuous basis when using fuel oil.

Use of oxidation catalyst technology would be feasible for a natural gas-fired unit; however, the cost effectiveness of over $6,000 per ton of CO removed will have a significant economic impact on this project. Therefore, efficient combustion will be the control method for CO and VOC.

Nitrogen Oxides (NO_x)

The applicant requested that BACT for nitrogen oxides during the first three years be water injection and Low NO_x Burners. This would limit emissions to 25 ppmvd when burning natural gas and 42 ppmvd when burning fuel oil.

A review of the EPA's BACT/LAER Clearinghouse indicates that the lowest NO_x emission limit established to date for a combustion turbine is 4.5 ppmvd (corrected to 15% O_2). This level of control was accomplished through the use of water injection and a selective catalytic reduction (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% reduction of NO_x with a new catalyst. As the catalyst ages, the maximum NO_x reduction will decrease to approximately 86 percent.

Although feasible, the applicant rejected using SCR because of economic, energy, and environmental impacts. The following factors were considered in the decision not to propose SCR:

a) Disposal of hazardous waste generated (spend catalyst).
b) An energy penalty of $0.05/KWH due to back pressure from the catalyst bed.
c) A power loss penalty based on lost capacity.
d) Potential for public exposure to high concentrations from ammonia storage and handling leaks and ammonia slip.
e) Ammonium bisulfate and ammonium sulfate particulate emissions (ammonium salts) due to the reaction of NH_3 with SO_3 present in the exhaust gases.
f) Cost effectiveness for SCR technology was determined to be in the range of $6,000 per ton of NO_x removed.

A concern associated with the use of SCR on combined cycle projects is the formation of ammonium bisulfate which can be formed by reaction of sulfur in the fuel and the ammonia injected. The ammonium bisulfate has a tendency to plug the tubes of the heat recovery steam generator leading to operational problems. The latest information available indicates that SCR can be used for oil firing provided that adjustments are made in the ammonia to NO_x injection ratio. For natural gas firing, NO_x emissions can be controlled with up to a 90 percent efficiency using a 1 to 1 or greater injection ratio. By lowering the injection ratio for oil firing, testing has indicated that NO_x can be controlled with efficiencies ranging from 60 to 75 percent. When the injection ratio is lowered there is not a problem with ammonium bisulfate formation since essentially all of the ammonia is able to react with the nitrogen oxides present in the combustion gases. SCR has been established as BACT for oil fired combined cycle facilities with NO_x emission limits ranging from 11.7 to 25 ppmvd depending on the efficiency of control.

The applicant determined that the total annual cost of SCR for this project is $1,957,700 with an average cost effectiveness in the range of $6,000 to $7,000 per ton of NO_x removed. The maximum annual NO_x emissions using water injection and Low NO_x combustor design will be 744 tons/year for the first three years. Assuming that SCR would reduce the NO_x emissions by 65%, about 484 tons/year of NO_x would be removed initially followed by 200 tons/year thereafter. When this reduction is factored into the total annual cost, the cost per ton of controlling NO_x is in the range of $6,000 to $6,500. This calculated cost is higher than has previously been approved as BACT.

The latest DER BACT determinations have a NO_x limit of 15 ppmvd (natural gas) using Low-NO_x burner technology. Although the turbine manufacturer does not presently guarantee this limit, they have agreed to lower NO_x to 15 ppm by 4/30/97. This lower NO_x limit will be achieved by application of low-NO_x burners or SCR. Therefore, the Department accepts water injection and Low NO_x Burner design as BACT for a limited time (up to 4/30/97).

The calculations that the applicant presented and Department findings indicate that the cost of controlling NO_x is high compared to other BACT determinations which require SCR. Based on the information presented by the applicant, the Department believes that the use of SCR for NO_x control is not justifiable as BACT at this time.

The Department will revise and lower the allowable BACT limit for this project no later than 4/30/97. It is the Department's understanding that the turbine manufacturer will be able to achieve 15 ppmvd NO_x emission limits within this period. If the 15 (gas)/42 (oil) ppmvd emission rates cannot be met by April 30, 1997, SCR will be installed.

Sulfur Dioxide(SO_2) and Sulfuric Acid Mist (H_2SO_4)

In accordance with "top down" BACT review, only two alternatives exist that would result in stringent SO_2 emissions; using low sulfur content fuel oil or flue gas desulfurization (FGD). EPA has recognized that FGD technology is inappropriate to apply to these combustion units due to negative environmental, economic and energy impacts. Sludge would be generated that would have to be disposed of properly, and there would be increased utility (electricity and water) costs associated with the operation of a FGD system. Finally, there is no information in the literature to indicate that FGD has ever been applied to stationary gas turbines burning distillate oil.

This leaves the use of low sulfur fuel oil as the best option. The Department accepts the use of No. 2 fuel oil with a 0.1% sulfur by weight as BACT for this project.

Details of the Analysis May be Obtained by Contacting:

Preston Lewis, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended by:	Approved by:
______________________	______________________
C. H. Fancy, P.E., Chief Bureau of Air Regulation	Carol M. Browner, Secretary Dept. of Environmental Regulation
______________ 1992 Date	______________ 1992 Date

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

PERMITTEE:
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The source shall be constructed in accordance with the permit application, plans, documents, amendments and drawings, except as otherwise noted in the General and Specific Conditions.

<u>Attachments are listed below</u>:

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3. As provided in Subsections 403.087(6) and 403.722(5), Florida Statutes, the issuance of this permit does not convey any vested rights or any exclusive privileges. Neither does it authorize any injury to public or private property or any invasion of personal rights, nor any infringement of federal, state or local laws or regulations. This permit is not a waiver of or approval of any other Department permit that may be required for other aspects of the total project which are not addressed in the permit.

4. This permit conveys no title to land or water, does not constitute State recognition or acknowledgement of title, and does not constitute authority for the use of submerged lands unless herein provided and the necessary title or leasehold interests have been obtained from the State. Only the Trustees of the Internal Improvement Trust Fund may express State opinion as to title.

5. This permit does not relieve the permittee from liability for harm or injury to human health or welfare, animal, or plant life, or property caused by the construction or operation of this permitted source, or from penalties therefore; nor does it allow the permittee to cause pollution in contravention of Florida Statutes and Department rules, unless specifically authorized by an order from the Department.

6. The permittee shall properly operate and maintain the facility and systems of treatment and control (and related appurtenances) that are installed or used by the permittee to achieve compliance with the conditions of this permit, as required by Department rules. This provision includes the operation of backup or auxiliary facilities or similar systems when necessary to achieve compliance with the conditions of the permit and when required by Department rules.

GENERAL CONDITIONS:

7. The permittee, by accepting this permit, specifically agrees to allow authorized Department personnel, upon presentation of credentials or other documents as may be required by law and at a reasonable time, access to the premises, where the permitted activity is located or conducted to:

a. Have access to and copy any records that must be kept under the conditions of the permit;

b. Inspect the facility, equipment, practices, or operations regulated or required under this permit; and

c. Sample or monitor any substances or parameters at any location reasonably necessary to assure compliance with this permit or Department rules.

Reasonable time may depend on the nature of the concern being investigated.

8. If, for any reason, the permittee does not comply with or will be unable to comply with any condition or limitation specified in this permit, the permittee shall immediately provide the Department with the following information:

a. a description of and cause of non-compliance; and

b. the period of noncompliance, including dates and times; or, if not corrected, the anticipated time the non-compliance is expected to continue, and steps being taken to reduce, eliminate, and prevent recurrence of the non-compliance.

The permittee shall be responsible for any and all damages which may result and may be subject to enforcement action by the Department for penalties or for revocation of this permit.

9. In accepting this permit, the permittee understands and agrees that all records, notes, monitoring data and other information relating to the construction or operation of this permitted source which are submitted to the Department may be used by the Department as evidence in any enforcement case involving the permitted source arising under the Florida Statutes or Department rules, except where such use is prescribed by Sections 403.73 and 403.111, Florida Statutes. Such evidence shall only be used to the extent it is consistent with the Florida Rules of Civil Procedure and appropriate evidentiary rules.

GENERAL CONDITIONS:

10. The permittee agrees to comply with changes in Department rules and Florida Statutes after a reasonable time for compliance, provided, however, the permittee does not waive any other rights granted by Florida Statutes or Department rules.

11. This permit is transferable only upon Department approval in accordance with Florida Administrative Code Rules 17-4.120 and 17-30.300, F.A.C., as applicable. The permittee shall be liable for any non-compliance of the permitted activity until the transfer is approved by the Department.

12. This permit or a copy thereof shall be kept at the work site of the permitted activity.

13. This permit also constitutes:

(x) Determination of Best Available Control Technology (BACT)
(x) Determination of Prevention of Significant Deterioration (PSD)
(x) Compliance with New Source Performance Standards (NSPS)

14. The permittee shall comply with the following:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. During enforcement actions, the retention period for all records will be extended automatically unless otherwise stipulated by the Department.

b. The permittee shall hold at the facility or other location designated by this permit records of all monitoring information (including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation) required by the permit, copies of all reports required by this permit, and records of all data used to complete the application for this permit. These materials shall be retained at least three years from the date of the sample, measurement, report, or application unless otherwise specified by Department rule.

c. Records of monitoring information shall include:

- the date, exact place, and time of sampling or measurements;

GENERAL CONDITIONS:

- the person responsible for performing the sampling or measurements;
- the dates analyses were performed;
- the person responsible for performing the analyses;
- the analytical techniques or methods used; and
- the results of such analyses.

15. When requested by the Department, the permittee shall within a reasonable time furnish any information required by law which is needed to determine compliance with the permit. If the permittee becomes aware that relevant facts were not submitted or were incorrect in the permit application or in any report to the Department, such facts or information shall be corrected promptly.

SPECIFIC CONDITIONS:

1. Unless otherwise indicated, the construction and operation of the subject facilities shall be in accordance with the capacities and specifications stated in the application.

2. Emissions from these facilities shall not exceed the limits listed below (based on operation at 59°F):

Pollu-tant	Source	Fuel	1st Three Years lbs/hr	1st Three Years tons/yr	After 1st Three Years** lbs/hr	After 1st Three Years** tons/yr
NOx	HRSG Stack	Gas	87.8	384.5	52.7	230.7
	CO_2 Plant Stack	Gas	19.9	87.1	18.3	80.0
	HRSG Stack	Oil	164.0	718.2	--	--
	CO_2 Plant Stack	Oil	23.4	102.4	--	--
SO2	HRSG Stack	Oil	0.1% Sulfur Max.		--	--
	CO_2 Plant Stack	Oil	0.1% Sulfur Max.		--	--
VE	HRSG Stack	Gas	10% Opacity*		10% Opacity*	
	CO_2 Plant Stack	Gas	10% Opacity*		10% Opacity*	
	HRSG Stack	Oil	20% Opacity*		--	
	CO_2 Plant Stack	Oil	20% Opacity*		--	
VOC	CO_2 Plant Stack	--	18.2	79.6	17.7	77.6
CO	HRSG Stack	Gas	42.9	187.8	42.9	187.8
	CO_2 Plant Stack	Gas	11.9	52.0	11.9	52.0
	HRSG Stack	Oil	75.3	329.9	75.3	329.9
	CO_2 Plant Stack	Oil	13.4	58.5	13.4	58.5

*Except for one 6-minute period per hour of not more than 27% opacity.
**Based on 15 ppmvd NO_x.

SPECIFIC CONDITIONS:

3. The cogeneration facility shall be permitted to fire natural gas permanently and No. 2 fuel oil for the first three years of operation. Fuel consumption rates and hours of operation for the turbine and duct burner shall not exceed those listed below:

	Natural Gas			No. 2 Fuel Oil		
	M ft3/hr	MM ft3/yr	hrs/yr	M lb/hr	M lb/yr	hrs/yr
Turbine	914.5	8011.0	8760	55.6	372.6	6701
Duct Burner	104.2	912.8	8760	0	0	0

4. Before this construction permit expires, the cogeneration facility and CO_2 Recovery Plant stacks shall be sampled or tested as applicable according to the emission limits in Specific Condition No. 2. Annual compliance tests shall be conducted each year thereafter. Compliance tests shall be run at 96% to 100% of the maximum capacity achievable for the average ambient temperature during the compliance tests. The turbine manufacturer's capacity vs. temperature (ambient) curve shall be included with the compliance test results. Tests shall be conducted using the following reference methods:

NO_x: EPA Method 20
SO_2: Fuel supplier's sulfur analysis
VE: EPA Method 9
CO: EPA Method 10
VOC: EPA Method 25A

5. The DER Southwest District office shall be notified at least 30 days prior to the compliance tests. Compliance test results shall be submitted to the DER Southwest District office in Tampa and the DER Bureau of Air Regulation office in Tallahassee (third annual compliance test only) within 45 days after completion of the tests. Sampling facilities, methods, and reporting shall be in accordance with F.A.C. Rule 17-2.700 and 40 CFR 60, Appendix A.

6. A continuous operations monitoring system shall be installed, operated, and maintained in accordance with 40 CFR 60.334. The natural gas, fuel oil and water injection flows to the cogeneration turbine along with the power output of the generators shall be metered and continuously recorded. The data shall be logged daily and maintained so that it can be provided to DER upon request.

7. The permittee shall have the option of including, in the initial construction, adequate modules and other provisions

SPECIFIC CONDITIONS:

necessary for future installation of state-of-the-art catalytic abatement or equivalent NOx control systems. Within 90 days of receipt of the third annual compliance test results, the Bureau of Air Regulation shall, if NO_x emission limits are not met, review the need for making a revised determination of Best Available Control Technology. If test results show that it is unlikely that NO_x limits can be met, a revised BACT determination shall be made. The Department may revise the BACT determination to require installation of such technology if so indicated by the revised BACT cost/benefit analysis. The retrofit costs associated with not making provisions for such technology initially shall not be considered by the Department in the retrofit cost analysis.

8. The permittee, for good cause, may request that this construction permit be extended. Such a request shall be submitted to the Bureau of Air Regulation prior to 60 days before the expiration of the permit (F.A.C. Rule 17-4.090).

9. An application for an operation permit must be submitted to the Southwest District office at least 90 days prior to the expiration date of this construction permit. To properly apply for an operation permit, the applicant shall submit the appropriate application form, fee, certification that construction was completed noting any deviations from the conditions in the construction permit, and compliance test reports as required by this permit (F.A.C. Rules 17-4.055 and 17-4.220).

Issued this ______ day
of ______________, 1992

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

____
Carol M. Browner, Secretary

Best Available Control Technology (BACT) Determination
Mulberry Cogeneration Project
Polk County

The applicant proposes to install a 126 MW combined cycle cogeneration unit along with a 150 TPD carbon dioxide plant that will recover CO_2 from the power plant flue gas. The Polk County facility will consist of a General Electric PG7111EA Gas Turbine Generator exhausting through a primary heat recovery steam generator which will produce steam for the steam-electric cycle. Initially, the turbine will be fired by natural gas and No. 2 fuel oil, with natural gas becoming the permanent fuel after the first three years of operation. A secondary heat recovery steam generator will be auxiliary-fired by natural gas to provide a CO_2-enriched flue gas feed to the CO_2 recovery plant.

Date of Receipt of a Complete Application

August 14, 1992

BACT Determination Requested by Applicant

NO_x - Dry Low NO_x Combustion
CO - Combustion Design
H_2SO_4/SO_2 - Low Sulfur Fuel Oil (0.1%S)
VOC - Combustion Design for CT
Scrubber for CO_2 Absorber Exhaust
PM/PM_{10} - Combustion Design/Clean Fuel

BACT Determination by the Department

NO_x - Dry Low NO_x Combustion with future SCR capability
CO - Combustion Design
H_2SO_4/SO_2 - Low Sulfur Fuel Oil (0.1%S)
VOC - Combustion Design for CT
Scrubber for CO_2 Absorber Exhaust
PM/PM_{10} - Combustion Design/Clean Fuel

Proposed Emission Limits (tons per year)

	First 3 yrs (22% Gas/78% Oil)			After First 3 yrs (100% Gas)			PSD
	HRSG	CO_2 Plant	Total	HRSG	CO_2 Plant	Total	
NO_x	644.8	99.1	743.9	230.7	80.0	310.7	40.0
SO_2	327.4	16.4	343.8	11.4	1.8	13.2	40.0
PM/PM_{10}	58.0	28.9	86.9	30.7	27.7	58.4	25/15
CO	298.6	57.1	355.7	187.8	52.0	239.8	100.0
VOC	37.7	79.3	117.0	28.2	78.8	107.0	40.0
H_2SO_4	26.4	1.3	27.7	0.9	0.1	1.0	7.0
Be	.008	--	.008	--	--	--	0.0004
As	.013	--	.013	--	--	--	0.0

These limits assume that 4.6% of the turbine exhaust mass flow is diverted to the CO_2 plant. Emissions for the first three years are based on firing 22% gas - 78% oil in the turbine for 8,760 hours/yr at 1016 MMBtu/hr and natural gas in the duct burner for 8,760 hours/yr at 99 MMBtu/hr. Emissions after the first three years are based on firing only natural gas at 868.8 MMBtu/hr. Turbine performance under natural gas firing is based on NO_x emissions of 25 ppm (corrected to 15 percent O_2) for the first three years and 15 ppm thereafter. Performance on oil firing is based on NO_x emissions of 42 ppmvd (corrected to 15 percent O_2). SO_2 emissions are based on 0.1 percent sulfur.

BACT Determination Procedure

In accordance with Florida Administrative Code Chapter 17-2, Air Pollution, this BACT determination is based on the maximum degree of reduction of each pollutant emitted which the Department, on a case by case basis, taking into account energy, environmental and economic impacts, and other costs, determines is achievable through application of production processes and available methods, systems, and techniques. In addition, the regulations state that in making the BACT determination the Department shall give consideration to:

(a) Any Environmental Protection Agency determination of Best Available Control Technology pursuant to Section 169, and any emission limitation contained in 40 CFR Part 60 (Standards of Performance for New Stationary Sources) or 40 CFR Part 61 (National Emission Standards for Hazardous Air Pollutants).

(b) All scientific, engineering, and technical material and other information available to the Department.

(c) The emission limiting standards or BACT determinations of any other state.

(d) The social and economic impact of the application of such technology.

The EPA currently stresses that BACT should be determined using the "top-down" approach. The first step in this approach is to determine for the emission source in question the most stringent control available for a similar or identical source or source category. If it is shown that this level of control is technically or economically infeasible for the source in question, than the next most stringent level of control is determined and similarly evaluated. This process continues until the BACT level under consideration cannot be eliminated by any substantial or unique technical, environmental, or economic objections.

BACT Determination Rationale

Particulate Matter (PM/PM_{10})

Particulate emissions will be minimized by combustion control and the use of clean fuels. The particulate emissions from the combustion turbine when burning natural gas and fuel oil will not cause visible emissions to exceed 10% and 20% opacity, respectively.

Arsenic and Berylium (As, Be)

The Department agrees that there are no feasible methods to control beryllium and arsenic except by specifying the quality of the fuel.

Carbon Monoxide (CO) and Volatile Organic Compounds (VOC)

The majority of BACT emissions limitations have been based on controlling carbon monoxide and volatile organic compounds through efficient combustion. Advanced control is achievable through the use of catalytic oxidation. Catalytic oxidation is a postcombustion control that has been employed in CO nonattainment areas where regulations have required CO emission levels to be less than those associated with wet injection. These installations have been required to use LAER technology and typically have CO limits in the 10-ppm range (corrected to dry conditions).

In an oxidation catalyst control system, CO emissions are reduced by allowing unburned CO to react with oxygen at the surface of a precious metal catalyst such as platinum. Combustion of CO starts at about 300°F, with efficiencies above 90 percent occurring at temperatures above 600°F. Catalytic oxidation occurs at temperatures 50 percent lower than that of thermal oxidation, which reduces the amount of thermal energy required. For CT/HRSG combinations, the oxidation catalyst can be located directly after the CT or in the HRSG. Catalyst size depends upon the exhaust flow, temperature, and desired efficiency.

Due to the oxidation of sulfur compounds and excessive formation of H_2SO_4 mist emissions, oxidation catalyst systems are not considered to be technically feasible for gas turbines fired with fuel oil. Catalytic oxidation has not been demonstrated on a continuous basis when using fuel oil.

Use of oxidation catalyst technology would be feasible for a natural gas-fired unit; however, the cost effectiveness of over $6,000 per ton of CO removed will have a significant economic impact on this project. Therefore, efficient combustion will be the control method for CO and VOC.

Nitrogen Oxides (NO_x)

The applicant requested that BACT for nitrogen oxides during the first three years be water injection and Low NO_x Burners. This would limit emissions to 25 ppmvd when burning natural gas and 42 ppmvd when burning fuel oil.

A review of the EPA's BACT/LAER Clearinghouse indicates that the lowest NO_x emission limit established to date for a combustion turbine is 4.5 ppmvd (corrected to 15% O_2). This level of control was accomplished through the use of water injection and a selective catalytic reduction (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% reduction of NO_x with a new catalyst. As the catalyst ages, the maximum NO_x reduction will decrease to approximately 86 percent.

Although feasible, the applicant rejected using SCR because of economic, energy, and environmental impacts. The following factors were considered in the decision not to propose SCR:

a) Disposal of hazardous waste generated (spend catalyst).
b) An energy penalty of $0.05/KWH due to back pressure from the catalyst bed.
c) A power loss penalty based on lost capacity.
d) Potential for public exposure to high concentrations from ammonia storage and handling leaks and ammonia slip.
e) Ammonium bisulfate and ammonium sulfate particulate emissions (ammonium salts) due to the reaction of NH_3 with SO_3 present in the exhaust gases.
f) Cost effectiveness for SCR technology was determined to be in the range of $6,000 per ton of NO_x removed.

A concern associated with the use of SCR on combined cycle projects is the formation of ammonium bisulfate which can be formed by reaction of sulfur in the fuel and the ammonia injected. The ammonium bisulfate has a tendency to plug the tubes of the heat recovery steam generator leading to operational problems. The latest information available indicates that SCR can be used for oil firing provided that adjustments are made in the ammonia to NO_x injection ratio. For natural gas firing, NO_x emissions can be controlled with up to a 90 percent efficiency using a 1 to 1 or greater injection ratio. By lowering the injection ratio for oil firing, testing has indicated that NO_x can be controlled with efficiencies ranging from 60 to 75 percent. When the injection ratio is lowered there is not a problem with ammonium bisulfate formation since essentially all of the ammonia is able to react with the nitrogen oxides present in the combustion gases. SCR has been established as BACT for oil fired combined cycle facilities with NO_x emission limits ranging from 11.7 to 25 ppmvd depending on the efficiency of control.

The applicant determined that the total annual cost of SCR for this project is $1,957,700 with an average cost effectiveness in the range of $6,000 to $7,000 per ton of NO_x removed. The maximum annual NO_x emissions using water injection and Low NO_x combustor design will be 744 tons/year for the first three years. Assuming that SCR would reduce the NO_x emissions by 65%, about 484 tons/year of NO_x would be removed initially followed by 200 tons/year thereafter. When this reduction is factored into the total annual cost, the cost per ton of controlling NO_x is in the range of $6,000 to $6,500. This calculated cost is higher than has previously been approved as BACT.

The latest DER BACT determinations have a NO_x limit of 15 ppmvd (natural gas) using Low-NO_x burner technology. Although the turbine manufacturer does not presently guarantee this limit, they have agreed to lower NO_x to 15 ppm by 4/30/97. This lower NO_x limit will be achieved by application of low-NO_x burners or SCR. Therefore, the Department accepts water injection and Low NO_x Burner design as BACT for a limited time (up to 4/30/97).

The calculations that the applicant presented and Department findings indicate that the cost of controlling NO_x is high compared to other BACT determinations which require SCR. Based on the information presented by the applicant, the Department believes that the use of SCR for NO_x control is not justifiable as BACT at this time.

The Department will revise and lower the allowable BACT limit for this project no later than 4/30/97. It is the Department's understanding that the turbine manufacturer will be able to achieve 15 ppmvd NO_x emission limits within this period. If the 15 (gas)/42 (oil) ppmvd emission rates cannot be met by April 30, 1997, SCR will be installed.

Sulfur Dioxide(SO_2) and Sulfuric Acid Mist (H_2SO_4)

In accordance with "top down" BACT review, only two alternatives exist that would result in stringent SO_2 emissions; using low sulfur content fuel oil or flue gas desulfurization (FGD). EPA has recognized that FGD technology is inappropriate to apply to these combustion units due to negative environmental, economic and energy impacts. Sludge would be generated that would have to be disposed of properly, and there would be increased utility (electricity and water) costs associated with the operation of a FGD system. Finally, there is no information in the literature to indicate that FGD has ever been applied to stationary gas turbines burning distillate oil.

This leaves the use of low sulfur fuel oil as the best option. The Department accepts the use of No. 2 fuel oil with a 0.1% sulfur by weight as BACT for this project.

Details of the Analysis May be Obtained by Contacting:

Preston Lewis, BACT Coordinator
Department of Environmental Regulation
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended by:

____
C. H. Fancy, P.E., Chief
Bureau of Air Regulation

________________________ 1992
Date

Approved by:

____
Carol M. Browner, Secretary
Dept. of Environmental Regulation

________________________ 1992
Date

KBN

August 12, 1992

RECEIVED

AUG 14 1992

Bureau of
Air Regulation

Mr. John Reynolds
Bureau of Air Regulation
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Mulberry Cogeneration Project

Dear John:

The developers of the Mulberry Cogeneration Project and I appreciate the time you spent last week concerning the dry low-nitrogen oxide (NO_x) combustion technology being developed by General Electric (GE). As discussed, the developers of the project and GE have reviewed the development schedule for this technology and have reached agreement to offer lower NO_x emissions for the Department's consideration. In addition, as suggested by Preston Lewis, the proposed permit for the Auburndale Power Partners project was reviewed. Elements of this permit are directly applicable to the Mulberry Project and should be of assistance in drafting the permit for our project. Based on these efforts, I am transmitting on behalf of the project developers of the Mulberry Cogeneration Project the following emission and fuel limiting standards for your consideration. These proposed limitations are applicable as best available control technology (BACT) and are consistent with those proposed for the Auburndale Project.

1. First 3 Years of Operation: The full load equivalent capacity factor on fuel oil will be no more than 78 percent; the capacity factor for natural gas will be 22 percent. The NO_x emission limits will be limited to no more than 25 parts per million by volume dry (ppmvd) (corrected to 15 percent oxygen) when firing natural gas and 42 ppmvd (corrected) when firing fuel oil.

2. After the First 3 Years of Operation: The emissions limits for NO_x will not exceed 15 ppmvd (corrected) when firing natural gas and 42 ppmvd (corrected) when firing fuel oil. Natural gas will be used as the primary fuel when available from the Florida Gas Transmission Phase III pipeline expansion. When available from the expansion, fuel oil would be limited to no more than 30 days of full load operation per year, and the NO_x emissions would not exceed 42 ppmvd (corrected). The limit for natural gas firing (i.e., 15 ppmvd corrected to 15 percent O_2) would apply no later than April 30, 1997.

Please be advised that our discussion of higher heat input for the secondary heat recovery steam generator (HRSG) has been evaluated, and it has been concluded that an increase will not be requested. Therefore, the heat input as proposed in the application of 99 million British thermal units per hour (MMBtu/hr) will not change.

91193A1/11

KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

KBN

As we discussed at the meeting, the timing of receipt of the proposed permit is not only important to the project developers but to the State of Florida. This project has been approved by the Public Service Commission, and power from this facility is needed to meet future power requirements in the state. The proposed permit for the Auburndale project should be helpful in drafting the proposed permit for our project. Your expeditious issuance of the proposed permit would be greatly appreciated.

If you have any questions please call me or Ward Marshall of Central & Southwest Services (214) 754-1374.

Sincerely,

Kennard F. Kosky

Kennard F. Kosky, P.E.
President

KFK/abb

cc: William Malenius
File (2)
C. Holladay
B. Thomas, SW Dist
J. Harper, EPA
C. Shaver, NPS
C KF/PL

KBN

August 12, 1992

Mr. John Reynolds
Bureau of Air Regulation
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

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91193A1/11

KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

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Sincerely,

Kennard F. Kosky, P.E.
President

KFK/abb

cc: William Malenius
File (2)

KBN

FACSIMILE COVERSHEET

DATE: 08/12/92

TO: John Reynolds

ORGANIZATION: FDER - Air

FAX NUMBER: 904-922-6979 TELEPHONE NUMBER: 904-488-1344

FROM: Ken Kosky

TOTAL NUMBER OF PAGES: 3 (including cover page)

MESSAGE/INSTRUCTIONS:

PROJECT NUMBER: 9193-0100 FAX OPERATOR:

( ) This is the ONLY form of delivery of the transmitted document.

(✓) The original of the transmitted document will be sent by:

(✓) US Mail
( ) Overnight delivery
( ) Other:

Return original to KFK

cc: Project File ✓ yes ___ no

KBN Engineering and Applied Sciences, Inc.
1034 NW 57th Street, Gainesville, FL 32605
Phone (904) 331-9000 FAX (904) 332-4189

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AEB

JUL - 1 1992

RECEIVED
JUL 08 1992
Division of Air
Resources Management

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Polk Power Partners,
Mulberry Cogeneration Project (PSD-FL-187)

Dear Mr. Fancy:

This is to acknowledge receipt of the Prevention of Significant Deterioration (PSD) permit application and additional information packages for the above referenced facility. The proposed facility will be an integrated cogeneration facility, producing approximately 120,000 kilowatts net power to the transmission system and approximately 150 tons per day of liquid CO_2. The project consists of one General Electric PG 7111EA combustion turbine, with a primary heat recovery steam generator (HRSG), a secondary HRSG, and a steam turbine generator.

The applicant proposes to limit NO_x emissions from the combustion turbine through water injection and dry low-NO_x combustion technology, to limit NO_x emissions from the duct burner through combustion control, to limit SO_2 and H_2SO_4 Mist emissions from the combustion turbine through limiting the sulfur content of the No. 2 distillate fuel oil, to limit CO emissions from the combustion turbine and duct burner through combustion control, to limit VOC emissions through combustion control for the combustion turbine and through a scrubber for CO_2 absorber exhausts, and to limit PM/PM_{10}, Be, and As emissions from the combustion turbine through combustion control and the use of clean fuels.

We have reviewed the package as submitted and have no adverse comments. Thank you for the opportunity to review and comment on the package. If you have any questions or comments, please contact Mr. Scott Davis of my staff at (404) 347-5014.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc: J. Reynolds
C. Holladay
B. Thomas, SW Dist.
C. Shaver, NPS
R. Koshy, KBN
CHF/PL

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

June 30, 1992

NOTE: It was agreed that the completeness date would be extended until calculations were received!

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. William R. Malenius
Senior Program Manager
Polk Power Partners
23293 South Pointe Drive
Laguna Hills, California 92653

Dear Mr. Malenius:

Re: Permit Application AC 53-211670, PSD-FL-187
Mulberry Cogeneration Project

This is the second incompleteness letter for the subject application. On June 8, the Department received KBN's response to the May 5 incompleteness letter which requested that the application show all emission calculations. KBN enclosed a computer disk containing matrixed Lotus 1-2-3 spreadsheets to present the emission calculations and stated that this was the only feasible way to perform the calculations. While that method may work best for the consultant performing the calculations, it is not the best method of presenting the calculations. It requires more time for permit review because the review engineer must search through the row/column matrix to find the raw numbers used in the formulas. The emission calculations and formulas should be submitted in hard copy and in raw, non-matrix form. This facilitates review and thus speeds up processing of the application. We generally accept modeling data submitted on computer disks. However, the modeling formulas are part of the software and do not have to be checked in the same manner as the emission calculations.

Enclosed are some example calculations from other applications to illustrate preferred formats for emission calculations. Please resubmit the requested calculations in hard copy using a similar format.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

1304

CHF/JR/plm

Enclosure

c: W. Thomas, SED (w/o enclosure)
C. Shaver, NPS (" ")
D. Martin, Planner (" ")
J. Harper, EPA (w/o enclosure)
K. Kosky, P.E. (w/ enclosure)

6/30/92

KBN

KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street
Gainesville, Florida 32605
FAX: 904/332-4189
Telephone: 904/331-9000

Letter of Transmittal

RECEIVED
JUL 9 1992
Bureau of
Air Regulation

Date: 7-8-92

Project No.: 9193-0200

To: JOHN REYNOLDS
FLORIDA DEPT. ENV. REG.
2600 BLAIR STONE RD
TALLAHASSEE, FL 32399-2400

Re: MULBERRY COGENERATION PROJECT
PERMIT APPLICATION AC 53-211670
PSD-FL-187

The following items are being sent to you: ☑ with this letter ☐ under separate cover

Copies	Description
1	APPENDIX A TABLES FROM REPORT
	REVISED TO SHOW CALCULATIONS WITH FORMULAS AND INPUT PARAMETERS
	INFORMATION PROVIDED FOR DISTILLATE OIL AND NATURAL GAS. PROPANE IS NO LONGER CONSIDERED FOR THIS PROJECT

These are transmitted:

☑ As requested
☐ For review
☐ For review and comment
☑ For approval
☐ For your information
☐ __________

Remarks: PLEASE CALL ME WHEN YOU HAVE REVIEWED THIS MATERIAL

Signed: Robert C. McCann Jr.

Copy to: KF KOSKY

KBN6/LOT.1-P
04/06/90

Table A-1. Design Information and Stack Parameters for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load

Data		Gas Turbine Fuel Oil 20of	Gas Turbine Fuel Oil 40oF	Gas Turbine Fuel Oil 59oF	Gas Turbine Fuel Oil 80oF	Gas Turbine Fuel Oil 100oF
A	B	C	D	E	F	G
General						
Power (kW)		95,860.0	90,080.0	84,470.0	77,930.0	71,250.0
Heat Rate (Btu/kwh)		10,760.0	10,870.0	10,990.0	11,150.0	11,350.0
CT Exhaust Flow						
Mass Flow (lb/hr)		2,605,000	2,492,000	2,384,000	2,261,000	2,134,000
Temperature (oF)		957	971	984	999	1,015
Moisture (% Vol.)		7.53	7.70	8.03	8.72	9.93
Oxygen (% Vol.)		13.22	13.23	13.23	13.18	13.04
Molecular Weight		28.59	28.57	28.53	28.44	28.30
Heat Input (MMBtu/hr)= Power (kW) x Heat Rate (Btu/kwh) ÷ 1,000,000 Btu/MMBtu						
Power (kW)		95,860.0	90,080.0	84,470.0	77,930.0	71,250.0
Heat Rate (Btu/kwh)		10,760.0	10,870.0	10,990.0	11,150.0	11,350.0
Heat Input (MMBtu/hr)		1,031.5	979.2	928.3	868.9	808.7
Fuel Oil Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/lb)						
Heat Input (MMBtu/hr)		1,031.5	979.2	928.3	868.9	808.7
Heat Content,LHV (Btu/lb)		18,550	18,550	18,550	18,550	18,550
Fuel Oil (lb/hr)		55,604.0	52,785.4	50,044.5	46,842.0	43,595.0
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)		2,605,000	2,492,000	2,384,000	2,261,000	2,134,000
Temperature (°F)		957	971	984	999	1,015
Molecular Weight		28.59	28.57	28.53	28.44	28.30
Volume Flow (acfm)		1,570,662	1,518,533	1,468,004	1,410,850	1,352,891
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F + 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)		2,605,000	2,492,000	2,384,000	2,261,000	2,134,000
Temperature (°F)		68	68	68	68	68
Molecular Weight		28.59	28.57	28.53	28.44	28.30
Volume Flow (scfm)		585,257	560,297	536,777	510,575	484,289
HRSG Stack Data						
Stack Height (ft)		125	125	125	125	125
Diameter (ft)		15.0	15.0	15.0	15.0	15.0
Volume Flow (acfm) from HRSG= [Volume flow (acfm) x (HRSG temp.(°F)+ 460°F)] ÷ [CT temp.(°F)+ 460°F]						
Volume Flow (acfm) from CT		1,570,662	1,518,533	1,468,004	1,410,850	1,352,891
CT Temperature (°F)		957	971	984	999	1,015
HRSG Temperature (°F)		220	220	220	220	220
Volume Flow (acfm) from HRSG		753,740	721,595	691,304	657,559	623,705
Velocity (ft/sec)= Volume flow (acfm) from HRSG ÷ [((diameter)²÷ 4) x 3.14159] ÷ 60 sec/min						
Volume Flow (acfm) from HRSG		753,740	721,595	691,304	657,559	623,705
Diameter (ft)		15.0	15.0	15.0	15.0	15.0
Velocity (ft/sec)		71.1	68.1	65.2	62.0	58.8

Source: General Electric, 1991.

Table A-2. Maximum Criteria Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load

Pollutant		Gas Turbine Fuel Oil 20of	Gas Turbine Fuel Oil 40oF	Gas Turbine Fuel Oil 59oF	Gas Turbine Fuel Oil 80oF	Gas Turbine Fuel Oil 100oF
A	B	C	D	E	F	G
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer						
PM, lb/hr (manufacturer)		15.0	15.0	15.0	15.0	15.0
TPY		65.7	65.7	65.7	65.7	65.7
Sulfur Dioxide (lb/hr)= Fuel oil (lb/hr) x sulfur content(fraction) x (lb SO2/lb S) x fraction emitted as SO2						
Fuel Oil (lb/hr)		55,604.0	52,785.4	50,044.5	46,842.0	43,595.0
Sulfur content (%)		0.10	0.10	0.10	0.10	0.10
lb SO2/lb S (64/32)		2.0	2.0	2.0	2.0	2.0
SO2 Fraction emitted		0.95	0.95	0.95	0.95	0.95
SO2, lb/hr		105.65	100.29	95.08	89.00	82.83
TPY		462.7	439.3	416.5	389.8	362.8
Nitrogen Oxides (lb/hr)= NOx(ppm) x [20.9 x (1 - Moisture(%)/100) - Oxygen(%)] x 2116.8 lb/ft2 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]						
Basis, ppm*		42.0	42.0	42.0	42.0	42.0
Moisture (%)		7.53	7.7	8.03	8.72	9.93
Oxygen (%)		13.22	13.23	13.23	13.18	13.04
Volume Flow (acfm)		1,570,662	1,518,533	1,468,004	1,410,850	1,352,891
Temperature (°F)		957	971	984	999	1015
NOx, lb/hr		182.2	173.1	164.0	153.5	142.8
TPY		798.0	758.3	718.2	672.4	625.6
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt NOx) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+		35.0	35.0	35.0	35.0	35.0
Moisture (%)		7.53	7.7	8.03	8.72	9.93
Volume Flow (acfm)		1,570,662	1,518,533	1,468,004	1,410,850	1,352,891
Temperature (°F)		957	971	984	999	1015
lb/hr		82.6	78.9	75.3	71.1	66.6
TPY		361.7	345.6	329.9	311.5	291.5
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 12 (mole. wgt as methane) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+		10.0	10.0	10.0	10.0	10.0
Moisture (%)		7.53	7.7	8.03	8.72	9.93
Volume Flow (acfm)		1,570,662	1,518,533	1,468,004	1,410,850	1,352,891
Temperature (°F)		957	971	984	999	1015
lb/hr		10.11	9.66	9.22	8.71	8.15
TPY		44.3	42.3	40.4	38.1	35.7
Lead (lb/hr)= Lead (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
Basis, lb/10E+12 Btu		8.9	8.9	8.9	8.9	8.9
HIR (MMBtu/hr)		1,031.5	979.2	928.3	868.9	808.7
lb/hr		9.18E-03	8.71E-03	8.26E-03	7.73E-03	7.20E-03
TPY		0.040	0.038	0.036	0.034	0.032

* corrected to 15% O2 dry conditions
+ corrected to dry conditions

Table A-3. Maximum Other Regulated Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load

Pollutant	Units	Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Arsenic (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) + 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	4.2	4.2	4.2	4.2	4.2
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	4.33E-03	4.11E-03	3.90E-03	3.65E-03	3.40E-03
	TPY	1.90E-02	1.80E-02	1.71E-02	1.60E-02	1.49E-02
Beryllium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	2.5	2.5	2.5	2.5	2.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.58E-03	2.45E-03	2.32E-03	2.17E-03	2.02E-03
	TPY	1.13E-02	1.07E-02	1.02E-02	9.51E-03	8.86E-03
Mercury (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	3	3	3	3	3
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	3.09E-03	2.94E-03	2.78E-03	2.61E-03	2.43E-03
	TPY	1.36E-02	1.29E-02	1.22E-02	1.14E-02	1.06E-02
Fluoride (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	32.5	32.5	32.5	32.5	32.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	3.35E-02	3.18E-02	3.02E-02	2.82E-02	2.63E-02
	TPY	1.47E-01	1.39E-01	1.32E-01	1.24E-01	1.15E-01
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2 (98/64)						
	Fraction SO2 (%)	5	5	5	5	5
	SO2 (lb/hr)/0.95	111.2	105.6	100.1	93.7	87.2
	lb H2SO4/lb SO2	1.53	1.53	1.53	1.53	1.53
	lb/hr	8.51E+00	8.08E+00	7.66E+00	7.17E+00	6.68E+00
	TPY	3.73E+01	3.54E+01	3.36E+01	3.14E+01	2.92E+01

Sources: (1) EPA, 1990; (2) EPA, 1980

Table A-4. Maximum Non-Regulated Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load

Pollutant	Units	Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Manganese (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	6.44	6.44	6.44	6.44	6.44
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	6.64E-03	6.31E-03	5.98E-03	5.60E-03	5.21E-03
	TPY	2.91E-02	2.76E-02	2.62E-02	2.45E-02	2.28E-02
Nickel (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	170	170	170	170	170
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	1.75E-01	1.66E-01	1.58E-01	1.48E-01	1.37E-01
	TPY	7.68E-01	7.29E-01	6.91E-01	6.47E-01	6.02E-01
Cadmium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	10.5	10.5	10.5	10.5	10.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	1.08E-02	1.03E-02	9.75E-03	9.12E-03	8.49E-03
	TPY	4.74E-02	4.50E-02	4.27E-02	4.00E-02	3.72E-02
Chromium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	47.5	47.5	47.5	47.5	47.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	4.90E-02	4.65E-02	4.41E-02	4.13E-02	3.84E-02
	TPY	2.15E-01	2.04E-01	1.93E-01	1.81E-01	1.68E-01
Copper (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	280	280	280	280	280
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.89E-01	2.74E-01	2.60E-01	2.43E-01	2.26E-01
	TPY	1.26E+00	1.20E+00	1.14E+00	1.07E+00	9.92E-01
Vanadium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	30	30	30	30	30
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	7.19E-02	6.83E-02	6.47E-02	6.06E-02	5.64E-02
	TPY	3.15E-01	2.99E-01	2.83E-01	2.65E-01	2.47E-01
Selenium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	10.1	10.1	10.1	10.1	10.1
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.42E-02	2.30E-02	2.18E-02	2.04E-02	1.90E-02
	TPY	1.06E-01	1.01E-01	9.54E-02	8.93E-02	8.31E-02
Polycyclic Organic Matter (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	0.12	0.12	0.12	0.12	0.12
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.88E-04	2.73E-04	2.59E-04	2.42E-04	2.26E-04
	TPY	1.26E-03	1.20E-03	1.13E-03	1.06E-03	9.88E-04
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	405	405	405	405	405
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	4.18E-01	3.97E-01	3.76E-01	3.52E-01	3.28E-01
	TPY	1.83E+00	1.74E+00	1.65E+00	1.54E+00	1.43E+00

Note: Multiply by 2.324 to convert picogram/Joule (pg/J) to lb/10E+12 Btu.

Source: (1) EPA, 1990

Table A-5. Maximum Emissions for Additional Non-Regulated Pollutant
Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load

Pollutant		Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Antimony (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	9.4	9.4	9.4	9.4	9.4
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.25E-02	2.14E-02	2.03E-02	1.90E-02	1.77E-02
	TPY	9.87E-02	9.37E-02	8.88E-02	8.31E-02	7.74E-02
Barium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	8.4	8.4	8.4	8.4	8.4
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.01E-02	1.91E-02	1.81E-02	1.70E-02	1.58E-02
	TPY	8.82E-02	8.37E-02	7.94E-02	7.43E-02	6.91E-02
Cobalt (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	3.9	3.9	3.9	3.9	3.9
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	9.35E-03	8.87E-03	8.41E-03	7.88E-03	7.33E-03
	TPY	4.09E-02	3.89E-02	3.69E-02	3.45E-02	3.21E-02
Zinc (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	294	294	294	294	294
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	7.05E-01	6.69E-01	6.34E-01	5.94E-01	5.53E-01
	TPY	3.09E+00	2.93E+00	2.78E+00	2.60E+00	2.42E+00
Chlorine (lb/hr)= Basis (ppm) x Fuel oil (lb/hr) ÷ 1,000,000						
	ppm	0.5	0.5	0.5	0.5	0.5
	Fuel Oil (lb/hr)	55,604.0	52,785.4	50,044.5	46,842.0	43,595.0
	lb/hr	2.78E-02	2.64E-02	2.50E-02	2.34E-02	2.18E-02
	TPY	1.22E-01	1.16E-01	1.10E-01	1.03E-01	9.55E-02

Note: Multiply by 2.324 to convert picogram/Joule (pg/J) to lb/10E+12 Btu.

Source: (1) EPA, 1979

Table A-6. Design Information and Stack Parameters for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Natural Gas, Base Load

Data		Gas Turbine Natural Gas 20of	Gas Turbine Natural Gas 40oF	Gas Turbine Natural Gas 59oF	Gas Turbine Natural Gas 80oF	Gas Turbine Natural Gas 100oF
A	B	C	D	E	F	G
General						
Power (kW)		93,110.0	87,470.0	82,040.0	75,880.0	69,900.0
Heat Rate (Btu/kwh)		10,340.0	10,450.0	10,590.0	10,790.0	11,050.0
CT Exhaust Flow						
Mass Flow (lb/hr)		2,558,000	2,448,000	2,343,000	2,226,000	2,108,000
Temperature (oF)		962	976	988	1,003	1,017
Moisture (% Vol.)		6.10	6.32	6.77	7.75	9.46
Oxygen (% Vol.)		14.03	14.04	14.00	13.85	13.55
Molecular Weight		28.61	28.58	28.53	28.42	28.23
Heat Input (MMBtu/hr)= Power (kW) x Heat Rate (Btu/kwh) ÷ 1,000,000 Btu/MMBtu						
Power (kW)		93,110.0	87,470.0	82,040.0	75,880.0	69,900.0
Heat Rate (Btu/kwh)		10,340.0	10,450.0	10,590.0	10,790.0	11,050.0
Heat Input (MMBtu/hr)		962.8	914.1	868.8	818.7	772.4
Natural Gas Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/lb)						
(cf/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/cf)						
Heat Input (MMBtu/hr)		962.8	914.1	868.8	818.7	772.4
Heat Content,LHV (Btu/lb)		19,303	19,303	19,303	19,303	19,303
Natural Gas (lb/hr)		49,876.1	47,353.3	45,008.7	42,415.4	40,014.2
Heat Content,LHV (Btu/cf)		950	950	950	950	950
Natural Gas (cf/hr)		1,013,429	962,170	914,530	861,837	813,047
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)		2,558,000	2,448,000	2,343,000	2,226,000	2,108,000
Temperature (°F)		962	976	988	1,003	1,017
Molecular Weight		28.61	28.58	28.53	28.42	28.23
Volume Flow (acfm)		1,546,476	1,495,987	1,446,407	1,393,785	1,341,523
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F + 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)		2,558,000	2,448,000	2,343,000	2,226,000	2,108,000
Temperature (°F)		68	68	68	68	68
Molecular Weight		28.61	28.58	28.53	28.42	28.23
Volume Flow (scfm)		574,219	550,057	527,419	503,020	479,569
HRSG Stack Data						
Stack Height (ft)		125	125	125	125	125
Diameter (ft)		15.0	15.0	15.0	15.0	15.0
Volume Flow (acfm) from HRSG= [Volume flow (acfm) x (HRSG temp.(°F)+ 460°F)] ÷ [CT temp.(°F)+ 460°F]						
Volume Flow (acfm) from CT		1,546,476	1,495,987	1,446,407	1,393,785	1,341,523
CT Temperature (°F)		962	976	988	1,003	1,017
HRSG Temperature (°F)		220	220	220	220	220
Volume Flow (acfm) from HRSG		739,524	708,406	679,252	647,829	617,627
Velocity (ft/sec)= Volume flow (acfm) from HRSG ÷ [((diameter)² ÷ 4) x 3.14159] ÷ 60 sec/min						
Volume Flow (acfm) from HRSG		739,524	708,406	679,252	647,829	617,627
Diameter (ft)		15.0	15.0	15.0	15.0	15.0
Velocity (ft/sec)		69.7	66.8	64.1	61.1	58.3

Source: General Electric, 1991.

Table A-7. Maximum Criteria Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Natural Gas, Base Load

Pollutant		Gas Turbine Natural Gas 20of	Gas Turbine Natural Gas 40oF	Gas Turbine Natural Gas 59oF	Gas Turbine Natural Gas 80oF	Gas Turbine Natural Gas 100oF
A	B	C	D	E	F	G
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer						
PM, lb/hr (manufacturer)		7.0	7.0	7.0	7.0	7.0
TPY		30.66	30.66	30.66	30.66	30.66
Sulfur Dioxide (lb/hr)= Natural gas (cf/hr) x sulfur content(gr/100 cf) x 1 lb/7000 gr x (lb SO2/lb S) ÷ 100						
Natural Gas (cf/hr)		1,013,429	962,170	914,530	861,837	813,047
Basis, gr/100 cf		1.0	1.0	1.0	1.0	1.0
lb SO2/lb S (64/32)		2.0	2.0	2.0	2.0	2.0
SO2, lb/hr		2.90	2.75	2.61	2.46	2.32
TPY		12.68	12.04	11.44	10.79	10.17
Nitrogen Oxides (lb/hr)= NOx(ppm) x [20.9 x (1 - Moisture(%)/100) - Oxygen(%)] x 2116.8 lb/ft2 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]						
Basis, ppm*		25.0	25.0	25.0	25.0	25.0
Moisture (%)		6.1	6.32	6.77	7.75	9.46
Oxygen (%)		14.03	14.04	14	13.85	13.55
Volume Flow (acfm)		1,546,476	1,495,987	1,446,407	1,393,785	1,341,523
Temperature (°F)		962	976	988	1003	1017
NOx, lb/hr		97.5	92.5	87.8	82.9	78.2
TPY		427.05	404.98	384.53	363.07	342.49
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt NOx) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+		20.0	20.0	20.0	20.0	20.0
Moisture (%)		6.1	6.32	6.77	7.75	9.46
Volume Flow (acfm)		1,546,476	1,495,987	1,446,407	1,393,785	1,341,523
Temperature (°F)		962	976	988	1003	1017
lb/hr		47.0	44.9	42.9	40.5	37.9
TPY		205.91	196.78	187.78	177.21	165.81
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 12 (mole. wgt as methane) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+		7.0	7.0	7.0	7.0	7.0
Moisture (%)		6.1	6.32	6.77	7.75	9.46
Volume Flow (acfm)		1,546,476	1,495,987	1,446,407	1,393,785	1,341,523
Temperature (°F)		962	976	988	1003	1017
lb/hr		7.05	6.74	6.43	6.07	5.68
TPY		30.9	29.5	28.2	26.6	24.9
Lead (lb/hr)= Negligible						
Basis, lb/10E+12 Btu		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA

* corrected to 15% O2 dry conditions
\+ corrected to dry conditions

Table A-8. Maximum Other Regulated Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Natural Gas, Base Load

Pollutant	Units	Gas Turbine Natural Gas 20oF	Gas Turbine Natural Gas 40oF	Gas Turbine Natural Gas 59oF	Gas Turbine Natural Gas 80oF	Gas Turbine Natural Gas 100oF
A	B	C	D	E	F	G
Arsenic (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Beryllium (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Mercury (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Fluoride (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2 (98/64)						
	Fraction SO2 (%)	5	5	5	5	5
	SO2 (lb/hr)/0.95	3.0	2.9	2.8	2.6	2.4
	lb H2SO4/lb SO2	1.53	1.53	1.53	1.53	1.53
	lb/hr	2.33E-01	2.22E-01	2.11E-01	1.98E-01	1.87E-01
	TPY	1.02E+00	9.70E-01	9.22E-01	8.69E-01	8.20E-01

Sources: (1) EPA, 1990; (2) EPA, 1980

Table A-9. Maximum Non-Regulated Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Natural Gas, Base Load

Pollutant	Units	Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Manganese (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Nickel (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Cadmium (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Chromium (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Copper (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Vanadium (lb/hr)= Negligible						
	pg/J (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Selenium (lb/hr)= Negligible						
	pg/J (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Polycyclic Organic Matter (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	0.48	0.48	0.48	0.48	0.48
	HIR (MMBtu/hr)	962.8	914.1	868.8	818.7	772.4
	lb/hr	1.07E-03	1.02E-03	9.69E-04	9.13E-04	8.62E-04
	TPY	4.70E-03	4.47E-03	4.24E-03	4.00E-03	3.77E-03
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	38	38	38	38	38
	HIR (MMBtu/hr)	962.8	914.1	868.8	818.7	772.4
	lb/hr	8.50E-02	8.07E-02	7.67E-02	7.23E-02	6.82E-02
	TPY	3.72E-01	3.54E-01	3.36E-01	3.17E-01	2.99E-01

Note: Multiply by 2.324 to convert picogram/Joule (pg/J) to lb/10E+12 Btu.

Source: (1) EPA, 1990

Table A-14. Design Information and Stack Parameters for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load (Adjusted Flow for CO2 Plant)

Data		Gas Turbine Fuel Oil 20of	Gas Turbine Fuel Oil 40oF	Gas Turbine Fuel Oil 59oF	Gas Turbine Fuel Oil 80oF	Gas Turbine Fuel Oil 100oF
A	B	C	D	E	F	G
General						
Power (kW)		95,860.0	90,080.0	84,470.0	77,930.0	71,250.0
Heat Rate (Btu/kwh)		10,760.0	10,870.0	10,990.0	11,150.0	11,350.0
CT Exhaust Flow (Design Mass Flow - 120,000 lb/hr to CO2 Plant)						
Design Mass Flow (lb/hr)		2,605,000	2,492,000	2,384,000	2,261,000	2,134,000
Mass Flow, CT (lb/hr)		2,485,000	2,372,000	2,264,000	2,141,000	2,014,000
Mass Flow, CO2 plant (lb/hr)		120,000	120,000	120,000	120,000	120,000
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
Temperature (oF)		957	971	984	999	1,015
Moisture (% Vol.)		7.53	7.70	8.03	8.72	9.93
Oxygen (% Vol.)		13.22	13.23	13.23	13.18	13.04
Molecular Weight		28.59	28.57	28.53	28.44	28.30
Heat Input (MMBtu/hr)= Power (kW) x Heat Rate (Btu/kwh) ÷ 1,000,000 Btu/MMBtu						
Power (kW)		95,860.0	90,080.0	84,470.0	77,930.0	71,250.0
Heat Rate (Btu/kwh)		10,760.0	10,870.0	10,990.0	11,150.0	11,350.0
Heat Input (MMBtu/hr)		1,031.5	979.2	928.3	868.9	808.7
Fuel Oil Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/lb)						
Heat Input (MMBtu/hr)		1,031.5	979.2	928.3	868.9	808.7
Heat Content,LHV (Btu/lb)		18,550	18,550	18,550	18,550	18,550
Fuel Oil (lb/hr)		55,604.0	52,785.4	50,044.5	46,842.0	43,595.0
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)- CT Adjusted		2,485,000	2,372,000	2,264,000	2,141,000	2,014,000
Temperature (°F)		957	971	984	999	1,015
Molecular Weight		28.59	28.57	28.53	28.44	28.30
Volume Flow (acfm)		1,498,309	1,445,409	1,394,112	1,335,971	1,276,814
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F + 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)- CT Adjusted		2,485,000	2,372,000	2,264,000	2,141,000	2,014,000
Temperature (°F)		68	68	68	68	68
Molecular Weight		28.59	28.57	28.53	28.44	28.30
Volume Flow (scfm)		558,297	533,317	509,758	483,477	457,056
HRSG Stack Data						
Stack Height (ft)		125	125	125	125	125
Diameter (ft)		15.0	15.0	15.0	15.0	15.0
Volume Flow (acfm) from HRSG= [Volume flow (acfm) x (HRSG temp.(°F)+ 460°F)] ÷ [CT temp.(°F)+ 460°F]						
Volume Flow (acfm) from CT		1,498,309	1,445,409	1,394,112	1,335,971	1,276,814
CT Temperature (°F)		957	971	984	999	1,015
HRSG Temperature (°F)		220	220	220	220	220
Volume Flow (acfm) from HRSG		719,019	686,847	656,507	622,659	588,633
Velocity (ft/sec)= Volume flow (acfm) from HRSG ÷ [((diameter)²÷ 4) x 3.14159] ÷ 60 sec/min						
Volume Flow (acfm) from HRSG		719,019	686,847	656,507	622,659	588,633
Diameter (ft)		15.0	15.0	15.0	15.0	15.0
Velocity (ft/sec)		67.8	64.8	61.9	58.7	55.5

Source: General Electric, 1991.

Table A-15. Maximum Criteria Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load (Adjusted Flow for CO2 Plant)

Pollutant ..		Gas Turbine Fuel Oil 20of	Gas Turbine Fuel Oil 40oF	Gas Turbine Fuel Oil 59oF	Gas Turbine Fuel Oil 80oF	Gas Turbine Fuel Oil 100oF
A	B	C	D	E	F	G
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer x Ratio CT Adjusted/Design Mass Flow						
PM, lb/hr (manufacturer)		15.0	15.0	15.0	15.0	15.0
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
PM, lb/hr		14.3	14.3	14.2	14.2	14.2
TPY		62.7	62.5	62.4	62.2	62.0
Sulfur Dioxide (lb/hr)= Fuel oil (lb/hr) x sulfur content(fraction) x (lb SO2/lb S) x fraction emitted as SO2 x Ratio CT Adjusted/Design Mass Flow						
Fuel Oil (lb/hr)		55,604.0	52,785.4	50,044.5	46,842.0	43,595.0
Sulfur content (%)		0.10	0.10	0.10	0.10	0.10
lb SO2/lb S (64/32)		2.0	2.0	2.0	2.0	2.0
SO2 Fraction emitted		0.95	0.95	0.95	0.95	0.95
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
SO2, lb/hr		100.78	95.46	90.30	84.28	78.17
TPY		441.4	418.1	395.5	369.1	342.4
Nitrogen Oxides (lb/hr)= NOx(ppm) x [20.9 x (1 - Moisture(%)/100) - Oxygen(%)] x 2116.8 lb/ft2 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]						
Basis, ppm*		42.0	42.0	42.0	42.0	42.0
Moisture (%)		7.53	7.7	8.03	8.72	9.93
Oxygen (%)		13.22	13.23	13.23	13.18	13.04
Volume Flow (acfm)		1,498,309	1,445,409	1,394,112	1,335,971	1,276,814
Temperature (°F)		957	971	984	999	1015
NOx, lb/hr		173.8	164.8	155.7	145.4	134.8
TPY		761.3	721.8	682.0	636.7	590.4
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt NOx) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+		35.0	35.0	35.0	35.0	35.0
Moisture (%)		7.53	7.7	8.03	8.72	9.93
Volume Flow (acfm)		1,498,309	1,445,409	1,394,112	1,335,971	1,276,814
Temperature (°F)		957	971	984	999	1015
lb/hr		78.8	75.1	71.5	67.3	62.8
TPY		345.0	329.0	313.3	294.9	275.1
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 12 (mole. wgt as methane) x 60 min/hr ÷ [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+		10.0	10.0	10.0	10.0	10.0
Moisture (%)		7.53	7.7	8.03	8.72	9.93
Volume Flow (acfm)		1,498,309	1,445,409	1,394,112	1,335,971	1,276,814
Temperature (°F)		957	971	984	999	1015
lb/hr		9.65	9.20	8.76	8.25	7.69
TPY		42.2	40.3	38.4	36.1	33.7
Lead (lb/hr)= Lead (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr)x Ratio CT Adjusted/Design Mass Flow ÷ 1,000,000 Btu/MMBtu						
Basis, lb/10E+12 Btu		8.9	8.9	8.9	8.9	8.9
HIR (MMBtu/hr)		1,031.5	979.2	928.3	868.9	808.7
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
lb/hr		8.76E-03	8.29E-03	7.85E-03	7.32E-03	6.79E-03
TPY		0.038	0.036	0.034	0.032	0.030

* corrected to 15% O2 dry conditions
+ corrected to dry conditions

Table A-16. Maximum Other Regulated Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load (Adjusted Flow for CO2 Plant)

Pollutant	Units	Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
Arsenic (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	4.2	4.2	4.2	4.2	4.2
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	4.13E-03	3.91E-03	3.70E-03	3.46E-03	3.21E-03
	TPY	1.81E-02	1.71E-02	1.62E-02	1.51E-02	1.40E-02
Beryllium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	2.5	2.5	2.5	2.5	2.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.46E-03	2.33E-03	2.20E-03	2.06E-03	1.91E-03
	TPY	1.08E-02	1.02E-02	9.65E-03	9.01E-03	8.36E-03
Mercury (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	3	3	3	3	3
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.95E-03	2.80E-03	2.64E-03	2.47E-03	2.29E-03
	TPY	1.29E-02	1.22E-02	1.16E-02	1.08E-02	1.00E-02
Fluoride (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	32.5	32.5	32.5	32.5	32.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	3.20E-02	3.03E-02	2.87E-02	2.67E-02	2.48E-02
	TPY	1.40E-01	1.33E-01	1.25E-01	1.17E-01	1.09E-01
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2 (98/64)						
	Fraction SO2 (%)	5	5	5	5	5
	SO2 (lb/hr)/0.95	106.1	100.5	95.1	88.7	82.3
	lb H2SO4/lb SO2	1.53	1.53	1.53	1.53	1.53
	lb/hr	8.12E+00	7.69E+00	7.28E+00	6.79E+00	6.30E+00
	TPY	3.56E+01	3.37E+01	3.19E+01	2.97E+01	2.76E+01

Sources: (1) EPA, 1990; (2) EPA, 1980

Table A-17. Maximum Non-Regulated Pollutant Emissions for Mulberry Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load (Adjusted Flow for CO2 Plant)

Pollutant	Units	Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
Manganese (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow + 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	6.44	6.44	6.44	6.44	6.44
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	6.34E-03	6.00E-03	5.68E-03	5.30E-03	4.92E-03
	TPY	2.78E-02	2.63E-02	2.49E-02	2.32E-02	2.15E-02
Nickel (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	170	170	170	170	170
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	1.67E-01	1.58E-01	1.50E-01	1.40E-01	1.30E-01
	TPY	7.33E-01	6.94E-01	6.56E-01	6.13E-01	5.68E-01
Cadmium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	10.5	10.5	10.5	10.5	10.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	1.03E-02	9.79E-03	9.26E-03	8.64E-03	8.01E-03
	TPY	4.53E-02	4.29E-02	4.05E-02	3.78E-02	3.51E-02
Chromium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	47.5	47.5	47.5	47.5	47.5
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	4.67E-02	4.43E-02	4.19E-02	3.91E-02	3.63E-02
	TPY	2.05E-01	1.94E-01	1.83E-01	1.71E-01	1.59E-01
Copper (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	280	280	280	280	280
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.76E-01	2.61E-01	2.47E-01	2.30E-01	2.14E-01
	TPY	1.21E+00	1.14E+00	1.08E+00	1.01E+00	9.36E-01
Vanadium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	30	30	30	30	30
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	6.86E-02	6.50E-02	6.15E-02	5.74E-02	5.32E-02
	TPY	3.00E-01	2.85E-01	2.69E-01	2.51E-01	2.33E-01
Selenium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	10.1	10.1	10.1	10.1	10.1
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.31E-02	2.19E-02	2.07E-02	1.93E-02	1.79E-02
	TPY	1.01E-01	9.58E-02	9.06E-02	8.46E-02	7.85E-02
Polycyclic Organic Matter (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMB						
	pg/J (1)	0.12	0.12	0.12	0.12	0.12
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.74E-04	2.60E-04	2.46E-04	2.29E-04	2.13E-04
	TPY	1.20E-03	1.14E-03	1.08E-03	1.01E-03	9.32E-04
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	lb/10E+12 Btu (1)	405	405	405	405	405
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	3.98E-01	3.77E-01	3.57E-01	3.33E-01	3.09E-01
	TPY	1.75E+00	1.65E+00	1.56E+00	1.46E+00	1.35E+00

Note: Multiply by 2.324 to convert picogram/Joule (pg/J) to lb/10E+12 Btu.

Source: (1) EPA, 1990

Table A-18. Maximum Emissions for Additional Non-Regulated Pollutant
Cogeneration Facility- GE PG7111(EA), DLN Option, Distillate Oil, Base Load (Adjusted Flow for CO2 Plant)

Pollutant		Gas Turbine No.2 Oil 20oF	Gas Turbine No.2 Oil 40oF	Gas Turbine No.2 Oil 59oF	Gas Turbine No.2 Oil 80oF	Gas Turbine No.2 Oil 100oF
A	B	C	D	E	F	G
Ratio Mass Flow, CT/Design		0.954	0.952	0.950	0.947	0.944
Antimony (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	9.4	9.4	9.4	9.4	9.4
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	2.15E-02	2.04E-02	1.93E-02	1.80E-02	1.67E-02
	TPY	9.41E-02	8.92E-02	8.44E-02	7.87E-02	7.30E-02
Barium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio mass Flow ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	8.4	8.4	8.4	8.4	8.4
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	1.92E-02	1.82E-02	1.72E-02	1.61E-02	1.49E-02
	TPY	8.41E-02	7.97E-02	7.54E-02	7.04E-02	6.53E-02
Cobalt (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	3.9	3.9	3.9	3.9	3.9
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	8.92E-03	8.45E-03	7.99E-03	7.46E-03	6.92E-03
	TPY	3.91E-02	3.70E-02	3.50E-02	3.27E-02	3.03E-02
Zinc (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) x Ratio Mass Flow ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	294	294	294	294	294
	HIR (MMBtu/hr)	1,031.5	979.2	928.3	868.9	808.7
	lb/hr	6.72E-01	6.37E-01	6.02E-01	5.62E-01	5.21E-01
	TPY	2.94E+00	2.79E+00	2.64E+00	2.46E+00	2.28E+00
Chlorine (lb/hr)= Basis (ppm) x Fuel oil (lb/hr) x Ratio Mass Flow ÷ 1,000,000						
	ppm	0.5	0.5	0.5	0.5	0.5
	Fuel Oil (lb/hr)	55,604.0	52,785.4	50,044.5	46,842.0	43,595.0
	lb/hr	2.65E-02	2.51E-02	2.38E-02	2.22E-02	2.06E-02
	TPY	1.16E-01	1.10E-01	1.04E-01	9.71E-02	9.01E-02

Note: Multiply by 2.324 to convert picogram/Joule (pg/J) to lb/10E+12 Btu.

Source: (1) EPA, 1979

Table A-23. Stack Parameters for CO2 Facility (Includes Duct Burner on Natural Gas)

Data		Duct Burner Data with Gas Turbine on Oil at Ambient Temperature				
		20of	40oF	59oF	80oF	100oF
A	B	C	D	E	F	G
General						
Power (kW)		NA	NA	NA	NA	NA
Heat Rate (Btu/kwh)		NA	NA	NA	NA	NA
CT Exhaust Flow						
Mass Flow (lb/hr)*		112,500	112,500	112,500	112,500	112,500
Temperature (oF)		220	220	220	220	220
Moisture (% Vol.)		6.10	6.32	6.77	7.75	9.46
Oxygen (% Vol.)		14.03	14.04	14.00	13.85	13.55
Molecular Weight		28.00	28.00	28.00	28.00	28.00
Heat Input (MMBtu/hr)= Provided						
Power (kW)		NA	NA	NA	NA	NA
Heat Rate (Btu/kwh)		NA	NA	NA	NA	NA
Heat Input (MMBtu/hr)		99.0	99.0	99.0	99.0	99.0
Natural Gas Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/lb) (cf/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/cf)						
Heat Input (MMBtu/hr)		99.0	99.0	99.0	99.0	99.0
Heat Content,LHV (Btu/lb)		19,303	19,303	19,303	19,303	19,303
Natural Gas (lb/hr)		5,128.7	5,128.7	5,128.7	5,128.7	5,128.7
Heat Content,LHV (Btu/cf)		950	950	950	950	950
Natural Gas (cf/hr)		104,211	104,211	104,211	104,211	104,211
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr); from CT,DB*		112,500	112,500	112,500	112,500	112,500
Temperature (°F); from CT, DB		220	220	220	220	220
Molecular Weight		28.00	28.00	28.00	28.00	28.00
Volume Flow (acfm)		33,235	33,235	33,235	33,235	33,235
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F + 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)*		112,500	112,500	112,500	112,500	112,500
Temperature (°F)		68	68	68	68	68
Molecular Weight		28.00	28.00	28.00	28.00	28.00
Volume Flow (scfm)		25,806	25,806	25,806	25,806	25,806
CO2 Stack Data						
Stack Height (ft)		170	170	170	170	170
Diameter (ft)		3.0	3.0	3.0	3.0	3.0
Volume Flow (acfm)= [Volume flow (acfm) x (CO2 temp.(°F)+ 460°F)] ÷ [DB temp.(°F)+ 460°F]						
Volume Flow (acfm); CT, DB		33,235	33,235	33,235	33,235	33,235
DB Temperature (°F)		220	220	220	220	220
CO2 Temperature (°F)		117	117	117	117	117
Volume Flow (acfm)		28,201	28,201	28,201	28,201	28,201
Velocity (ft/sec)= Volume flow (acfm) ÷ [((diameter)^2÷ 4) x 3.14159] ÷ 60 sec/min						
Volume Flow (acfm)		28,201	28,201	28,201	28,201	28,201
Diameter (ft)		3.0	3.0	3.0	3.0	3.0
Velocity (ft/sec)		66.5	66.5	66.5	66.5	66.5

* Based on 120,000 lb/hr from CT; 5,000 lb/hr from duct burner; less 12,500 lb/hr (10 %) due to CO2 removal.

Table A-24. Maximum Criteria Pollutant Emissions for CO2 Plant (Without Contribution from CT)

Pollutant		Duct Burner Data with Gas Turbine on Oil at Ambient Temperature				
		20of	40oF	59oF	80oF	100oF
A	B	C	D	E	F	G
Particulate (lb/hr)= Basis (lb/MMBtu) x Heat Input Rate (MMBtu/hr)						
Basis (lb/MMBtu)		0.01	0.01	0.01	0.01	0.01
HIR (MMBtu/hr)		99.0	99.0	99.0	99.0	99.0
PM, lb/hr		0.99	0.99	0.99	0.99	0.99
TPY		4.34	4.34	4.34	4.34	4.34
Sulfur Dioxide (lb/hr)= Natural gas (cf/hr) x sulfur content(gr/100 cf) x 1 lb/7000 gr x (lb SO2/lb S) ÷ 100						
Natural Gas (cf/hr)		104,211	104,211	104,211	104,211	104,211
Basis, gr/100 cf		1.0	1.0	1.0	1.0	1.0
lb SO2/lb S (64/32)		2.0	2.0	2.0	2.0	2.0
SO2, lb/hr		0.30	0.30	0.30	0.30	0.30
TPY		1.30	1.30	1.30	1.30	1.30
Nitrogen Oxides (lb/hr)= Basis (lb/MMBtu) x Heat Input Rate (MMBtu/hr)						
Basis (lb/MMBtu)		0.16	0.16	0.16	0.16	0.16
HIR (MMBtu/hr)		99.0	99.0	99.0	99.0	99.0
NOx, lb/hr		15.84	15.84	15.84	15.84	15.84
TPY		69.38	69.38	69.38	69.38	69.38
Carbon Monoxide (lb/hr)= Basis (lb/MMBtu) x Heat Input Rate (MMBtu/hr)						
Basis (lb/MMBtu)		0.1	0.1	0.1	0.1	0.1
HIR (MMBtu/hr)		99.0	99.0	99.0	99.0	99.0
NOx, lb/hr		9.90	9.90	9.90	9.90	9.90
TPY		43.36	43.36	43.36	43.36	43.36
VOCs (lb/hr)= Basis (lb/MMBtu) x Heat Input Rate (MMBtu/hr)						
Basis (lb/MMBtu)		0.03	0.03	0.03	0.03	0.03
HIR (MMBtu/hr)		99.0	99.0	99.0	99.0	99.0
NOx, lb/hr		2.97	2.97	2.97	2.97	2.97
TPY		13.01	13.01	13.01	13.01	13.01
Lead (lb/hr)= Negligible						
Basis, lb/10E+12 Btu		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA

Note: Additional 5 lb/hr of PM are emitted due to heat stable salts from amine absorber.
Additional 14.7 lb/hr of VOCs are emitted due to monoethanolamine (as carbon) from amine absorber.

Table A-25. Maximum Other Regulated Pollutant Emissions for CO2 Plant (Without Contribution from CT)

Pollutant	Units	Duct Burner Data with Gas Turbine on Oil at Ambient Temperature				
		20oF	40oF	59oF	80oF	100oF
A	B	C	D	E	F	G
Arsenic (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Beryllium (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Mercury (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Fluoride (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2 (98/64)						
	Fraction SO2 (%)	5	5	5	5	5
	SO2 (lb/hr)/0.95	0.3	0.3	0.3	0.3	0.3
	lb H2SO4/lb SO2	1.53	1.53	1.53	1.53	1.53
	lb/hr	2.40E-02	2.40E-02	2.40E-02	2.40E-02	2.40E-02
	TPY	1.05E-01	1.05E-01	1.05E-01	1.05E-01	1.05E-01

Source: (1) EPA, 1990

Table A-26. Maximum Non-Regulated Pollutant Emissions for CO2 Plant (Without Contribution from CT)

Pollutant	Units	Duct Burner Data with Gas Turbine on Oil at Ambient Temperature				
		20oF	40oF	59oF	80oF	100oF
A	B	C	D	E	F	G
Manganese (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Nickel (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Cadmium (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Chromium (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Copper (lb/hr)= Negligible						
	lb/10E+12 Btu (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Vanadium (lb/hr)= Negligible						
	pg/J (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Selenium (lb/hr)= Negligible						
	pg/J (1)	NA	NA	NA	NA	NA
	HIR (MMBtu/hr)	NA	NA	NA	NA	NA
	lb/hr	NA	NA	NA	NA	NA
	TPY	NA	NA	NA	NA	NA
Polycyclic Organic Matter (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (mmBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	0.48	0.48	0.48	0.48	0.48
	HIR (MMBtu/hr)	99.0	99.0	99.0	99.0	99.0
	lb/hr	1.10E-04	1.10E-04	1.10E-04	1.10E-04	1.10E-04
	TPY	4.84E-04	4.84E-04	4.84E-04	4.84E-04	4.84E-04
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 Btu/MMBtu						
	pg/J (1)	38	38	38	38	38
	HIR (MMBtu/hr)	99.0	99.0	99.0	99.0	99.0
	lb/hr	8.74E-03	8.74E-03	8.74E-03	8.74E-03	8.74E-03
	TPY	3.83E-02	3.83E-02	3.83E-02	3.83E-02	3.83E-02

Note: Multiply by 2.324 to convert picogram/Joule (pg/J) to lb/10E+12 Btu.

Source: (1) EPA, 1990

United States Department of the Interior

FISH AND WILDLIFE SERVICE
75 Spring Street, S.W.
Atlanta, Georgia
30303

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JUN 22 1992

Division of Air
Resources Management

June 15, 1992

Mr. C. H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of
Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

We have reviewed Florida Power Corporation's (FPC) May 14, 1992, letter that clarifies the modeling protocol for their proposed power plant facility in Polk County, Florida. The proposed facility would be located approximately 110 km southeast of the Chassahowitzka Wilderness Area (WA), a Fish and Wildlife Service (Service) Prevention of Significant Deterioration (PSD) Class I area.

It is our understanding that FPC will initially model the proposed Polk County facility and all other increment-consuming sources in the Florida Department of Environmental Regulation (FDER) supplied inventory with the EPA ISCST model using 1982-86 National Weather Service data from Tampa, Florida. If a Class I increment violation is predicted in the cumulative ISCST analysis, and the proposed FPC source does not significantly contribute to the modeled increment violation, then no additional analysis for that averaging period or receptor is necessary. During the averaging periods when modeled violations occur, and the proposed FPC source has a predicted significant impact, additional air quality modeling will be performed with the EPA MESOPUFF II model.

In the MESOPUFF II Step 1 analysis, FPC will model the proposed Polk County facility emissions alone. FPC will then add their MESOPUFF II concentrations to the ISCST cumulative PSD impacts (minus the FPC ISCST predicted impacts). If this substitution of FPC MESOPUFF concentrations results in receptor concentrations below the Class I increments, then the analysis is complete for that averaging period and receptor.

If the Class I increment violation persists after MESOPUFF II Step 1, FPC will model all sources in the inventory which are greater than 50 km from the Chassahowitzka WA with MESOPUFF II for the cumulative PSD increment analysis for the respective averaging periods and receptors which still exceed the Class I increment. This analysis constitutes MESOPUFF II Step 2. All source(s) which are 50 km or less from the Chassahowitzka WA will be modeled with the EPA ISCST model during all steps of this analysis. These "near" source(s) will have their impact added to the respective ISCST or MESOPUFF II cumulative analysis. To allow the MESOPUFF II model to be initialized, a 3-day period before the event in question and 2 days afterward will be modeled to allow the MESOPUFF II model to reach stabilization. These initial MESOPUFF II calculations will be performed by adhering to the EPA guidance of modeling sulfur dioxide (SO_2) as inert. Upon Service review of these inert SO_2 results, we may accept MESOPUFF II calculations with some or all of the chemical transformation and deposition options available in the MESOPUFF II model.

All other issues of this modeling protocol have been agreed to in our May 13, 1992, letter. The "fine tuning" portions of this protocol were decided on a case-by-case basis for this specific air quality analysis. From our standpoint, the acceptance of the protocol should allow FPC to proceed with the air quality modeling analysis.

With regards to the issue of PSD Class I increment significant levels which FPC discussed in their May 14, 1992, letter, we believe they should be as conservative as possible and consistent with the methodology originally used to establish the significant impact levels for the National Ambient Air Quality Standards (NAAQS). In other words, the Class I significant impact levels should be established by ratioing the NAAQS significant levels to the NAAQS, and then multiplying by the respective Class I increments. For example, the ratio of the 24-hour significance level (5 ug/m^3) to the 24-hour NAAQS (365 ug/m^3), is 0.014. Multiplying this ratio by the Class I SO_2 increment, 24-hour average, yields a significance level of 0.07 ug/m^3 (rounded to the nearest hundredth). Similarly, the annual and 3-hour significant levels would be 0.025 and 0.48 ug/m^3, respectively. The resulting significant levels are more conservative than the State of Virginia's proposal because they are proportional to the NAAQS rather than the Class II increments.

As proposed, the significant impact levels would not be applied to determine whether a source or modification might have an adverse impact on an Air Quality Related Value (AQRV) at a Class I area, or whether a source has to conduct a cumulative modeling analysis to assess the total ambient concentrations used in such an analysis. The proposed significant levels are for the purpose of assessing whether a source causes or contributes to Class I increment violations, but <u>not</u> for determining whether a source needs to conduct an AQRV analysis. FPC acknowledged this distinction, and will be performing an AQRV analysis.

Regarding the AQRV analysis, we have received a second letter dated May 22, 1992, from FPC asking us to provide them with a list of sensitive resources in the Chassahowitzka WA that may potentially be affected by increased concentrations of pollutants. We will send the following information to both you and FPC under separate cover within the next week: a map of the Chassahowitzka National Wildlife Refuge that outlines the boundaries of the WA; the most recent plant, amphibian, reptile, bird, and mammal lists for the refuge; and selected pages from the 1991 Annual Narrative of the Chassahowitzka National Wildlife Refuge that list endangered and threatened species found on the refuge, in addition to discussing habitat types and associated dominant plant species.

We would like FPC to address the effects of increased concentrations of primary pollutants, such as sulfur dioxide and nitrogen oxides, on resources, in addition to addressing the effects of secondary pollutants such as ozone, nitrates, and sulfates. Although we are of course concerned about impacts on resources throughout the refuge, FPC can limit their AQRVs analysis to those resources located in the WA. FPC should do a literature survey to help them assess the effects of pollutants on vegetation in the hardwood swamplands and the mangrove forest, since these habitat types are found exclusively in the WA. They should focus particular attention to assessing the effects on lichens because some of these species are known to be sensitive to SO_2. As far as the wetlands species are concerned, we do not expect the rushes and marsh grasses to be sensitive to air pollutants; however, the effects of pollutants on the species found on the tree islands--the cabbage palms and Eastern red cedars--should be addressed.

Although SO_2 modeling is important for the increment analysis, we do not anticipate that wildlife on the refuge will be directly affected by gaseous pollutant emissions. However, we are concerned about the effects on wildlife resulting from acid deposition (i.e., loss of invertebrate food base, death of fish and amphibian eggs and larvae). Freshwater creeks flowing into the WA provide important feeding areas for the Federally-endangered peregrine falcon and bald eagle; and therefore, their integrity is essential to support these species in the WA. FPC should assess the effects of increased acid deposition on the invertebrates, fish, and amphibians that inhabit these freshwater creeks in addition to addressing any indirect effects on other wildlife species. A literature review should help them with this assessment as well.

Visibility is another AQRV of concern at Chassahowitzka WA. In addition to plume impacts, regional haze is a pervasive problem in the area that can detract from the experience of visitors to the WA. We would like FPC to address the visibility issue also.

If you have any concerns regarding the modeling protocol for the FPC Polk County facility, please contact Mr. John Notar of our Air Quality Branch in Denver at 303/969-2071. Any questions regarding the AQRV analysis should be directed to Ms. Tonnie Maniero at the same phone number.

Sincerely yours,

John R. Eadie

for James W. Pulliam, Jr.
Regional Director

cc:
Ms. Jewell Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxic Management Division
U.S. EPA, Region 4
345 Courtland Street, NE.
Atlanta, Georgia 30365

Mr. Scott Osborne
Florida Power Corporation
3201 34th Street South
P.O. Box 14042
St. Petersburg, Florida 33733

Ms. Kathleen L. Small
Florida Power Corporation
3201 34th Street South
P.O. Box 14042
St. Petersburg, Florida 33733

Mr. Douglas Fulle
EBASCO Environmental Services
145 Technology Park
Norcross, Georgia 30092

Mr. Robert McCann
KBN Engineering and Applied Sciences, Inc.
1034 NW 57th Street
Gainesville, Florida 32605

cc: J. Reynolds
C. Holladay
B. Thomas, SW Dist
CHF/PL

KBN

June 2, 1992

Mr. Clair H. Fancy
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED
JUN 0 1992
Division of Air
Resources Management

RE: Polk County--A.P.
Polk Power Partners, L.P.--Mulberry Cogeneration Project
Permit Application AC 53-211670 and PSD-FL-187

Dear Clair:

This correspondence and attachments present the information requested by the Department's May 5, 1992 letter.

1. A computer disk containing the Lotus 1-2-3 spreadsheets used to calculate emissions and presented in Tables A-1 through A-27 of the application is included with this correspondence. The spreadsheets are contained in files named TABA0105.WK3 through TABA2327.WK3. Because of the number and repetition of the calculations, a computerized spreadsheet is the only feasible way to perform the calculations. The computerized spreadsheet shows all calculations used to generate all the numerical quantities involving emissions.

   Please note that these spreadsheets are work products of KBN Engineering and Applied Sciences Inc., (KBN), and must be considered as confidential business information.

2. During the first 3 years of operation, the cogeneration facility will use only natural gas and fuel oil. Current project design does not include propane and therefore it should not be considered further in the application. The amount of natural gas under firm contract for the project during the first 3 years is sufficient to operate the facility at 22 percent of full load in any 24 hour period. The remainder of the fuel will be oil, i.e. 78 percent of full load in any 24-hour period.

   After the first 3 years of operation, the primary fuel will be natural gas. Fuel oil will only be used as backup (maximum of 30 days of operation).

3. Attachment 1 contains additional analyses to address the prevention of significant deterioration (PSD) Class I increment consumption and potential impacts on the air quality related values (AQRVs) of the Chassahowitska National Wilderness Area. As discussed, the proposed project's impacts are expected to be less than the National Park Service's proposed significant impact levels when potential violations of the Class I increment are predicted. Also, the proposed project's impacts are not expected to have an adverse effect on AQRVs. A disk copy and paper copy of the air dispersion modeling printouts are included with this letter.

KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

Submittal of this information should clarify all questions raised by the Department in the completeness determination for the above-referenced project. Please call if there are any further questions on the material submitted herein.

Sincerely,

Robert E. McCann Jr.
for
Kennard F. Kosky, P.E.
President

KFK/dmpm

Enclosure

cc: William Malenius, Ark Energy, Inc.
Ward Marshall, Central and South West Services, Inc.
File (2)
J. Reynolds
C. Holladay
B. Thomas, SW Dist
J. Harper, EPA
C. Shaver, NPS
D. Martin, Polk Co. Planning Div.

ATTACHMENT 1

Prevention of Significant Deterioration (PSD) Class I Increment Consumption and Air Quality Related Values (AQRV) Analyses of the Proposed Mulberry Cogeneration Facility

1.0 INTRODUCTION

KBN Engineering and Applied Sciences, Inc. (KBN) has performed air quality analyses to determine the prevention of significant deterioration (PSD) Class I increment consumption and air quality related values (AQRVs) analyses for the Chassahowitzka National Wilderness Area (NWA) due to emissions from the integrated cogeneration facility proposed by Polk Power Partners, L.P., d/b/a Polk Power Partners, L.P., Ltd. The facility, which is referred to as the Mulberry Cogeneration Facility, is located approximately 120 km from the closest part of the Chassahowitzka NWA, a PSD Class I area. Because the proposed facility alone had predicted 3-hour and 24-hour sulfur dioxide (SO_2) impacts greater than the National Park Service's (NPS's) proposed significant impact levels of 0.07 and 0.48 $\mu g/m^3$, respectively, the Florida Department of Environmental Regulation (FDER) has requested that a cumulative PSD Class I increment consumption analysis be performed for the 3-hour and 24-hour averaging periods. Based on verbal communications between FDER and NPS's, the AQRV analyses need only address the impacts of increased emissions of SO_2, nitrogen dioxide (NO_2), and volatile organic compounds for this project.

The following sections present the approaches, methods, and results of the respective PSD Class I increment consumption and AQRV analyses.

2.0 PREVENTION OF SIGNIFICANT DETERIORATION CLASS I INCREMENT ANALYSIS

An air quality modeling analysis was performed to determine the maximum SO_2 PSD Class I increment consumption at the Chassahowitzka PSD Class I area. This analysis included modeling with the Industrial Source Complex Short-Term (ISCST) model using the SO_2 emissions from the proposed project for the maximum emission case (i.e., 20 °F) with an inventory of other increment-consuming major and minor sources. The inventory for other sources, presented in Table 1, was based on data submitted in recent permit applications to FDER. The SO_2 impacts were predicted using the ISCST model at 13 discrete receptors surrounding the PSD Class I area which have also been included in recent permit applications. The impacts were predicted using a

5-year meteorological record (1982 through 1986) of surface and mixing height data from the National Weather Service (NWS) stations in Tampa and Ruskin, respectively.

Maximum predicted impacts for the 5 years of meteorological data are presented in Table 2. The overall highest, second-highest 3- and 24-hour impacts due to all sources are predicted to be 38.0 micrograms per cubic meter ($\mu g/m^3$) and 7.7 $\mu g/m^3$, respectively. The 3-hour and 24-hour impacts are above the SO_2 PSD Class I increment values. An additional modeling analysis was performed to determine the proposed project's contribution to the predicted violations. This analysis involved identifying the receptors and time periods for which the proposed source's impacts were greater than the NPS's proposed significant impact levels and then calculating the cumulative impacts from PSD sources for those periods and receptors. A summary of these results is presented in Table 3.

As shown in Table 3, when the proposed source's impacts are greater than the NPS's proposed significant impact levels, there were no predicted violations of the PSD Class I increment, except for one 24-hour event in 1986. For that event, the predicted 24-hour concentration was 5.22 $\mu g/m^3$ with the proposed source contributing approximately 0.09 $\mu g/m^3$. An investigation of the meteorological conditions which occurred on the day during which the proposed source had a predicted "significant" impact (see Table 4) revealed that the wind speeds were generally low (i.e., average of approximately 2.6 m/s) for the entire 24-hour period, including 2 hours of calm conditions, with wind direction change of about 130 degrees between the first and last hours of predicted source impacts. Because the proposed source's plume is not likely to be transported to the Class I area under those meteorological conditions, the proposed source's contribution is a conservative and unrealistic impact associated with the predicted violation. Also, with 2 hours of calm, the calculated 24-hour concentration of 5.22 $\mu g/m^3$ was based on 22 hours of impact (the 2 hours of calm were excluded from calculating the 24-hour concentration), instead of 24 hours. By considering only 22 hours of potential impacts, the 24-hour concentration is artificially increased by a factor of 1.09 (i.e., 24 hours/22 hours), or approximately 9 percent. Therefore, if a more realistic assessment of the proposed source's 24-hour impact was performed (i.e., long-range transport modeling) and all hours were used in the calculation, the predicted impact is expected to be less than the NPS's proposed significant impact levels. As a result, the total cumulative impact is also expected to be less than the PSD Class I increment.

3.0 AIR QUALITY RELATED VALUE ANALYSIS

3.1 POTENTIAL IMPACTS ON VEGETATION

The Chassahowitzka NWA is characterized by vegetation that includes flatwoods and brackish-water, marine, and halophytic terrestrial species. Predominant tree species are slash pine, laurel oak, sweetgum, and palm. Other plants in the preserve include needlegrass rush, seashore saltgrass, marsh hay, and red mangrove.

SO_2 concentrations at elevated levels have long been known to cause injury to plants. Acute SO_2 injury usually develops within a few hours or days of exposure, and symptoms include marginal, flecked, and/or intercoastal necrotic areas which appear water-soaked and dullish green initially. This injury generally occurs to younger leaves. Chronic injury usually is evident by signs of chlorosis, bronzing, premature senescence, reduced growth, and possible tissue necrosis (EPA, 1982). Phytotoxic symptoms demonstrated by plants can occur as low as 88 $\mu g/m^3$ (USDHEW, 1971). However, this occurs with the more primitive plants (i.e., mosses, ferns, lichens).

Many studies have been conducted to determine the effects of high-concentration, short-term SO_2 exposure on natural community vegetation. Sensitive plants include ragweed, legumes, blackberry, southern pine, and red and black oak. These species are injured by exposure to 3-hour SO_2 concentrations from 790 to 1,570 $\mu g/m^3$. Intermediate plants include locust and sweetgum. These species are injured by exposure to 3-hour SO_2 concentrations from 1,570 to 2,100 $\mu g/m^3$. Resistant species (injured at concentrations above 2,100 $\mu g/m^3$ for 3 hours) include white oak and dogwood (EPA, 1982).

A study of native Floridian species (Woltz and Howe, 1981) demonstrated that cypress, slash pine, live oak, and mangrove exposed to 1,300 $\mu g/m^3$ SO_2 for 8 hours were not visibly damaged. This supports the levels cited by other researchers on the effects of SO_2 on vegetation. A corroborative study (McLaughlin and Lee, 1974) demonstrated that approximately 20 percent of a cross-section of plants ranging from sensitive to tolerant were visibly injured at 3-hour SO_2 concentrations of 920 $\mu g/m^3$.

In order to assess the total air quality impacts at the Class I area that can be compared to the reported effects levels, the predicted impacts due to the PSD increment-affecting sources were added to background concentrations applicable to the 3-hour, 24-hour, and annual averaging periods. The background concentrations are assumed to be representative of impacts from sources not modeled and available from existing ambient monitoring data. In this analysis, ambient data collected in 1990 from a monitoring station (Station No. 0580-005-J02) located about 20 kilometers (km) from the Class I area were used to represent background concentrations. The annual concentration of 7 $\mu g/m^3$ and second-highest 3-hour and 24-hour concentrations of 248 and 53 $\mu g/m^3$, respectively, were assumed to represent background concentrations.

By adding the maximum predicted 3-hour SO_2 concentration of 38.0 $\mu g/m^3$ to the assumed background SO_2 concentration of 248 $\mu g/m^3$, a maximum total SO_2 concentration of 286 $\mu g/m^3$ would be expected in the Class I area. By comparing this concentration to those causing injury to native species, the SO_2-sensitive species (as well as more tolerant species) would not be damaged by the maximum predicted concentrations. By comparison with concentrations that cause plant injury, the maximum predicted SO_2 concentration of 286 $\mu g/m^3$ is approximately 36 percent of the most conservative concentration (i.e., 790 $\mu g/m^3$) that causes injury to SO_2-sensitive species.

The maximum total 24-hour and annual SO_2 concentrations of 60.7 and 8.2 $\mu g/m^3$, respectively, that would be predicted within the Class I area represent levels which are lower than those known to cause damage to test species. Jack pine seedlings exposed to SO_2 concentrations of 470 to 520 $\mu g/m^3$ for 24 hours demonstrated inhibition of foliar lipid synthesis; however, this inhibition was reversible (Malhotra and Kahn, 1978). Black oak exposed to 1,310 $\mu g/m^3$ SO_2 for 24 hours a day for 1 week demonstrated a 48 percent reduction in photosynthesis (Carlson, 1979). By comparison of these levels, it is apparent that the maximum predicted 24-hour concentrations are well below the concentrations that cause damage in SO_2-sensitive plants. The maximum annual concentration of 1.2 $\mu g/m^3$ due to the PSD sources adds slightly to the background levels and poses a minimal threat to area vegetation.

Nitrogen dioxide (NO_2) can injure plant tissue with symptoms usually appearing as irregular white to brown collapsed lesions between the leaf veins and near the margins. Conversely, non-injurious levels of NO_2 can be absorbed by plants, enzymatically transformed into ammonia, and incorporated into plant constituents such as amino acids (Matsumaru et al., 1979).

Plant damage can occur through either acute (short-term, high-concentration) or chronic (long-term, relatively low-concentration) exposure. For plants that have been determined to be more sensitive to NO_2 exposure than others, acute (1, 4, 8 hours) exposure caused 5 percent predicted foliar injury at concentrations ranging from 3,800 to 15,000 $\mu g/m^3$ (Heck and Tingey, 1979).

Chronic exposure of selected plants (some considered NO_2-sensitive) to NO_2 concentrations of 2,000 to 4,000 $\mu g/m^3$ for 213 to 1,900 hours caused reductions in yield of up to 37 percent and some chlorosis (Zahn, 1975).

By comparison of published toxicity values for NO_2 exposure to short-term (i.e., 1-, 3-, and 8-hour averaging times) and long-term (annual averaging time) modeled concentrations, the possibility of plant damage in the preserve can be examined for both acute and chronic exposure situations, respectively. The 1-, 3-, and 8-hour estimated NO_2 concentrations at the point of maximum impact are 3.8, 2.3, and 1.1 $\mu g/m^3$, respectively. These concentrations are approximately $7x10^{-5}$ to $1x10^{-3}$ of the levels that could potentially injure 5 percent of the plant foliage. For a chronic exposure, the annual estimated NO_2 concentration at the point of maximum impact in the preserve (0.020 $\mu g/m^3$) is $0.5x10^{-6}$ to $1.0x10^{-5}$ of the levels that caused minimal yield loss and chlorosis in plant tissue.

With the exception of ethylene, little information exists that examines the effects of gaseous organic compounds on plant growth. Ethylene is produced naturally by plants and is responsible for many of the responses a plant produces as it ages and enters the reproductive stage of development. Ethylene is also produced by the combustion of organic material such as agricultural and industrial waste. Losses due to ethylene have been documented in a cotton field when levels of ethylene rose above 7,500 $\mu g/m^3$. Lemons are affected by ethylene concentrations as low as 62 to 125 $\mu g/m^3$, at which point epinastic symptoms are observed (U.S. Department of Health, Education, and Welfare, 1969)

By assuming a threshold concentration of 62 $\mu g/m^3$ as a basis for risk assessment for the group of organic gases, an estimate of the impact of this group of compounds can be constructed. The maximum 1-hour concentrations of polycyclic organic matter and formaldehyde of 0.00001 and 0.0078 $\mu g/m^3$, respectively, are in the range of $1.6x10^{-7}$ to $1.3x10^{-4}$ of the values causing injury.

3.2 POTENTIAL IMPACTS ON SOILS

The majority of the soil in the Class I area is classified as Weekiwachee-Durbin muck. This is an euic, hyperthermic typic sufihemist that is characterized by high levels of sulfur and organic matter. This soil is flooded daily with the advent of high tide, and the pH ranges between 6.1 and 7.8. The upper level of this soil may contain as much as 4 percent sulfur (USDA, 1991).

The greatest threat to soils from increased SO_2 deposition is a decrease in pH or an increase of sulfur to levels considered unnatural or potentially toxic. Although ground deposition was not calculated, it is evident that the amount of SO_2 deposited would be inconsequential in light of the inherent sulfur content. The regular flooding of these soils by the Gulf of Mexico regulates the pH, and any rise in acidity in the soil would be buffered by this activity.

3.3 POTENTIAL IMPACTS ON WILDLIFE

The predicted SO_2 and NO_2 concentrations are well below the lowest observed effect levels in animals (Newman and Schreiber, 1988). Given these conditions, the proposed source's emissions poses no risk to wildlife. Because predicted levels are below those known to cause effect to vegetation, there is also no risk.

4.0 REFERENCES

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Table 1. Summary of SO2 Emission Source Stack and Operating Data Used in the Modeling Analysis (Metric Units) (Page 1 of 2)

Modeled Source ID	Source Description	UTM Coordinates (m) East	UTM Coordinates (m) North	Stack Data (m) Height	Stack Data (m) Diameter	Operating Data Temperature (K)	Operating Data Velocity (m/sec)	Modeled SO2 Emissions (g/sec)
99002	FPC Debary	467500	3197200	15.24	4.21	819.8	56.21	466.40
99005	FPC Int City/7EA	446300	3126000	15.24	4.21	819.8	56.21	310.90
99008	FPC Int City/7FA	446300	3126000	15.24	7.04	880.8	32.07	276.10
1	FL Crushed Stone Kiln 1	360000	3162398	97.60	4.88	442.0	23.23	98.40
6	CF Ind. Baseline C	388000	3116000	60.35	2.44	353.0	16.40	-50.40
7	CF Ind. Proposed C	388000	3116000	60.35	2.44	353.0	17.77	54.60
9	CF Ind. Baseline D	388000	3116000	60.35	2.44	353.0	16.40	-50.40
10	CF Ind. Proposed D	388000	3116000	60.35	2.44	353.0	17.77	54.60
22	FL Mining and Mtls Kiln	356200	3169900	27.40	4.88	470.2	7.48	1.45
30	TECO Big Bend - Unit 4	361900	3075000	149.40	7.32	342.2	19.81	654.70
31	TECO Big Bend - Units 1,2 (24-hr)	361900	3075000	149.40	7.32	422.0	28.65	-2436.00
33	TECO Big Bend - Unit 3 (24-hr)	361900	3075000	149.40	7.32	418.0	14.33	-1218.00
40	Pasco Cty RRF	347100	3139200	83.82	3.05	394.3	15.70	14.10
46	Crystal River 4	334200	3204500	182.90	6.90	398.0	21.00	1008.80
47	Crystal River 5	334200	3204500	182.90	6.90	398.0	21.00	1008.00
48	Crystal River 1	334200	3204500	152.00	4.57	422.0	42.00	-314.00
49	Crystal River 2	334200	3204500	153.00	4.86	422.0	42.00	-1859.00
50	OUC Stanton 1	334200	3204500	167.60	5.80	325.7	21.60	105.40
51	OUC Stanton 2 (24-hr)	483500	3150600	167.60	5.80	324.2	23.50	359.00
52	Kissimmee Util Exist	460100	3129300	18.30	3.66	422.0	38.00	32.10
53	Hardee	404800	3057400	22.90	4.88	389.0	23.90	277.60
54	Stauffer Shutdown	325600	3116700	49.00	1.20	293.0	3.60	-52.07
55	Lakeland McIntosh 3	408500	3105800	76.20	4.88	350.0	19.70	500.10
56	Hillsborough Cty RRF	368200	3092700	50.00	1.80	491.0	18.30	21.40
57	Pinellas	335300	3084400	49.10	2.74	522.0	27.72	62.24
61	Evans Packing	383300	3135800	12.30	0.40	466.2	9.20	0.20
70	Asphalt Pavers 4	361400	3168400	8.50	1.08	357.4	10.95	2.25
71	Asphalt Pavers 3	359900	3162400	12.20	1.37	377.0	10.58	2.25
90	Lakeland Util CT	409185	3102754	30.48	5.79	783.2	28.22	29.11
91	IMC SAP 1,2,3 Baseline	396600	3078900	61.00	2.60	350.0	14.28	-170.10
92	IMC SAP 1,2,3 Projected	396600	3078900	61.00	2.60	350.0	15.31	182.85
93	IMC SAP 4,5 Projected	396600	3078900	60.70	2.60	350.0	15.31	121.90
94	IMC DAP	396600	3078900	36.60	1.83	319.1	20.15	5.54
101	Prop Pasco Cogen	385600	3139000	30.48	3.35	384.3	17.13	5.04
102	Prop Lake Cogen	434000	3198800	30.48	3.35	384.3	17.13	5.04
111	CF Bartow Retired H2SO4	408500	3083000	30.50	1.68	350.0	14.60	-110.60
112	CF Bartow DAP	408500	3083000	9.10	0.70	450.0	22.50	4.30
113	CF Bartow #7 H2SO4	408500	3083000	67.10	2.40	351.0	9.80	52.90
114	CLM Chl	361800	3088300	30.00	0.61	375.0	20.00	21.02
115	Conserve	398400	3084200	30.50	1.80	308.0	18.90	-15.20
116	Conserve #1 H2SO4	398400	3084200	45.70	2.30	352.0	10.30	42.00
117	Farmland 1,2 H2SO4	409500	3079500	30.48	1.37	311.0	20.18	-54.56
118	Farmland 3,4 H2SO4	409500	3079500	30.48	2.29	355.0	9.27	67.16
119	Farmland 5 H2SO4	409500	3079500	45.72	2.44	355.0	9.65	41.96
120	IMC Lonesome Mine Dryer 1	389550	3067930	38.10	2.90	339.0	10.13	18.40

Table 1. Summary of SO2 Emission Source Stack and Operating Data Used in the Modeling Analysis (Metric Units) (Page 2 of 2)

Modeled Source ID	Source Description	UTM Coordinates (m)		Stack Data (m)		Operating Data		Modeled SO2 Emissions (g/sec)
		East	North	Height	Diameter	Temperature (K)	Velocity (m/sec)	
121	IMC Lonesome Mine Dryer 2	389550	3067930	38.10	2.44	346.0	18.40	21.17
136	Royster #1	406700	3085200	51.00	2.13	356.0	9.90	-257.60
137	Royster #2	406700	3085200	61.00	2.13	360.0	12.20	35.70
140	USSAC Ft Meade H2SO4 1	416120	3068620	53.40	2.59	355.0	15.91	63.00
141	USSAC Ft Meade H2SO4 2	416120	3068620	53.40	2.59	355.0	15.91	63.00
142	USSAC Ft Meade H2SO4 X	416210	3068740	29.00	3.02	314.0	6.77	-78.80
143	WR Grace Retired H2SO4	409700	3086000	45.70	1.40	352.0	16.50	-216.00
144	WR Grace 2 46 16	409700	3086000	61.00	2.80	346.0	7.30	73.60
145	WR Grace 2 46 17	409500	3086500	61.00	1.52	347.0	28.40	72.00
147	Gardinier SAP 4,5,6	363400	3082400	22.60	1.52	322.0	19.50	-196.30
148	Gardinier SAP 7 Exist	363400	3082400	45.70	2.29	355.0	9.20	-50.71
149	Gardinier SAP 7 Mod	363400	3082400	45.70	2.29	355.0	9.20	36.75
150	AMAX	394800	3067720	8.20	0.41	505.0	7.57	0.60
151	AMAX	394850	3069770	30.50	1.82	334.0	7.26	16.35
154	Mobil-Nichols	398290	3084290	25.90	2.29	339.0	15.20	2.44
250	FDOC Boiler #3	382200	3166100	9.14	0.61	478.0	4.57	2.99
260	E R Jahna (Lime Dryer)	386700	3155800	10.67	1.83	327.0	8.99	0.82
270	Oman Const (Asphalt)	359800	3164900	7.62	1.83	347.0	6.29	2.09
280	Dris Paving (Asphalt)	340600	3119200	12.20	3.05	339.0	6.47	0.23
290	Overstreet Paving (Asphalt)	355900	3143700	9.14	1.30	408.0	16.00	3.67
300	New Pt Richey Hosp Blr#1	331200	3124500	10.98	0.31	544.0	3.88	0.06
310	New Pt Richey Hosp Blr#2	331200	3124500	10.98	0.31	544.0	3.88	0.03
320	Hosp Corp of Am Boiler #1	333400	3141000	10.98	0.31	533.0	4.00	0.08
330	Hosp Corp of Am Boiler #2	333400	3141000	10.98	0.31	533.0	4.00	0.08
340	Couch Const-Odessa (Asphalt)	340700	3119500	9.14	1.40	436.0	22.30	7.25
350	Couch Const-Zephyrhills (Asphalt)	390300	3129400	6.10	1.38	422.0	21.00	3.54
400	Agrico Baseline	407500	3071300	45.73	1.60	350.0	26.40	-75.60
410	Agrico Proposed	407500	3071300	45.73	1.60	350.0	39.06	113.50
88020	Ark Energy - CO2 Plant	413600	3080600	51.82	0.91	320.0	20.27	0.65
99020	Ark Energy - Combustion Turbine	413600	3080600	38.10	4.57	378.0	20.67	12.70

Note: Ark Energy modeled at 20°F design temperature.

Table 2. Maximum Predicted SO2 Concentrations from the Screening Analysis for Comparison to PSD Class I Increments

Averaging Period	Maximum Concentration (µg/m)	Receptor Location (UTM) East (km)	Receptor Location (UTM) North (km)	Period Julian Day	Period Hour Ending	Period Year
3-Hour*	35.5	331.5	3183.4	161	3	1982
	27.2	336.5	3183.4	136	6	1983
	37.9	331.5	3183.4	156	12	1984
	38.0	331.5	3183.4	29	12	1985
	33.9	331.5	3183.4	108	12	1986
24-Hour*	7.40	340.3	3169.8	335	24	1982
	7.06	340.3	3165.7	211	24	1983
	7.24	331.5	3183.4	156	24	1984
	7.22	340.3	3169.8	334	24	1985
	7.71	343.0	3176.2	193	24	1986
Annual	1.03	340.3	3165.7	-	-	1982
	0.84	340.3	3165.7	-	-	1983
	1.06	340.3	3165.7	-	-	1984
	0.96	340.3	3165.7	-	-	1985
	1.18	342.0	3174.0	-	-	1986

Note: - = Not applicable.
µg/m = micrograms per cubic meter.
km = kilometers.

* Highest, second-highest concentrations predicted for this averaging period.

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 1 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1982	3	232	3	343.7	3178.3	5.58	0.49
1982	3	240	6	339.0	3183.4	3.42	0.51
1982	3	240	6	343.7	3178.3	3.31	0.50
1982	3	240	6	343.0	3176.2	2.49	0.49
1982	3	248	3	343.7	3178.3	0.82	0.49
1982	3	248	3	339.0	3183.4	0.30	0.51
1982	3	355	3	340.3	3165.7	-1.18	0.51
1982	3	22	24	336.5	3183.4	-2.47	0.49
1982	3	345	6	342.0	3174.0	-2.59	0.49
1982	3	232	3	339.0	3183.4	-3.43	0.50
1982	3	232	3	343.0	3176.2	-3.66	0.49
1982	3	345	6	343.0	3176.2	-3.93	0.49
1982	3	22	24	342.0	3174.0	-6.75	0.48
1982	3	199	6	343.7	3178.3	-8.29	0.49
1982	3	240	3	342.0	3174.0	-8.88	0.49
1982	3	49	6	340.3	3169.8	-9.74	0.48
1982	3	240	3	334.0	3183.4	-10.50	0.49
1982	3	210	3	342.0	3174.0	-10.85	0.79
1982	3	248	3	343.0	3176.2	-11.82	0.49
1982	3	145	3	343.0	3176.2	-12.00	0.56
1982	3	354	24	340.3	3167.7	-12.19	0.52
1982	3	49	6	340.3	3167.7	-12.35	0.52
1982	3	79	24	336.5	3183.4	-12.57	0.49
1982	3	199	6	339.0	3183.4	-12.68	0.50
1982	3	80	6	340.3	3165.7	-12.91	0.52
1982	3	264	3	340.3	3165.7	-13.37	0.54
1982	3	363	6	331.5	3183.4	-15.62	0.73
1982	3	199	6	343.0	3176.2	-16.20	0.49
1982	3	145	3	336.5	3183.4	-16.60	0.59
1982	3	210	3	334.0	3183.4	-16.89	0.85
1982	3	363	6	340.7	3171.9	-17.22	0.80
1982	3	176	24	342.0	3174.0	-17.35	0.84
1982	3	79	24	342.0	3174.0	-17.97	0.48
1982	3	263	9	340.3	3165.7	-18.17	0.64
1982	3	210	24	341.1	3183.4	-18.49	0.60
1982	3	210	24	342.4	3180.6	-21.19	0.57
1982	3	176	24	334.0	3183.4	-21.75	0.90
1982	3	210	24	343.7	3178.3	-22.49	0.55
1982	3	145	3	342.0	3174.0	-23.52	0.58
1982	3	210	3	340.7	3171.9	-23.81	1.07
1982	3	210	3	331.5	3183.4	-27.06	0.97
1982	3	363	6	340.3	3169.8	-27.19	0.81
1982	3	363	6	340.3	3167.7	-29.77	0.55
1982	3	210	3	340.3	3169.8	-32.94	0.81

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 2 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1982	3	176	24	331.5	3183.4	-38.35	1.07
1982	3	176	24	340.7	3171.9	-40.87	1.17
1982	3	176	24	340.3	3167.7	-44.95	0.54
1982	3	176	24	340.3	3169.8	-49.80	0.91
1982	24	205	24	340.3	3169.8	3.89	0.09
1982	24	49	24	340.3	3169.8	2.88	0.08
1982	24	205	24	340.3	3167.7	2.45	0.10
1982	24	204	24	343.7	3178.3	2.37	0.08
1982	24	263	24	340.3	3165.7	2.34	0.11
1982	24	204	24	342.4	3180.6	2.27	0.08
1982	24	155	24	340.3	3165.7	2.24	0.07
1982	24	49	24	340.3	3167.7	2.16	0.09
1982	24	364	24	334.0	3183.4	2.07	0.07
1982	24	339	24	342.4	3180.6	2.04	0.10
1982	24	339	24	343.7	3178.3	2.02	0.10
1982	24	339	24	341.1	3183.4	2.01	0.09
1982	24	204	24	341.1	3183.4	1.98	0.07
1982	24	22	24	343.0	3176.2	1.93	0.07
1982	24	155	24	340.3	3167.7	1.89	0.07
1982	24	339	24	343.0	3176.2	1.62	0.10
1982	24	49	24	340.3	3165.7	1.62	0.08
1982	24	362	24	343.0	3176.2	1.55	0.07
1982	24	339	24	339.0	3183.4	1.50	0.09
1982	24	263	24	340.3	3167.7	1.46	0.09
1982	24	364	24	336.5	3183.4	1.39	0.09
1982	24	145	24	343.0	3176.2	1.35	0.07
1982	24	116	24	340.3	3165.7	1.30	0.08
1982	24	205	24	340.3	3165.7	1.15	0.09
1982	24	339	24	336.5	3183.4	1.12	0.09
1982	24	204	24	339.0	3183.4	1.06	0.08
1982	24	191	24	342.0	3174.0	0.88	0.07
1982	24	345	24	343.0	3176.2	0.88	0.07
1982	24	339	24	342.0	3174.0	0.86	0.09
1982	24	204	24	336.5	3183.4	0.83	0.08
1982	24	232	24	340.3	3165.7	0.80	0.07
1982	24	364	24	339.0	3183.4	0.78	0.10
1982	24	204	24	343.0	3176.2	0.65	0.09
1982	24	248	24	339.0	3183.4	0.62	0.07
1982	24	22	24	336.5	3183.4	0.60	0.08
1982	24	145	24	336.5	3183.4	0.38	0.07
1982	24	339	24	334.0	3183.4	0.38	0.08
1982	24	364	24	341.1	3183.4	0.28	0.11
1982	24	364	24	340.7	3171.9	0.28	0.07

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 3 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1982	24	22	24	342.0	3174.0	0.17	0.08
1982	24	364	24	340.3	3169.8	0.10	0.07
1982	24	364	24	343.0	3176.2	0.05	0.10
1982	24	364	24	342.4	3180.6	0.03	0.11
1982	24	204	24	342.0	3174.0	-0.04	0.08
1982	24	191	24	334.0	3183.4	-0.05	0.08
1982	24	364	24	343.7	3178.3	-0.25	0.11
1982	24	145	24	342.0	3174.0	-0.28	0.07
1982	24	199	24	343.7	3178.3	-0.39	0.07
1982	24	364	24	342.0	3174.0	-0.45	0.09
1982	24	307	24	340.7	3171.9	-0.47	0.07
1982	24	363	24	340.7	3171.9	-0.47	0.10
1982	24	240	24	336.5	3183.4	-0.50	0.09
1982	24	210	24	341.1	3183.4	-0.64	0.09
1982	24	191	24	340.7	3171.9	-0.77	0.10
1982	24	80	24	340.3	3167.7	-0.78	0.07
1982	24	199	24	343.0	3176.2	-0.88	0.07
1982	24	199	24	339.0	3183.4	-0.89	0.07
1982	24	240	24	334.0	3183.4	-0.99	0.08
1982	24	240	24	339.0	3183.4	-1.03	0.09
1982	24	65	24	340.3	3167.7	-1.16	0.08
1982	24	240	24	343.0	3176.2	-1.22	0.10
1982	24	144	24	340.7	3171.9	-1.23	0.07
1982	24	176	24	342.0	3174.0	-1.28	0.11
1982	24	307	24	340.3	3169.8	-1.31	0.07
1982	24	240	24	341.1	3183.4	-1.36	0.08
1982	24	240	24	342.4	3180.6	-1.51	0.09
1982	24	240	24	342.0	3174.0	-1.51	0.09
1982	24	210	24	342.4	3180.6	-1.54	0.09
1982	24	65	24	340.3	3165.7	-1.59	0.08
1982	24	80	24	340.3	3165.7	-1.67	0.09
1982	24	191	24	340.3	3169.8	-1.73	0.08
1982	24	176	24	334.0	3183.4	-1.74	0.12
1982	24	191	24	331.5	3183.4	-1.75	0.09
1982	24	240	24	343.7	3178.3	-1.85	0.09
1982	24	173	24	334.0	3183.4	-2.04	0.07
1982	24	210	24	334.0	3183.4	-2.15	0.13
1982	24	210	24	343.7	3178.3	-2.19	0.09
1982	24	210	24	339.0	3183.4	-2.21	0.08
1982	24	264	24	340.3	3167.7	-2.39	0.09
1982	24	210	24	336.5	3183.4	-2.48	0.09
1982	24	363	24	331.5	3183.4	-2.53	0.09
1982	24	144	24	340.3	3169.8	-2.57	0.08
1982	24	210	24	331.5	3183.4	-2.76	0.14

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 4 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1982	24	363	24	340.3	3169.8	-2.97	0.10
1982	24	153	24	343.0	3176.2	-3.49	0.07
1982	24	173	24	342.0	3174.0	-3.54	0.08
1982	24	176	24	331.5	3183.4	-3.91	0.14
1982	24	264	24	340.3	3165.7	-4.25	0.12
1982	24	210	24	343.0	3176.2	-4.34	0.09
1982	24	355	24	340.3	3165.7	-4.36	0.09
1982	24	153	24	342.0	3174.0	-4.45	0.08
1982	24	153	24	334.0	3183.4	-4.49	0.07
1982	24	210	24	342.0	3174.0	-4.84	0.13
1982	24	176	24	340.7	3171.9	-4.88	0.15
1982	24	153	24	340.7	3171.9	-5.05	0.08
1982	24	176	24	340.3	3167.7	-5.11	0.07
1982	24	153	24	340.3	3169.8	-5.24	0.07
1982	24	153	24	331.5	3183.4	-5.44	0.07
1982	24	210	24	340.3	3167.7	-5.47	0.07
1982	24	210	24	340.7	3171.9	-5.60	0.16
1982	24	176	24	340.3	3169.8	-6.08	0.12
1982	24	210	24	340.3	3169.8	-6.52	0.12
1983	3	225	3	342.0	3174.0	-2.83	0.58
1983	3	264	6	334.0	3183.4	-4.60	0.48
1983	3	224	6	340.3	3165.7	-5.74	0.54
1983	3	135	6	342.0	3174.0	-8.63	0.51
1983	3	225	3	334.0	3183.4	-8.77	0.59
1983	3	336	24	343.0	3176.2	-9.02	0.60
1983	3	135	6	334.0	3183.4	-9.36	0.51
1983	3	30	3	341.1	3183.4	-10.17	0.51
1983	3	225	3	340.7	3171.9	-10.38	0.56
1983	3	30	3	334.0	3183.4	-10.58	0.49
1983	3	247	3	342.0	3174.0	-10.98	0.72
1983	3	30	3	342.4	3180.6	-11.24	0.50
1983	3	186	21	340.7	3171.9	-11.83	0.51
1983	3	225	3	331.5	3183.4	-11.90	0.51
1983	3	129	24	343.0	3176.2	-12.01	0.56
1983	3	174	6	343.0	3176.2	-12.06	0.57
1983	3	30	3	343.7	3178.3	-12.19	0.50
1983	3	39	24	342.0	3174.0	-12.87	0.54
1983	3	122	3	341.1	3183.4	-14.01	0.49
1983	3	279	3	341.1	3183.4	-14.55	0.50
1983	3	135	6	331.5	3183.4	-14.56	0.66
1983	3	242	6	340.3	3165.7	-14.61	0.54
1983	3	336	24	336.5	3183.4	-14.67	0.73
1983	3	285	21	331.5	3183.4	-14.90	0.56

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 5 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1983	3	30	3	342.0	3174.0	-15.01	0.51
1983	3	39	24	334.0	3183.4	-15.56	0.55
1983	3	247	3	334.0	3183.4	-16.03	0.73
1983	3	285	21	340.7	3171.9	-16.11	0.61
1983	3	135	6	340.7	3171.9	-16.44	0.74
1983	3	129	24	336.5	3183.4	-16.60	0.59
1983	3	174	6	336.5	3183.4	-16.68	0.60
1983	3	258	24	340.3	3167.7	-16.97	0.55
1983	3	186	21	340.3	3169.8	-18.80	0.51
1983	3	135	6	340.3	3169.8	-22.02	0.84
1983	3	39	24	331.5	3183.4	-22.87	0.48
1983	3	247	3	331.5	3183.4	-22.96	0.63
1983	3	135	6	340.3	3165.7	-23.52	0.59
1983	3	129	24	342.0	3174.0	-23.63	0.58
1983	3	174	6	342.0	3174.0	-23.78	0.59
1983	3	39	24	340.7	3171.9	-24.62	0.53
1983	3	135	6	340.3	3167.7	-24.79	0.78
1983	3	336	24	342.0	3174.0	-25.17	0.94
1983	3	285	21	340.3	3169.8	-25.32	0.62
1983	3	247	3	340.7	3171.9	-26.55	0.70
1983	3	244	3	339.0	3183.4	-26.71	0.61
1983	3	336	24	334.0	3183.4	-26.83	0.87
1983	3	244	3	342.4	3180.6	-27.92	0.56
1983	3	244	3	343.7	3178.3	-28.38	0.59
1983	3	336	24	331.5	3183.4	-31.92	0.64
1983	3	336	24	340.7	3171.9	-37.16	0.70
1983	3	244	3	343.0	3176.2	-39.79	0.59
1983	24	247	24	342.0	3174.0	3.82	0.13
1983	24	247	24	336.5	3183.4	3.03	0.09
1983	24	285	24	342.4	3180.6	2.83	0.09
1983	24	285	24	341.1	3183.4	2.82	0.09
1983	24	336	24	343.0	3176.2	2.69	0.09
1983	24	285	24	343.7	3178.3	2.55	0.09
1983	24	174	24	343.0	3176.2	2.41	0.09
1983	24	285	24	339.0	3183.4	2.22	0.07
1983	24	122	24	343.7	3178.3	2.06	0.07
1983	24	135	24	336.5	3183.4	1.85	0.07
1983	24	99	24	343.7	3178.3	1.55	0.07
1983	24	247	24	334.0	3183.4	1.54	0.13
1983	24	285	24	334.0	3183.4	1.51	0.08
1983	24	122	24	342.4	3180.6	1.46	0.08
1983	24	247	24	340.7	3171.9	1.34	0.13
1983	24	285	24	342.0	3174.0	1.26	0.07

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 6 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1983	24	135	24	342.0	3174.0	1.19	0.09
1983	24	174	24	336.5	3183.4	1.06	0.09
1983	24	122	24	341.1	3183.4	1.04	0.08
1983	24	99	24	339.0	3183.4	1.02	0.08
1983	24	174	24	342.0	3174.0	0.81	0.09
1983	24	135	24	334.0	3183.4	0.68	0.09
1983	24	247	24	340.3	3169.8	0.56	0.08
1983	24	258	24	340.3	3169.8	0.54	0.09
1983	24	336	24	336.5	3183.4	0.36	0.10
1983	24	135	24	340.7	3171.9	0.30	0.12
1983	24	99	24	343.0	3176.2	0.26	0.09
1983	24	36	24	341.1	3183.4	0.23	0.07
1983	24	135	24	340.3	3165.7	0.18	0.09
1983	24	285	24	331.5	3183.4	0.06	0.11
1983	24	135	24	340.3	3167.7	-0.10	0.11
1983	24	135	24	340.3	3169.8	-0.27	0.12
1983	24	135	24	331.5	3183.4	-0.29	0.10
1983	24	36	24	342.4	3180.6	-0.37	0.07
1983	24	285	24	340.7	3171.9	-0.50	0.12
1983	24	99	24	336.5	3183.4	-0.50	0.08
1983	24	247	24	331.5	3183.4	-0.54	0.12
1983	24	244	24	341.1	3183.4	-0.62	0.08
1983	24	258	24	340.3	3167.7	-0.69	0.10
1983	24	174	24	334.0	3183.4	-0.73	0.08
1983	24	244	24	343.7	3178.3	-0.77	0.10
1983	24	36	24	343.7	3178.3	-0.80	0.08
1983	24	225	24	342.0	3174.0	-0.88	0.08
1983	24	244	24	339.0	3183.4	-0.98	0.10
1983	24	244	24	342.4	3180.6	-0.99	0.09
1983	24	285	24	340.3	3165.7	-1.01	0.08
1983	24	99	24	342.0	3174.0	-1.03	0.09
1983	24	264	24	342.0	3174.0	-1.12	0.08
1983	24	336	24	342.0	3174.0	-1.13	0.13
1983	24	264	24	334.0	3183.4	-1.14	0.08
1983	24	224	24	340.3	3165.7	-1.19	0.08
1983	24	99	24	340.3	3165.7	-1.20	0.07
1983	24	99	24	340.3	3167.7	-1.30	0.07
1983	24	336	24	334.0	3183.4	-1.30	0.12
1983	24	258	24	340.3	3165.7	-1.35	0.09
1983	24	256	24	340.3	3165.7	-1.41	0.07
1983	24	99	24	340.3	3169.8	-1.45	0.08
1983	24	249	24	336.5	3183.4	-1.47	0.07
1983	24	39	24	342.0	3174.0	-1.51	0.07
1983	24	99	24	340.7	3171.9	-1.52	0.09

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 7 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1983	24	244	24	336.5	3183.4	-1.56	0.08
1983	24	98	24	340.3	3167.7	-1.59	0.08
1983	24	99	24	334.0	3183.4	-1.83	0.08
1983	24	285	24	340.3	3169.8	-1.83	0.12
1983	24	285	24	340.3	3167.7	-1.94	0.10
1983	24	186	24	340.7	3171.9	-2.01	0.08
1983	24	129	24	343.0	3176.2	-2.03	0.09
1983	24	186	24	331.5	3183.4	-2.20	0.08
1983	24	39	24	334.0	3183.4	-2.28	0.08
1983	24	279	24	341.1	3183.4	-2.37	0.08
1983	24	244	24	343.0	3176.2	-2.39	0.10
1983	24	279	24	342.4	3180.6	-2.40	0.08
1983	24	99	24	331.5	3183.4	-2.45	0.08
1983	24	279	24	343.7	3178.3	-2.53	0.08
1983	24	336	24	331.5	3183.4	-2.68	0.10
1983	24	129	24	336.5	3183.4	-2.78	0.10
1983	24	336	24	340.7	3171.9	-2.92	0.11
1983	24	98	24	340.3	3165.7	-2.94	0.12
1983	24	186	24	340.3	3169.8	-3.19	0.08
1983	24	39	24	340.7	3171.9	-3.20	0.07
1983	24	264	24	340.7	3171.9	-3.27	0.07
1983	24	225	24	340.7	3171.9	-3.45	0.07
1983	24	129	24	342.0	3174.0	-3.97	0.10
1983	24	129	24	334.0	3183.4	-4.04	0.08
1983	24	225	24	334.0	3183.4	-4.07	0.08
1983	24	242	24	340.3	3165.7	-4.34	0.08
1984	3	145	6	342.4	3180.6	-9.17	0.55
1984	3	110	9	340.3	3165.7	-9.33	0.53
1984	3	145	6	343.7	3178.3	-10.77	0.59
1984	3	110	24	331.5	3183.4	-11.78	0.55
1984	3	193	24	334.0	3183.4	-12.04	0.48
1984	3	357	9	340.3	3165.7	-14.16	0.53
1984	3	123	6	331.5	3183.4	-14.22	0.55
1984	3	246	24	340.3	3167.7	-14.68	0.52
1984	3	110	24	341.1	3183.4	-15.11	0.60
1984	3	145	6	339.0	3183.4	-15.13	0.61
1984	3	123	6	340.7	3171.9	-15.52	0.60
1984	3	110	24	340.7	3171.9	-15.92	0.60
1984	3	194	3	340.3	3165.7	-19.11	0.65
1984	3	145	6	343.0	3176.2	-20.10	0.59
1984	3	110	24	342.4	3180.6	-20.11	0.57
1984	3	110	24	340.3	3169.8	-20.72	0.60
1984	3	110	24	343.7	3178.3	-22.06	0.55

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 8 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1984	3	123	6	340.3	3169.8	-24.48	0.61
1984	24	145	24	341.1	3183.4	1.87	0.08
1984	24	145	24	342.4	3180.6	1.32	0.10
1984	24	145	24	343.7	3178.3	1.08	0.10
1984	24	246	24	340.3	3167.7	0.96	0.07
1984	24	145	24	339.0	3183.4	0.72	0.11
1984	24	145	24	342.0	3174.0	0.25	0.08
1984	24	141	24	342.0	3174.0	0.19	0.07
1984	24	145	24	343.0	3176.2	0.16	0.11
1984	24	110	24	340.7	3171.9	0.09	0.11
1984	24	110	24	341.1	3183.4	0.07	0.15
1984	24	110	24	331.5	3183.4	-0.06	0.10
1984	24	55	24	334.0	3183.4	-0.13	0.08
1984	24	110	24	340.3	3169.8	-0.35	0.13
1984	24	55	24	342.0	3174.0	-0.38	0.08
1984	24	145	24	336.5	3183.4	-0.84	0.09
1984	24	110	24	342.4	3180.6	-1.13	0.14
1984	24	110	24	340.3	3167.7	-1.53	0.12
1984	24	110	24	339.0	3183.4	-1.58	0.10
1984	24	110	24	340.3	3165.7	-1.74	0.11
1984	24	194	24	340.3	3165.7	-1.80	0.09
1984	24	110	24	343.7	3178.3	-1.81	0.13
1984	24	193	24	334.0	3183.4	-1.93	0.08
1984	24	193	24	342.0	3174.0	-2.13	0.08
1984	24	193	24	331.5	3183.4	-2.75	0.07
1984	24	55	24	340.7	3171.9	-2.91	0.07
1984	24	193	24	340.7	3171.9	-3.25	0.08
1984	24	110	24	343.0	3176.2	-3.53	0.08
1984	24	123	24	331.5	3183.4	-4.83	0.08
1984	24	123	24	340.7	3171.9	-5.47	0.09
1984	24	123	24	340.3	3169.8	-7.05	0.09
1985	3	234	6	342.0	3174.0	10.29	0.48
1985	3	234	6	334.0	3183.4	9.51	0.48
1985	3	302	3	340.3	3165.7	-4.07	0.54
1985	3	206	6	342.0	3174.0	-4.38	0.49
1985	3	231	9	340.7	3171.9	-4.98	0.50
1985	3	233	24	342.0	3174.0	-5.46	0.49
1985	3	140	3	340.3	3167.7	-5.85	0.48
1985	3	206	6	336.5	3183.4	-6.78	0.50
1985	3	168	6	334.0	3183.4	-7.32	0.48
1985	3	288	6	340.7	3171.9	-7.58	0.50
1985	3	231	9	340.3	3169.8	-9.24	0.51

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 9 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1985	3	87	6	342.0	3174.0	-9.48	0.56
1985	3	88	24	341.1	3183.4	-10.76	0.49
1985	3	64	3	340.3	3169.8	-11.12	0.57
1985	3	233	24	331.5	3183.4	-11.21	0.57
1985	3	198	6	340.7	3171.9	-11.34	0.51
1985	3	198	24	336.5	3183.4	-11.44	0.50
1985	3	303	3	343.0	3176.2	-11.51	0.53
1985	3	87	6	334.0	3183.4	-11.59	0.57
1985	3	24	6	340.7	3171.9	-12.20	0.52
1985	3	288	6	340.3	3169.8	-12.48	0.51
1985	3	303	3	336.5	3183.4	-12.67	0.50
1985	3	24	6	340.3	3165.7	-13.55	0.52
1985	3	27	24	340.7	3171.9	-14.22	0.58
1985	3	24	6	340.3	3169.8	-14.44	0.54
1985	3	27	24	331.5	3183.4	-14.62	0.53
1985	3	24	6	340.3	3167.7	-14.81	0.54
1985	3	168	6	342.0	3174.0	-16.00	0.48
1985	3	303	3	342.0	3174.0	-16.56	0.49
1985	3	140	3	340.3	3165.7	-16.66	0.66
1985	3	233	24	340.7	3171.9	-16.73	0.63
1985	3	198	24	342.0	3174.0	-16.81	0.49
1985	3	198	6	340.3	3169.8	-17.64	0.51
1985	3	233	24	340.3	3169.8	-20.69	0.57
1985	3	64	3	340.3	3167.7	-20.95	0.67
1985	3	87	6	331.5	3183.4	-21.29	0.50
1985	3	27	24	340.3	3169.8	-21.79	0.58
1985	3	3	3	339.0	3183.4	-21.99	0.48
1985	3	3	3	343.7	3178.3	-22.91	0.56
1985	3	3	3	341.1	3183.4	-22.94	0.58
1985	3	3	3	342.4	3180.6	-23.59	0.57
1985	3	87	6	340.7	3171.9	-23.73	0.55
1985	3	64	3	340.3	3165.7	-26.78	0.58
1985	24	335	24	341.1	3183.4	2.42	0.11
1985	24	335	24	342.4	3180.6	1.73	0.11
1985	24	335	24	343.7	3178.3	1.45	0.12
1985	24	303	24	340.3	3169.8	1.09	0.07
1985	24	335	24	339.0	3183.4	1.04	0.10
1985	24	303	24	340.3	3167.7	1.01	0.08
1985	24	206	24	334.0	3183.4	0.83	0.07
1985	24	335	24	336.5	3183.4	0.82	0.08
1985	24	303	24	340.3	3165.7	0.80	0.07
1985	24	233	24	331.5	3183.4	0.76	0.08
1985	24	233	24	334.0	3183.4	0.57	0.07

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 10 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1985	24	303	24	343.0	3176.2	0.22	0.07
1985	24	206	24	336.5	3183.4	0.14	0.09
1985	24	335	24	343.0	3176.2	0.02	0.10
1985	24	233	24	342.0	3174.0	-0.07	0.07
1985	24	168	24	334.0	3183.4	-0.08	0.07
1985	24	87	24	342.0	3174.0	-0.12	0.09
1985	24	24	24	334.0	3183.4	-0.29	0.07
1985	24	302	24	340.3	3165.7	-0.51	0.08
1985	24	24	24	342.0	3174.0	-0.52	0.08
1985	24	27	24	340.7	3171.9	-0.58	0.08
1985	24	206	24	342.0	3174.0	-0.65	0.09
1985	24	87	24	334.0	3183.4	-0.70	0.09
1985	24	24	24	331.5	3183.4	-0.76	0.08
1985	24	140	24	340.3	3167.7	-0.89	0.08
1985	24	24	24	340.3	3165.7	-1.07	0.08
1985	24	24	24	340.7	3171.9	-1.12	0.09
1985	24	206	24	343.0	3176.2	-1.24	0.09
1985	24	233	24	340.7	3171.9	-1.33	0.09
1985	24	27	24	331.5	3183.4	-1.36	0.08
1985	24	24	24	340.3	3169.8	-1.39	0.09
1985	24	24	24	340.3	3167.7	-1.40	0.08
1985	24	233	24	341.1	3183.4	-1.41	0.08
1985	24	198	24	340.3	3169.8	-1.50	0.07
1985	24	233	24	342.4	3180.6	-1.64	0.08
1985	24	87	24	340.7	3171.9	-1.69	0.09
1985	24	198	24	336.5	3183.4	-1.69	0.08
1985	24	168	24	342.0	3174.0	-1.77	0.07
1985	24	198	24	331.5	3183.4	-1.91	0.08
1985	24	27	24	340.3	3169.8	-1.93	0.08
1985	24	87	24	331.5	3183.4	-1.98	0.08
1985	24	140	24	340.3	3165.7	-2.00	0.10
1985	24	64	24	340.3	3169.8	-2.13	0.07
1985	24	88	24	343.7	3178.3	-2.23	0.09
1985	24	198	24	334.0	3183.4	-2.29	0.09
1985	24	233	24	343.7	3178.3	-2.35	0.08
1985	24	233	24	340.3	3169.8	-2.38	0.08
1985	24	88	24	341.1	3183.4	-2.63	0.10
1985	24	198	24	342.0	3174.0	-2.67	0.09
1985	24	198	24	340.7	3171.9	-2.85	0.09
1985	24	88	24	342.4	3180.6	-3.05	0.09
1985	24	64	24	340.3	3167.7	-3.18	0.08
1985	24	64	24	340.3	3165.7	-3.83	0.07
1985	24	19	24	341.1	3183.4	-4.32	0.08
1985	24	3	24	343.7	3178.3	-5.34	0.07

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 11 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1985	24	3	24	342.4	3180.6	-5.81	0.07
1985	24	3	24	341.1	3183.4	-6.00	0.08
1986	3	215	6	340.3	3167.7	1.06	0.55
1986	3	344	24	341.1	3183.4	-3.52	0.57
1986	3	344	24	342.4	3180.6	-3.59	0.65
1986	3	139	6	340.3	3169.8	-4.73	0.56
1986	3	344	24	343.7	3178.3	-4.74	0.69
1986	3	139	6	340.3	3167.7	-7.17	0.60
1986	3	163	3	334.0	3183.4	-7.21	0.59
1986	3	163	3	342.0	3174.0	-7.55	0.58
1986	3	344	24	339.0	3183.4	-7.84	0.69
1986	3	299	3	340.3	3167.7	-9.70	0.57
1986	3	139	6	340.3	3165.7	-10.20	0.59
1986	3	335	3	342.0	3174.0	-10.47	0.48
1986	3	344	24	343.0	3176.2	-11.22	0.69
1986	3	321	6	340.3	3165.7	-11.24	0.53
1986	3	345	3	331.5	3183.4	-11.30	0.60
1986	3	75	6	340.7	3171.9	-11.41	0.52
1986	3	227	6	341.1	3183.4	-11.60	0.50
1986	3	344	24	336.5	3183.4	-12.53	0.54
1986	3	70	24	336.5	3183.4	-12.59	0.49
1986	3	150	6	340.3	3165.7	-12.94	0.53
1986	3	345	3	340.7	3171.9	-13.87	0.66
1986	3	163	3	331.5	3183.4	-14.09	0.52
1986	3	150	3	340.3	3167.7	-14.10	0.54
1986	3	225	24	340.3	3165.7	-14.62	0.54
1986	3	299	3	340.3	3165.7	-14.80	0.68
1986	3	75	6	340.3	3169.8	-15.10	0.54
1986	3	335	3	340.7	3171.9	-15.11	0.48
1986	3	75	6	340.3	3167.7	-15.94	0.49
1986	3	47	24	340.7	3171.9	-17.40	0.52
1986	3	70	24	342.0	3174.0	-18.00	0.48
1986	3	47	24	340.3	3169.8	-19.65	0.50
1986	3	163	3	340.7	3171.9	-20.27	0.57
1986	3	345	3	340.3	3169.8	-22.41	0.71
1986	3	345	3	340.3	3167.7	-25.12	0.57
1986	3	168	3	340.3	3165.7	-25.22	0.65
1986	3	217	3	342.0	3174.0	-34.66	0.58
1986	3	217	3	334.0	3183.4	-40.09	0.58
1986	3	217	3	340.7	3171.9	-43.82	0.56
1986	3	217	3	331.5	3183.4	-51.02	0.51
1986	24	215	24	331.5	3183.4	5.22	0.09

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 12 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1986	24	215	24	340.7	3171.9	4.52	0.11
1986	24	344	24	331.5	3183.4	2.97	0.08
1986	24	344	24	341.1	3183.4	2.87	0.13
1986	24	344	24	342.4	3180.6	2.57	0.14
1986	24	344	24	343.7	3178.3	2.23	0.15
1986	24	215	24	340.3	3169.8	2.03	0.15
1986	24	344	24	340.7	3171.9	1.74	0.09
1986	24	163	24	342.0	3174.0	1.72	0.09
1986	24	168	24	340.3	3167.7	1.68	0.07
1986	24	344	24	339.0	3183.4	1.52	0.15
1986	24	163	24	334.0	3183.4	1.34	0.09
1986	24	335	24	343.0	3176.2	0.90	0.07
1986	24	344	24	342.0	3174.0	0.82	0.13
1986	24	335	24	342.0	3174.0	0.61	0.12
1986	24	344	24	343.0	3176.2	0.54	0.16
1986	24	215	24	340.3	3167.7	0.50	0.16
1986	24	168	24	340.3	3165.7	0.49	0.10
1986	24	344	24	334.0	3183.4	0.09	0.10
1986	24	205	24	341.1	3183.4	0.07	0.10
1986	24	335	24	340.7	3171.9	-0.10	0.14
1986	24	150	24	340.3	3169.8	-0.20	0.11
1986	24	205	24	343.7	3178.3	-0.38	0.09
1986	24	335	24	331.5	3183.4	-0.39	0.12
1986	24	335	24	336.5	3183.4	-0.39	0.09
1986	24	205	24	342.4	3180.6	-0.42	0.10
1986	24	335	24	334.0	3183.4	-0.44	0.11
1986	24	163	24	331.5	3183.4	-0.55	0.08
1986	24	344	24	336.5	3183.4	-0.69	0.14
1986	24	215	24	340.3	3165.7	-0.69	0.14
1986	24	299	24	340.3	3169.8	-0.87	0.09
1986	24	205	24	339.0	3183.4	-0.95	0.08
1986	24	335	24	340.3	3167.7	-1.30	0.09
1986	24	70	24	342.4	3180.6	-1.37	0.08
1986	24	227	24	341.1	3183.4	-1.43	0.08
1986	24	239	24	340.3	3169.8	-1.57	0.08
1986	24	335	24	340.3	3169.8	-1.62	0.12
1986	24	239	24	340.7	3171.9	-1.65	0.08
1986	24	139	24	340.3	3169.8	-1.72	0.09
1986	24	239	24	340.3	3167.7	-1.72	0.07
1986	24	70	24	343.7	3178.3	-1.77	0.09
1986	24	227	24	342.4	3180.6	-1.86	0.08
1986	24	299	24	340.3	3167.7	-1.88	0.11
1986	24	70	24	339.0	3183.4	-1.90	0.10
1986	24	163	24	340.7	3171.9	-2.14	0.09

Table 3. Summary of PSD Class I Impacts for which the Proposed Project Has a Significant Contribution Based on the Proposed National Park Service Significant Impact Levels (Page 13 of 13)

Year	Averaging Period	Julian Day	Hour Ending	Receptor Location UTM East (km)	Receptor Location UTM North (km)	Total Class I Impact (ug/m3)	Proposed Source Contribution (ug/m3)*
1986	24	75	24	340.3	3169.8	-2.16	0.07
1986	24	139	24	340.3	3167.7	-2.17	0.11
1986	24	227	24	343.7	3178.3	-2.19	0.07
1986	24	225	24	343.0	3176.2	-2.22	0.08
1986	24	150	24	340.3	3167.7	-2.40	0.14
1986	24	139	24	340.3	3165.7	-2.48	0.12
1986	24	299	24	340.3	3165.7	-2.59	0.12
1986	24	217	24	342.0	3174.0	-2.87	0.08
1986	24	70	24	343.0	3176.2	-3.12	0.13
1986	24	70	24	336.5	3183.4	-3.27	0.13
1986	24	225	24	342.0	3174.0	-3.41	0.09
1986	24	345	24	340.7	3171.9	-3.50	0.11
1986	24	141	24	341.1	3183.4	-3.75	0.07
1986	24	345	24	331.5	3183.4	-3.80	0.10
1986	24	225	24	336.5	3183.4	-3.83	0.08
1986	24	225	24	334.0	3183.4	-3.84	0.07
1986	24	208	24	343.7	3178.3	-3.87	0.07
1986	24	70	24	334.0	3183.4	-4.23	0.11
1986	24	225	24	340.7	3171.9	-4.42	0.08
1986	24	150	24	340.3	3165.7	-4.43	0.15
1986	24	208	24	342.4	3180.6	-4.46	0.08
1986	24	70	24	340.7	3171.9	-4.52	0.08
1986	24	70	24	342.0	3174.0	-4.68	0.13
1986	24	208	24	341.1	3183.4	-4.85	0.09
1986	24	225	24	340.3	3169.8	-4.96	0.09
1986	24	217	24	334.0	3183.4	-4.97	0.08
1986	24	217	24	340.7	3171.9	-5.17	0.08
1986	24	225	24	340.3	3167.7	-5.53	0.11
1986	24	345	24	340.3	3169.8	-5.78	0.12
1986	24	225	24	340.3	3165.7	-6.09	0.13
1986	24	345	24	340.3	3167.7	-6.97	0.11
1986	24	345	24	340.3	3165.7	-7.13	0.08

* Ark Energy modeled at 20°F design temperature.

Table 4. Detail of Hourly Meteorological Data Used in the Modeling Analysis - Tampa 1986, Julian Day 215

Hour	Flow Vector (degrees)	Random Flow Vector (degrees)	Wind Speed (m/sec)	Mixing Height (m)		Temperature (°K)	Input Stability Category	Proposed Project Impact (µg/m)
				Rural	Urban			
1	330	330	2.06	1312	925	298.2	5	0.0
2	340	337	2.06	1299	925	298.7	5	0.0
3	320	320	2.06	1285	925	298.7	5	0.767
4	320	320	2.06	1272	925	298.2	6	0.681
5	330	329	2.57	1259	925	298.2	6	0.0
6	330	331	3.60	7	926	298.2	5	0.0
7	340	339	2.57	148	953	299.3	4	0.0
8	320	317	2.57	289	979	300.9	3	0.016
9	320	325	2.57	431	1006	302.6	2	0.299
10	40	39	4.12	572	1032	303.7	3	0.0
11	10	6	4.63	714	1059	304.8	2	0.0
12	360	4	4.12	855	1085	304.3	2	0.0
13	40	40	3.60	997	1112	303.7	2	0.0
14	80	79	4.12	1138	1138	304.3	2	0.0
15	90	90	4.12	1138	1138	303.7	3	0.0
16	290	293	2.06	1138	1138	303.7	4	0.0
17	320	322	1.54	1138	1138	299.8	3	0.324
18	320	325	1.00	1138	1138	302.0	2	0.0
19	320	324	1.00	1138	1138	301.5	3	0.0
20	270	271	1.54	1153	1153	300.4	4	0.0
21	300	297	2.06	1172	1068	299.8	5	0.0
22	300	297	2.57	1192	1028	299.3	5	0.0
23	280	277	1.54	1212	987	299.3	6	0.0
24	300	300	2.57	1232	947	298.7	6	0.0

United States Department of the Interior

TAKE PRIDE IN AMERICA

FISH AND WILDLIFE SERVICE
75 Spring Street, S.W.
Atlanta, Georgia
30303

May 13, 1992

RECEIVED

MAY 15 1992

Bureau of Air Regulation

Mr. C. H. Fancy
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Dear Mr. Fancy:

We have reviewed the March 5, 1992, modeling protocol for Florida Power Corporation's (FPC) proposed power plant facility located in Polk County, Florida. The proposed facility would be located approximately 110 km southeast of the Chassahowitzka Wilderness Area (WA), a Fish and Wildlife Service class I area.

The MESOPUFF II model (an EPA Appendix B model) will be used to calculate class I sulfur dioxide (SO_2) increment consumption at Chassahowitzka WA from the proposed FPC facility as well as all other increment consuming sources in the area as defined by the Florida Department of Environmental Regulation (FDER). The U.S. Environmental Protection Agency (EPA) has recently determined that sources located within 50.0 km of a class I area should be modeled with an EPA guideline model as defined in the EPA "Guidelines on Air Quality Models." FPC's proposal to apply the EPA, Industrial Source Complex Short Term Model (ISCST) for these near field sources is acceptable to us.

The following material will discuss the technical acceptability of the proposed FPC modeling protocol. The proposed modeling grid domain of 225 cells, each 20 x 20 km, is acceptable for the scale of the total analysis. We accept the proposed use of 5 years of National Weather Service (NWS) upper air rawinsonde data (1982-1986) from the Ruskin, Florida, the West Palm Beach, Florida, and the Waycross, Georgia, stations. Missing data replacement from the previous day's sounding of the same time period is acceptable, and missing data at certain levels within the sounding may be substituted by persistence from a lower level. The 5 years (1982-1986) of NWS surface data from Tampa and Orlando will be input to the MESOPAC II program. Also the NWS surface data for 1984-1986 from Gainesville will be used. Surface NWS data from Jacksonville will be used for 1982 and 1983 since digitized data from Gainesville is not available. If a refined MESOPUFF II analysis is required after the initial inert pollutant model run, then hourly precipitation data from the above surface stations will be employed. Land use data from the proposed Argonne National Laboratory data base will be applied to each grid cell based on the land use category covering the greatest percent of each grid cell. The time dependent dispersion coefficients in MESOPUFF II will be applied at distances of greater than 50 km. The FDER has developed 13 discrete receptor locations in the class I area at which concentration calculations will be made. We have reviewed and agree with the proposed "selected values" for the variables in the Read 56 program, the MESOPAC II program, and the MESOPUFF II model.

Presently, there are no specified significant impact levels for the class I increments. We have proposed to EPA's Office of Air Quality and Planning Standards the following class I SO_2 significant levels: 0.48 ug/m^3, 3-hour average; 0.07 ug/m^3, 24-hour average; and 0.025 ug/m^3, annual average. If the proposed FPC's source impact is less than these values, then the proposed source does not significantly contribute to a predicted increment violation.

Initially, the ISCST model will be run for the 5-year period with the Tampa surface and mixing height data, to calculate averaging periods when the class I SO_2 concentration is exceeded in the cumulative analysis. During the 5-year period, if FPC's proposed source has an impact of less than the above described significant levels, on periods when the class I increment is exceeded, then no additional modeling for that time period is required. For time periods when the cumulative impact exceeds the class I increment and the FPC's source impact is greater than the above significant levels, a cumulative MESOPUFF II analysis will be performed for that averaging time period for all 13 receptor locations.

To initialize the MESOPUFF II model, the model must be run for 4 days before and 3 days after the short term averaging period which is being analyzed. This MESOPUFF II cumulative analysis will be performed without deposition or chemical transformation. This follows the EPA guidance that SO_2 be modeled as an inert pollutant. We recognize that some deposition and chemical transformation processes occur in long-range transport and will entertain a request to employ some of these options after the inert model run, if the analysis reaches a critical junction. If modeling is performed with some of the deposition or chemical transformation options, sources with a negative emission rate (i.e., increment expanding sources) must be modeled separately. The MESOPUFF II model does not internally calculate a negative deposition rate or chemical transformation. The negative emission rate sources will have their contribution subtracted from that of the increment consuming sources on a receptor-by-receptor and hour-by-hour basis, in the MESOPUFF II postprocessing step of the analysis. Therefore, the total concentration for a particular time period can be either positive or negative, depending on the relative contribution of the various sources.

Results from the MESOPUFF II analysis will report the highest annual, and the highest and high second-high short term concentrations. The FPC source's contribution to these concentrations will also be reported.

We are awaiting concurrence on the specifics and totality of this protocol. We will provide response on any agreed to modification of this protocol.

If you have any concerns regarding the protocol or any other Prevention of Significant Deterioration issue regarding FPC Polk County facility, please contact John Notar of our Air Quality Branch in Denver at 303/969-2071.

Sincerely yours,

W. A. Ulch Jr.

for James W. Pulliam, Jr.
Regional Director

cc:
Mr. Jellell Harper, Chief
Air Enforcement Branch
Air, Pesticides and Toxic Management Division
U.S. EPA, Region 4
345 Courtland Street, NE.
Atlanta, Georgia 30365

Mr. Scott Osborne
Florida Power Corporation
3201 34th Street South
St. Petersburg, Florida 33733

Mr. Robert McCann
KBN Engineering and Applied Sciences, Inc.
1034 N.W. 57th Street
Gainesville, Florida 32605

J. Reynolds
C. Holladay
B. Thomas, SW Dist
D. Martin, Polk Co. Planning Div.
CHF/BA/PL

May 5, 1992

Memorandum

To: Regional Director, Refuges and Wildlife, Fish and Wildlife Service, Region 4

From: Chief, Air Quality Branch

Subject: Florida Power Corporation

We have reviewed the material that the Florida Department of Environmental Regulation (FDER) forwarded to us regarding Florida Power Corporation's (FPC) proposed Polk County Generating Station. They request to apply the EPA long-range transport model MESOPUFF II to access increment consumption to the PSD class I Chasshowitzka Wilderness Area (CHAS). The proposed 900 megawatts FPC facility would be located some 110 km southeast of CHAS.

The FPC will first access the impact of its Polk County facility with the EPA guideline air quality model Industrial Source Complex Short Term (ISCST). If there are periods when the conservative ISCST modeling indicates an exceedance of the class I increment, and the proposed FPC facility significantly contributes to that exceedance, then a long-range transport analysis with the MESOPUFF II model will be performed.

We are working closely with the State of Florida Department of Environmental Regulations, FPC, and EPA Region IV to ensure that this analysis conforms with State and federal methodology and policy.

We ask that you finalize and sign the attached letter. If you have any questions regarding this matter, please contact me or John Notar at (303) 969-2071.

Sandra V. Silva

Attachment

bcc:
AQD-DEN: Bunyak, Rolofson, Ross, Shaver, Silva, Reading File
AQD-DEN:JNOTAR:jn:5/4/92:x2071:POLK-M1.MEM

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

May 5, 1992

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. William R. Malenius
Senior Program Manager
Polk Power Partners
23293 South Pointe Drive
Laguna Hills, California 92653

Dear Mr. Malenius:

Re: Permit Application AC 53-211670, PSD-FL-187
Mulberry Cogeneration Project

In order to complete the subject application received on April 6, 1992, the following additional information and revisions are required:

1. The subject application should be revised to show all emission calculations. It should clearly show the calculation of all numerical quantities involving emissions instead of just sample calculations for fuel oil firing.

2. The application states that natural gas will be the permanent primary fuel. Please provide further clarification as to why no primary fuel is specified during the first three years of operation. The application should be revised to show total emissions from the projected actual annual use of each fuel.

3. The predicted maximum SO_2 24-hour and 3-hour concentrations in the Chassahowitzka PSD Class I area due to the proposed project's emissions are greater than the National Park Service proposed 24-hour and 3-hour significant impact levels of 0.07 and 0.48 ug/m^3, respectively. Please perform a cumulative 24-hour and 3-hour SO_2 Class I increment analysis as required by the National Park Service. An air quality related values (AQRVs) analysis should also be done since there are presently no significant impact levels that exempt a proposed PSD project from performing this analysis. The AQRVs analysis includes impacts to soils, vegetation, and wildlife. The National Park Service has indicated through verbal communication that the AQRVs analysis needs only to address the impacts of increased SO_2, NO_x, and VOC emissions for this project.

If further clarification is needed on any of the above, please contact John Reynolds or Cleve Holladay at 904-488-1344.

Sincerely,

Barry D. Andrews

for C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/JR/plm

c: W. Thomas, SWD
J. Harper, EPA
C. Shaver, NPS
D. Martin, Planner
K. Kosky, P.E.

SENDER:
- Complete items 1 and/or 2 for additional services.
- Complete items 3, and 4a & b.
- Print your name and address on the reverse of this form so that we can return this card to you.
- Attach this form to the front of the mailpiece, or on the back if space does not permit.
- Write "Return Receipt Requested" on the mailpiece next to the article number.

I also wish to receive the following services (for an extra fee):
1. ☐ Addressee's Address
2. ☐ Restricted Delivery

Consult postmaster for fee.

3. Article Addressed to:

Mr. William R. Malenius
Senior Program Manager
Polk Power Partners
23293 South Pointe Dirve
Laguna Hills, CA 92653

4a. Article Number
P 710 058 531

4b. Service Type
☐ Registered ☐ Insured
☒ Certified ☐ COD
☐ Express Mail ☐ Return Receipt for Merchandise

7. Date of Delivery
5/14/92

5. Signature (Addressee)

8. Addressee's Address (Only if requested and fee is paid)

6. Signature (Agent)
[signature]

PS Form 3811, October 1990 ☆U.S. GPO: 1990—273-861 **DOMESTIC RETURN RECEIPT**

P 710 058 531

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Street & No. 23293 South Pointe Drive	
P.O., State & ZIP Code Laguna Hills, CA 92653	
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TOTAL Postage & Fees	$
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PS Form 3800, June 1990

KBN

April 15, 1992

Mr. Clair Fancy
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: Polk County - A.P.
Polk Power Partners, L.P., d/b/a Polk Power Partners, L.P., Ltd.
Mulberry Cogeneration Project
Computer Modeling Printouts

Dear Clair:

As a followup to the air construction permit application and prevention of significant deterioration analysis for the above-referenced project (submitted to FDER April 3, 1992), please find enclosed a portion of the ISCST modeling computer printouts for the air dispersion analysis. A diskette copy of all air modeling input and output files was submitted with the application. The computer printouts provided include those for the SO_2 AAQS, PSD Class I, and PSD Class II analysis. However, due to the voluminous amount of output, only a portion of the proposed facility significance analysis printouts have been enclosed. This portion includes only one year of output at one operating scenario (i.e., 1982 meteorological data and CT operating at a 100-degree ambient temperature). The hard copies provided account for approximately 15 percent of the total output for this project.

For your convenience, summary reports have been included for all pollutants and operating scenarios included on the diskette. This computer-generated listing, developed by KBN, summarizes five years of modeling output runs and shows highest and second-highest concentrations along with location and time period. The output is grouped by source group and averaging period.

Please refer to the output files on diskette if you find it necessary to reference those analyses not provided on hard copy. Please feel free to contact me at 904-331-9000 if you have any questions concerning this submittal.

Sincerely,

Gail C. Rampersaud

Gail C. Rampersaud
Associate Engineer

cc: G. Reynolds
L. Holladay
B. Thomas, SW Dist
G. Harper, EPA
C. Shaver, NPS

91193A1/1

Florida Department of Environmental Regulation

Twin Towers Office Bldg. ● 2600 Blair Stone Road ● Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

April 10, 1992

Ms. Jewell A. Harper, Chief
Air Enforcement Branch
U.S. EPA, Region IV
345 Courtland Street, N.E.
Atlanta, Georgia 30308

Dear Ms. Harper:

RE: Polk Power Partners, LP, d/b/a Polk Power Partners, LP, Ltd
Mulberry Cogen/CO_2 Recovery Facilities
Polk County, PSD-FL-187

The Department has received the above referenced PSD application package. Please review this package and forward your comments to the Department's Bureau of Air Regulation by May 4, 1992. The Bureau's FAX number is (904)922-6979.

If you have any questions, please contact John Reynolds or Cleve Holladay at (904)488-1344 or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/rbm

Enclosures

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

April 10, 1992

Mr. Bill Thomas
District Air Program Administrator
Southwest District
4520 Oak Fair Blvd.
Tampa, Florida 33610-7347

Dear Mr. Thomas:

RE: Polk Power Partners, LP, d/b/a Polk Power Partners, LP, Ltd
Mulberry Cogen/CO_2 Recovery Facilities
Polk County, AC 53-211669 & AC 53-211670; PSD-FL-187

The Department has received the above referenced PSD application package. Please review this package and forward your comments to the Department's Bureau of Air Regulation by May 4, 1992. The Bureau's FAX number is (904)922-6979.

If you have any questions, please contact John Reynolds or Cleve Holladay at (904)488-1344 or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/rbm

Enclosures

Florida Department of Environmental Regulation
Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400
Lawton Chiles, Governor
Carol M. Browner, Secretary

April 10, 1992

Mrs. Chris Shaver, Chief
Permit Review and Technical Support Branch
National Park Service-Air Quality Division
Post Office Box 25287
Denver, Colorado 80225

Dear Mrs. Shaver:

RE: Polk Power Partners, LP, d/b/a Polk Power Partners, LP, Ltd
Mulberry Cogen/CO_2 Recovery Facilities
Polk County, PSD-FL-187

The Department has received the above referenced PSD application. Please review this package for completeness and forward your comments to the Bureau of Air Regulation by May 4, 1992. The Bureau's FAX number is (904)922-6979.

If you have any questions, please call John Reynolds or Cleve Holladay at (904)488-1344 or write to me at the above address.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/rbm

Enclosures

Imperial
Polk County
Board of County Commissioners

Planning Division

P.O. Box 1969
330 W. Church St.
Bartow, FL 33830
(813) 534-6084
SUNCOM 569-6084
FAX (813) 534-6055

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Florida Department of Env. Reg.
Div. of Air Resources Mgmt.
4520 Oak Fair Blvd.
Tampa, Fl 33610

March 12, 1992

Dr. Richard Garrity:

This letter is to inform you that Polk County is an interested party in the permitting process for the following project:

Applicant: Polk Power Partners LP
Project: Non-certified Electric-Power Generating Facility at the Noralyn Commerce Park

Plant Location: Section 26 Township 30 Range 24

Please notify us of all meetings as we would like the opportunity to participate in the conditioning of the permit for the purposes of compliance with the Polk County Comprehensive Plan and site specific parameters. If this permit has already been granted or if an intent to issue has been noticed, please contact Celeste Deardorf of my staff immediately. Under provisions of Florida Statutes, we would like the opportunity to comment as it relates to local issues.

Thank you for your cooperation in this matter.

Sincerely,

Robert Anders, AICP
Planning Director

Donald Martin
Principal Planner
Planning Division
P.O. Box 1969
Bartow, Florida 33830

RE: Polk Power Partners/Noralyn Commerce Park

I have received the permit application pursuant to the above referenced project as well as Polk County's Notice of Interested Party and Notice of Participation. We will keep you informed of all proceedings and decisions in regards to this project.

AGENCY:
Florida Department of Env. Reg.
Div. of Air Resources Mgmt.

John Reynolds — 4-20-92
(signature of permit reviewer) (date)

JOHN REYNOLDS
(print name)

DER BUREAU OF AIR REGULATION
2600 BLAIRSTONE RD
TALLAHASSEE, FL 32399-2400
(address)

904-488-1344
(phone)

ARK ENERGY INC.

March 13, 1992

To Whom It May Concern:

Polk Power Partners, L.P. d/b/a Polk Power Partners, L.P., Ltd. hereby designates Black & Veatch (B&V) and KBN Engineering and Applied Sciences, Incorporated (KBN) as authorized agent for permitting activities associated with the Mulberry Cogeneration Facility located within the Noralyn Commerce Park, Polk County, Florida.

Sincerely,

Arnold R. Klann
Vice President and Secretary
Polk Power G.P. Inc.

wrm:TW031392.LTR
cc: Will Stratton - CSW Energy, Inc.
Bill Malenius - ARK Energy, Inc.
David Brown - CSW Services
Karen Wong - Millbank, Tweed, Hadley & McCloy
Michael Craig - Peterson, Myers, Craig, Crews, Brandon & Puterbaugh, P.A.
Roger Anderson - KBN Engineering and Applied Sciences, Inc.
Don Gray - Black & Veatch

23293 South Pointe Drive • Laguna Hills, California 92653 • Tel (714) 588-3767 • Fax (714) 588-3972

Summary of Computer Modeling Printouts Supplied to FDER for the Mulberry Cogeneration Facility 4/3/92

Output File Name	Description
<< PROPOSED FACILITY ONLY >>	
ARK<ppp><tt>.O<yy>	Proposed Facility Screening Impacts for Regulated Pollutants
ARKSREF.O<yy>	SO2 Refinements - 3-hour and 24-hour
ARKPRF<tt>.O<yy>	PM Refinements, 24-hour
ARKCRF<hh>.O<yy>	CO Refinements, 20 and 100 degrees
ARKMRF<hh>.O<yy>	Sulfuric Acid Mist Refinements, 20 and 100 degrees
ARKBRF<hh>.O<yy>	Be Refinements, 20 and 100 degrees
ARKASRF8.O<yy>	Arsenic Refinements, 20 and 100 degrees, 8-hour
ARKASRF2.O<yy>	Arsenic Refinements, 20 and 100 degrees, 24-hour
ARKAMINE.O<yy>	Ethanolamine Screening Impacts (CO2 Plant Only)
ARKARF<hh>.O<yy>	Amine Refinements
<< CLASS I >>	
ARKSCL1.O<yy>	SO2 PSD Class I Impacts, 20 and 100 degrees
ARKNCL1.O<yy>	NO2 PSD Class I Impacts, 20 and 100 degrees
ARKPCL1.O<yy>	PM PSD Class I Impacts, 20 and 100 degrees
<< CLASS II and AAQS >>	
ARKCLSII.O<yy>	SO2 PSD Class II Screeening
ARKSAAQS.O<yy>	SO2 AAQS Screening
AR<rr>RF<hh>.O<yy>	AAQS and Class II Refinements
AR<rr>SC<hh>.O<yy>	AAQS and Class II Source Contributions

Note:
- ppp = pollutant (SO2,NOX,PM,BE,CO,AS,SA(sulfuric acid mist)
- tt = temperature (20=20 degrees; 10=100 degrees)
- yy = meteorological year (82,83,84,85,86)
- rr = run type (AQ=AAQS; C2=Class II)
- hh = averaging period (03=3-hour;08=8-hour;24=24-hour;AN=annual;32=3,24-hour)

May 13, 1991

ENVIRONMENTAL
ENGINEERING
CONSULTANTS, INC.

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED

MAY 15 1991

Bureau of
Air Regulation

Re: Westford Resources, Inc.
Mulberry Power Plant

Dear Mr. Fancy:

On February 4, 1991 an informal pre-application meeting was held with you regarding Westford Resources, Inc's plan on constructing a 74.9 MW power plant in Polk County, fired on Orilmulsion. Part of the discussions dealt with the pre-construction monitoring requirements of the PSD regulations. Attached is a discussion of our evaluation of the requirements and subsequent request to use the data from two of FDER's SO_2 monitoring stations located close to the proposed site.

Please review this request as quickly as possible. We plan on submitting the PSD application within a month and therefore, your prompt consideration of this request will be appreciated.

Should you or your staff have any questions, please call Jim Estler at 1-800-229-3311.

Sincerely,

ENVIRONMENTAL ENGINEERING CONSULTANTS, INC.

Robert E. Wallace III, P.E.
President

REW/dege

Enclosure

cc: Arch Ford, Westford Resources (With Attachments)

5119 NORTH FLORIDA AVENUE
P.O. BOX 7854
TAMPA, FLORIDA 33673
813/237-3781
TELEFAX 813/238-0036

WESTFORD RESOURCES, INC.

MULBERRY POWER PLANT

PSD APPLICABILITY:

Project Location:

The proposed 74.9 MW power plant will be located south of Bartow on Highway 555 at the Noralyn Commerce Park, Polk County. The area has been designated attainment for all criteria pollutants and a PSD Class II area for SO_2, TSP and NO_2. The site is located more than 100 Km from the nearest Class I area (Chassahowitka National Wilderness Area) and thus will not be addressed in any modeling analysis (Location Map attached).

Potential Emissions:

The potential emissions from the proposed source are projected to exceed 100 TPY cut-off specified in Subsection 17-2.500(2)(d)2., b., F.A.C. and therefore the proposed source would be considered a new major facility. The proposed potential emission rates are presented in Table 1 and will exceed the applicable PSD significant emission rates for SO_2, TSP, PM10, NO_x, and CO. Therefore, the proposed source is subject to PSD review for those pollutants.

PRE-CONSTRUCTION AMBIENT MONITORING:

Overview:

As stated in EPA's "Ambient Monitoring Guidelines For Prevention of Significant Deterioration (PSD)", it is the "intent not to require extensive and costly monitoring programs by sources unless it is absolutely necessary. If preliminary modeling or other data indicates that a new source would not pose a threat to a NAAQS, the source may not need to conduct pre-construction monitoring".

For any criteria pollutant that the applicant proposes to emit in significant amounts, continuous ambient monitoring data may be required as part of the air quality analysis. If, however, either (1) the predicted ambient impact, i.e., the highest modeled concentration for the applicable averaging time, caused by the proposed source or (2) the existing ambient pollutant concentrations are less than the prescribed significant monitoring value (see Table 1), the permitting agency has discretionary authority to exempt an applicant from this data requirement.

From the applicability determination, a review of pre-construction monitoring must be evaluated for TSP, PM_{10}, SO_2, NO_2, and CO. However, pre-construction monitoring generally would not be required if the maximum predicted ambient impact of the source is less than de mimimis air quality impact levels list in Table 1.

Project Modeling Impacts:

The determination of the proposed project's effects on air quality is based on the results of the dispersion modeling used to establish if the maximum air quality impact is less than the pollutant specified "de minimus" concentration.

Air quality modeling has been preformed on the proposed source and will be formally submitted as part of the PSD application. The predicted maximum air quality impacts of the proposed facility for those pollutants subject to PSD review are listed in Table 1.

TABLE 1: Potential Emissions and Predicted Impacts of Mulberry Power Plant Project Compared to PSD Significant Emission Rates and De Minimis Air Quality Impacts Levels

Pollutant	Emissions (TPY) Potential From Proposed Source	Signif- incant Emission Rate	Impacts (ug/m3) Predicted Impacts	De Minimus Air Quality Impact Level
Sulfur Dioxide	1437.69	40	17	13, 24-hour
Particulate Matter (TSP)	107.83	25	1.3	10, 24-hour
Particulate Matter (PM10)	107.83	15	1.3	10, 24-hour
Nitrogen Dioxide	1078.27	40	1.1	14, Annual
Carbon Monoxide	431.31	100	<575	575, 8-hour
Volatile Organic Compounds	7.19	40	NA	Emissions Increase
Lead	0.0001	0.6	**	0.1,Calendar quarter
Sulfuric Acid Mist	19.4	7	**	*
Total Fluorides	0.125	3	**	0.25, 24-hour
Total Reduced Sulfur	NEG	10	**	10, 1-hour
Reduced Sulfur Compounds	NEG	10	**	10, 1-hour
Hydrogen Sulfide	NEG	10	**	0.2, 1-hour
Asbestos	NEG	0.007	**	*
Beryllium	0.0001	0.0004	**	0.001, 24-hour
Mercury	0.0001	0.1	**	0.25, 24-hour
Vinyl Chloride	NEG	1	**	15, 24-hour

Pollutant	Emissions (TPY) Potential From Proposed Source	Significant Emission Rate	Impacts (ug/m3) Predicted Impacts	De Minimus Air Quality Impact Level
Benzene	NEG	0	**	*
Radionuclides	NEG	0	**	*
Inorganic Arsenic	1.0×10^{-4}	0	+	*

Note: NA = Not Applicable.
NEG = Negligible.

* No acceptable ambient measurement method has been developed and, therefore, de minimis levels have not been established by EPA.

\+ Predicted impacts will be assessed on soils and vegetation in the PSD application.

** Predicted impacts are not required because emissions are less than significant emission rates.

Existing Ambient Data:

The predicted maximum impact of SO_2 is greater than its defined "de minimus" value. Under certain conditions the guidelines allow for the use of existing ambient data. In order to be acceptable, the data must be judged by FDER to be representative of the air quality for the area in which the proposed project is located. In determining the representativeness of the data, the following critical items as discussed in the PSD Monitoring Guidelines must be considered:

1. Monitor location
2. Quality of data
3. Currentness of data

FDER currently operates two continuous SO_2 monitors in the Polk County area. Existing air quality data were obtained from these monitoring stations which are the closest monitoring stations to the proposed project site. The closest ambient air monitoring station to the proposed project site that measures SO_2 concentrations are located in Nichols, about 14 km west of the site and a former site in Lakeland, about 21 km north, northwest of the site. FDER has recently moved the Lakeland site to an east Mulberry location about 9 km west, northwest from the proposed site. This relocated continuous SO2 monitor has been in operation for a few months. All sites are located in industrial areas dominated by phosphate fertilizer chemical plants and power plants. Because they are located in industrial areas and in proximity of major sources, the observed concentrations are considered slightly higher than those expected to occur at the proposed site. Therefore the existing background concentrations are considered to be conservative (i.e. higher than expected than at the proposed site). A summary of the maximum concentration measured at the closest monitors are presented in Table 2. The SO2 data collected at the monitoring station in Nichols and Lakeland were reviewed and used in estimating background concentrations. The data from the new Mulberry site is not yet available. Therefore the nearest station to the proposed site is located in Nichols approximately 14 km to the west. During 1987, the second highest 3-hour and 24-hour and annual average concentrations were 267, 51, and 11 ug/m3, respectively. These concentrations are assumed to represent background concentrations.

No, Use 1990 8612 252 62 9
3hr 24hr Ann

TABLE 2   Summary of maximum SO_2, TSP, and NO_2 Concentrations Measured at the Closest Monitoring Site

---

Pollutant: SO_2

Location: Lakeland

Site No.: 2160-001-F01

UTM Coordinates (km) East: 407.5,

UTM Coordinates (km) North: 3107.5

Year: 1987/1986

Observations Number: 8444/6520

Observations %: 96.4 / 74.4

Concentration (ug/m3) - 3-hour   1st: 200/267   2nd: 162/178

Concentration (ug/m3) - 24-hour   1st: 86/81   2nd: 55/71

Concentration (ug/m3) - Annual: 10/13

Pollutant: SO_2

Location: Nichols

Site No.: 3680-010-F02

UTM Coordinates (km) East: 399.5

UTM Coordinates (km) North: 3081.3

Year: 1987/1986

Observations Number: 8571/4994

Observations %: 97.8/57.0

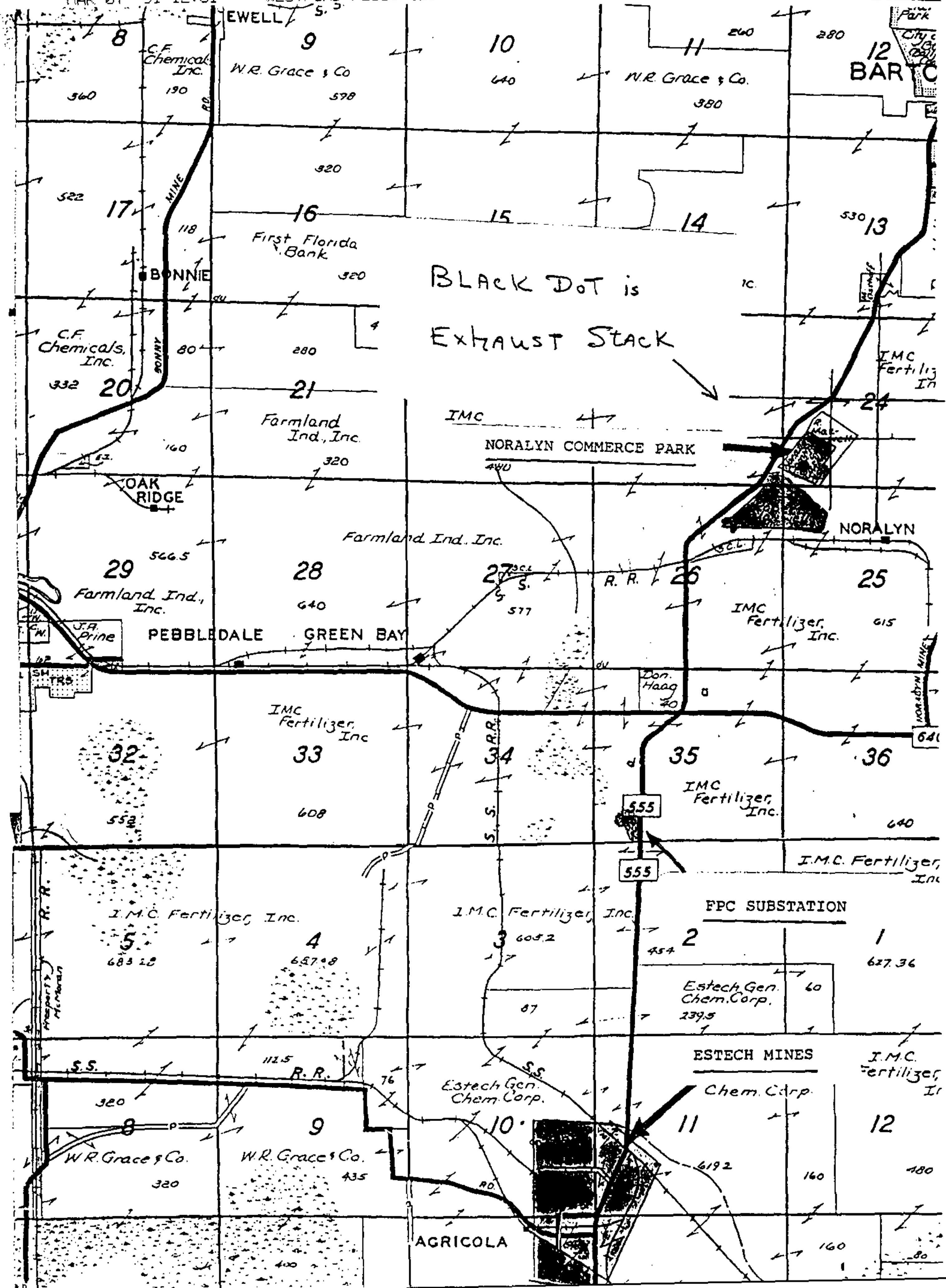
Concentration (ug/m3) - 3-hour   1st: 697/203   2nd: 267/162

Concentration (ug/m3) - 24-hour   1st: 115/38   2nd: 51/35

Concentration (ug/m3) - Annual: 11/7

Pre-construction Exemption Request:

It is therefore proposed, that the data from these sites be judged acceptable by FDER to satisfy the pre-construction monitoring requirements for the proposed Mulberry Power Plant. This data has been considered acceptable by both FDER and EPA Region IV in the past in PSD application submitted for TECO Power Services Corporation, Hardee Power Station (PSD-FL-140). See the attached copy of EPA's August 17, 1990 letter to Mr. Clair Fancy, P.E., paragraph 2 and EPA's letter of December 21, 1990 to Mr. Steve Smallwood, P.E., paragraph 2 and 3 (copies attached).


EWELL
C.F. Chemical Inc.
W.R. Grace & Co.
W.R. Grace & Co.
BAR
MINE RD.
First Florida Bank
BONNIE
BLACK DOT is Exhaust Stack
C.F. Chemicals, Inc.
BONNY
IMC Fertilizer Inc
Farmland Ind., Inc.
IMC
NORALYN COMMERCE PARK
OAK RIDGE
Farmland Ind. Inc.
NORALYN
Farmland Ind., Inc.
R. R.
IMC Fertilizer, Inc.
J.A. Prine
PEBBLEDALE
GREEN BAY
Don. Haag
NORALYN MINE
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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION IV

345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

AUG 17 1990

4APT-AEB

RECEIVED

AUG 20 1990

DER - BAQM

Mr. Clair H. Fancy, P.E., Chief
Bureau of Air Regulation
Florida Department of Environmental
Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: TECO Power Services Corp. Hardee Power Station (PSD-FL-140)

Dear Mr. Fancy:

This is to acknowledge receipt of the preliminary determination for the above referenced facility by letter dated August 2, 1990. We have reviewed the package as submitted and have the following comments.

MODELING/MONITORING

As noted in our comments on the permit application dated August 11, 1989, we indicated that preconstruction monitoring based on regional monitors was acceptable if such monitors could be found to be representative. For SO_2, the monitors located north of the site fall into the representative category and we will accept one of those monitors as fullfilling the PSD requirement for SO_2.

For ozone, we believe the Tampa monitoring site is the most representative site based on the prevailing winds and distance to the Hardee County site. Also, since maximum ozone concentrations will occur downwind from an urban area in the range of 30 or more kilometers, it is possible that the background levels at the site are higher than at sites that are not downwind of the Tampa area. The purpose of PSD monitoring is to quantify the background levels in the impact area.

BACT ANALYSIS

The BACT determination requires the use of wet injection and limits the hours of operation of the combined cycle units to 2190 hours per year. This is equivalent to 25% of capacity which is typical of a "peaking" unit. The simple cycle turbine of Phase IA, however, is not limited on hours of operation. In addition, the combined cycle units have the capacity to use by-pass vents and thus function as simple cycle units. It would appear, then, that the combined cycle units could operate continuously provided the hours of operation in the combined phase did not exceed 2190.

If the units are "peaking" units as the applicant claims, then the combined capacity of all the units (both combined cycle and simple cycle) should be limited to 25% of facility capacity. This is in keeping with the precedent set with Key West and facilities in North and South Carolina. Otherwise, the BACT analysis would indicate the need for add-on NO_x controls.

In addition, the burner design should be evaluated for BACT. The applicant proposes to use General Electric turbines. GE manufactures a "quiet combustor" which achieves NO_x levels of 25 ppm using wet injection when firing natural gas. Other burner designs are available which are capable of achieving equal or better emission levels. For example, the South Bay Power Plant in Chula Vista, CA, has recently proposed a 140 MW combined cycle turbine with emission limits of 9 ppm NO_x and 8 ppm CO firing natural gas, using steam injection. The technology proposed is currently in practice at the Delmarva Power and Light, Hay Road Station, Delaware. NO_x emissions at this facility have been tested at lower than 25 ppm.

In any case, it does not seem appropriate to allow a simple cycle "peaking" unit to operate 8760 hours per year without a lower emission rate. Also, clarification should be given as to whether the combined cycle units will be allowed to operate in simple cycle mode.

As with the Key West permit, the permit should contain provisions to require that the facility must reevaluate BACT, with SCR as a minimum, in the event that the 25% capacity factor is exceeded or the source wishes to operate as other than a peaking unit.

Thank you for the opportunity to review and comment on this package. If you have any questions on these comments, please do not hesitate to contact Mr. Gregg Worley of my staff at (404) 347-2904.

Sincerely yours,

Jewell A. Harper, Chief
Air Enforcement Branch
Air, Pesticides, and Toxics
Management Division

cc: Mr. Barry Andrews, FDER
TECO Hardee

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IV
345 COURTLAND STREET, N.E.
ATLANTA, GEORGIA 30365

4APT-AEB

DEC 21 1990

Mr. Steve Smallwood, P.E., Director
Air Resources Management Division
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

RE: TECO Power Services Corp. Hardee Power Station (PSD-FL-140)

Dear Mr. Smallwood:

This is to acknowledge receipt of the revised preliminary determination for the above referenced facility by letter dated December 5, 1990. We have reviewed the package as submitted and have significant comments as outlined in the following paragraphs. The issues raised in this letter are sufficient to preclude the issuance of a construction permit to TECO Power Services Corp. In order to prevent additional action by EPA, we strongly advise that you not issue this construction permit until the following issues are resolved.

MODELING/MONITORING

As noted in our comments on the permit application dated August 11, 1989, and in our comments on the preliminary determination of August 2, 1990, we indicated that preconstruction monitoring based on regional monitors was acceptable if such monitors could be found to be representative. As you know, the requirement for preconstruction monitoring under PSD regulations is not discretionary. A source may be exempted from preconstruction monitoring only if its impacts are predicted to be de minimis as defined in PSD regulations. Once the predicted impacts are determined to be greater than de minimis, a reviewing agency may allow the use of representative data in place of on-site monitoring. Such decision is made on a case-by-case basis and is not discretionary; the basis for such decision must conform to the "Ambient Monitoring Guidelines for Prevention of Significant Deterioration."

For SO_2, the monitors located north of the site fall into the representative category and we will accept one of those monitors as fulfilling the PSD requirement for SO_2.

For ozone however, we believe the Tampa monitoring site is the most representative site based on the prevailing winds and distance to the Hardee County site. Also, since maximum ozone concentrations will occur downwind from an urban area in the range of 30 or more kilometers, it is possible that the background levels at the site are higher than at sites that are not downwind of the Tampa area. The purpose of PSD monitoring is to quantify the background levels in the impact area. Therefore, we do not concur that the identified monitoring sites are representative and we recommend actual preconstruction monitoring at the Hardee site or use of data from the Tampa monitoring site.

BACT ANALYSIS

In light of Region IV's previous comments on the application and preliminary determination for this source along with the permitting history for combustion turbines both in the Region and nationwide, Region IV cannot condone the BACT determination presented in the revised preliminary determination. The applicant has continually based the rejection of SCR as a NO_x control on the fact that the projected use of the facility is 25% of capacity, thereby rendering the application of SCR to be technically infeasible (when firing in the simple cycle mode) and economically unreasonable (when firing in the combined cycle mode). This is consistent with recent BACT determinations in Florida and Region IV; however, the sources in previous cases (Key West, Panda Energy, and South Carolina Electric and Gas) each accepted permit limits on hours of operation to roughly 25% of capacity.

The NESCAUM Stationary Source Committee published a recommendation in June of 1990 concerning the permitting of simple cycle turbines. This recommendation stated: "Historically, simple cycle gas turbines used in peaking service have operated, on the average, less than fifteen hundred hours per year. However, actual hours of operation in any given year can vary substantially and could easily exceed fifteen hundred hours per year." 1500 hours per year is roughly 18% of full capacity (8760 hours per year). The recommendation suggested that regulatory agencies limit the hours of operation of "peaking units" and proposed emission guidelines for sources which included limiting the hours of operation to 2500 hours per year (28.5%).

Correspondence from the applicant indicates that in addition to the predicted capacity utilization of 25%, a maximum capacity utilization of 55% is expected. In other words, the applicant proposes to utilize the facility in a cycling manner, going from peak load to mid-range to base load according to need. The August 2, 1990, preliminary determination is consistent with recent BACT determinations in that it proposed to limit the hours of operation of the source to 25% with the condition that if this capacity would be exceeded, the source would install SCR. However, the December 5, 1990, preliminary determination proposes to allow the source to operate at 60% lifetime capacity before having to install SCR. It is not acceptable to limit capacity on a 60% lifetime average such that the source could operate at 20% capacity one year and 100% capacity the next year and still not be required to apply SCR. In essence, the revised preliminary determination allows the source to operate as a base load unit without requiring add-on controls or even dry low-NO_x combustors. Furthermore, a lifetime average is not an enforceable entity.

The August 2, 1990 BACT determination for TECO required the use of wet injection and limited the hours of operation of the combined cycle units to 2190 hours per year. This is equivalent to 25% of capacity which is typical of a "peaking" unit. The simple cycle turbine of Phase IA, however, was not limited on hours of operation. In addition, the combined cycle units have the capacity to use by-pass vents and thus function as simple cycle units. It would appear, then, that the combined cycle units could operate continuously provided the hours of operation in the combined phase did not exceed 2190.

If the units are "peaking" units as the applicant previously claimed, then the combined capacity of all the units (both combined cycle and simple cycle) should be limited to 25% of facility capacity. This is in keeping with the precedent set with Key West and facilities in North and South Carolina. Otherwise, the BACT analysis would indicate the need for add-on NO_x controls.

In addition, the burner design should be evaluated for BACT. The applicant proposes to use General Electric Frame 7EA turbines. General Electric manufactures a "quiet combustor" which achieves NO_x levels of 25 ppm using wet injection when firing natural gas. Other burner designs are available which are capable of achieving equal or better emission levels with and without wet injection. For example, the South Bay Power Plant in Chula Vista, CA, has recently proposed a 140 MW combined cycle turbine with emission limits of 9 ppm NO_x and 8 ppm CO firing natural gas, using steam injection. The technology proposed is currently in practice at the Delmarva Power and Light, Hay Road Station, Delaware. NO_x emissions at this facility have been tested at lower than 25 ppm.

In any case, it does not seem appropriate to allow a simple cycle "peaking" unit to operate 8760 hours per year without a lower emission rate. Also, clarification should be given as to whether the combined cycle units will be allowed to operate in simple cycle mode.

The applicant has continually pointed to the firing of fuel oil as another drawback to implementing the use of SCR; however, as seen in publications such as the "White Paper Selective Catalytic Reduction Controls to Abate NO_x Emissions" by the Industrial Gas Cleaning Institute (November, 1989), SCR manufacturers are confident with performance on "high sulfur" fuels, and especially low sulfur distillate fuels such as proposed by the applicant.

As with the Key West permit, the permit for TECO should contain provisions to require the facility reevaluate BACT, with SCR as a minimum, in the event that the 25% capacity factor is exceeded or the source wishes to operate as other than a peaking unit. The determination made by DER staff in the August 2, 1990, document is justified and consistent with previous BACT determinations.

Thank you for the opportunity to review and comment on this package. If you have any questions on these comments, please do not hesitate to contact me at (404) 347-3043.

Sincerely yours,

Richard D. Green, Deputy/for

Winston A. Smith, Director
Air, Pesticides, and Toxics
Management Division

cc: TECO Hardee
[illegible]

KBN

August 26, 1992

RECEIVED

AUG 28 1992

Division of Air
Resources Management

Mr. C.H. Fancy, P.E.
Chief, Bureau of Air Regulations
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

Dear Clair:

I have been out of the country so I was unaware of your August 13, 1992, letter indicating that the Mulberry Cogeneration was complete as of my letter dated August 12, 1992. I find this conclusion to be not only disturbing but completely inconsistent with the facts in this case. I believe you will find the facts support the conclusion that no additional or new information was submitted to justify an additional review of 90 days.

On July 30, representatives of the project, General Electric (GE), and I met with Preston Lewis and John Reynolds to present GE's low-NO_x combustion technology. This was done in light of the recent decision on the Orlando CoGen Project which required 15 ppm NO_x (corrected to 15 percent oxygen) when firing natural gas. The GE representatives presented their program which included achieving 15 ppm NO_x levels in the near future (1994-96 timeframe). At the meeting, it was expressly mentioned by Preston Lewis that the draft permit for the Auburndale Cogeneration was being issued with conditions that would be of interest to the Mulberry project. That is, Auburndale Project was allowed to operate an interim period on oil with the imposition of 15 ppm NO_x emissions when firing gas at a date 3 years after initial operation.

You should be aware that the interim use of oil (up to 3 years) for the Mulberry project was previously known to the Department since the original application. Indeed, in June 1992, in response to an incompleteness letter from the Department, information was transmitted that indicated that oil would only be used up to a 78 percent capacity rather than a 100 percent capacity factor as indicated in the original application.

Also discussed at the meeting was a possible change in the heat input for the secondary HRSG duct burners. In fact, I expressly stated that there would be no requested increase in heat input for the HRSG.

After the meeting I reviewed the Auburndale Cogeneration Project's draft permit. After discussions with the proponents for the Mulberry project, I submitted on behalf of the project sponsors their desire to have permit conditions similar to those drafted for the Auburndale project. No new additional information was submitted! Furthermore, the interim use of oil was previously known to the Department and no questions were raised from our June submittal.

I also understand that a conversation was held among Ward Marshall (Central and South West Services), Robert McCann (KBN), and John Reynolds on August 25, 1992. Mr. Reynolds committed to providing

KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

KBN

a preliminary determination within 1 to 2 weeks. I am concerned with the restart of the 90-day clock, particularly when the application was assumed to be complete in June.

I would hope that this project is treated in a manner similar to the other two most recent cogeneration projects, i.e., the Auburndale project and the Orlando CoGen project. Your previous handling of issues has always been fair and consistent on similar projects. I would therefore request that the permit be considered complete as of the date of our June 1992 submittal and a draft permit be issued.

Your assistance is always appreciated.

Sincerely,

Kennard F. Kosky

Kennard F. Kosky, P.E.
Principal Scientist

KFK/dmm

cc: John Reynolds, FDER
Bill Malenius (Ark Energy)
Ward Marshall (CSW)
File (2)

HOPPING BOYD GREEN & SAMS

ATTORNEYS AND COUNSELORS
123 SOUTH CALHOUN STREET
POST OFFICE BOX 6526
TALLAHASSEE, FLORIDA 32314
(904) 222-7500
FAX (904) 224-8551
FAX (904) 681-2964

December 20, 1993

BY HAND DELIVERY

Clair Fancy, Chief
Bureau of Air Regulation
Department of Environmental Protection
2600 Blair Stone Rd.
Tallahassee, Fla. 32399

RE: Mulberry Cogeneration Project;
PSD-FL-187

Dear Clair:

Pursuant to the attached correspondence, GE Capital Corporation has indicated it will be unable to close the planned financing of the Mulberry Cogeneration Project with the current carbon monoxide emissions limits contained in the project's PSD permit. The concern involves the future CO emission limits after January 1, 1998 when the nitrogen oxides emissions limit is reduced from a basis of 25 ppm to 15 ppm. As previously indicated to the Department, a reduction in the NOx emissions will result in an increase in CO emissions. However, the present PSD permit does not allow this increase.

On behalf of Polk Power Partners, I would request the opportunity to meet with you and others on your staff as quickly as possible to discuss what actions the Department can undertake to revise the permit. It appears that a revised PSD permit to establish a CO emission rate based upon 25 ppm at such time as the project reaches 15 ppm NOx will be needed to obtain financing.

We prefer to arrange a meeting sometime during the day, Tuesday, December 21st to allow time for the client to attend. I will contact you later today to identify a time when we could meet for an hour or so to discuss this matter.

Sincerely,

Douglas S. Roberts

Encls.
cc: John Reynolds w/encls.

MULBERRY

POLK POWER PARTNERS, L.P.

VIA FACSIMILE (904) 224-8551

December 17, 1993

Gary P. Sams, Esq.
HOPPING BOYD GREEN & SAMS
123 South Calhoun Street
P.O. Box 6526
Tallahassee, Florida 32314

SUBJECT: Attached Correspondence from General Electric Capital Corporation

Dear Gary:

Attached is a letter from Andrew Beaton of General Electric Capital Corporation regarding the correspondence from the Florida Department of Environmental Protection concerning the raising of the carbon monoxide (CO) emission rate at the Mulberry Project from 20 ppm to 25 ppm. As you will note, GECC is unwilling to close the transaction on the basis of the DEP letter. Since this delays our currently scheduled December 31, 1993 closing, we need to take all possible action to try to address this matter. Accordingly, I would appreciate it if you could try to arrange a meeting with the appropriate individuals at the Department of Environmental Protection so that we can discuss possible solutions to the problem.

If you have any questions, please do not hesitate to contact me.

Yours very truly,

David G. (Jeff) Reese
Legal & Public Affairs

Attachment

cc: Arnold R. Klann
William Malenius

123NW641.JR

3753 Howard Hughes Parkway • Suite 200 • Las Vegas, Nevada 89109 • Tel (800) 772-5146 • Fax (702) 892-3950
Mailing Address: 23046 Avenida de la Carlota, Suite 400 • Laguna Hills, California 92653 • Tel (714) 588-3767 • Fax (714) 588-3972

GE Capital

Transportation & Industrial Funding Corporation
A unit of General Electric Capital Corporation
1600 Summer Street, Stamford, CT 06927-4000
203 357-4499

December 16, 1993

Polk Power Partners, L.P.
c/o ARK Energy Inc.
23046 Avenida de la Carlota
Suite 400
Laguna Hills, CA 02653

Attn: Bill Malenius

RE: Mulberry Cogeneration Project

Gentlemen:

We have reviewed the correspondence by representatives of the Mulberry Cogeneration Project with the State of Florida Department of Environmental Protection concerning the raising of the carbon monoxide (CO) emission rate from 20 ppm to 25 ppm in conjunction with the ultimate lowering of the NOx emission rate to 15 ppm. We recognize that the Department has written that it will "adjust the CO limits higher if necessary based on the results of the compliance test...so that the Mulberry Cogeneration Facility can be operated and in a manner that is environmentally responsible." We have no reason to doubt the Department's sincerity.

Unfortunately, the existing permit allows emissions based only on a CO emission rate of 20 ppm, notwithstanding the inability of GE, the equipment vendor, to guarantee performance at that CO emission level with a NOx emission rate of 15 ppm. We further understand, on advice of counsel, that as a matter of law the Department's letter agreement may not constitute a strictly enforceable undertaking to later revise Permit PSD-FL-187, without regard for potential intervening circumstances, which could include challenges by third parties and changes of applicable BACT policies of the State or U.S. EPA.

Accordingly, our lending guidelines do not permit us to accept the risk of not obtaining the appropriately modified permit despite obviously well-intended agency assurances of future official action such as that of the State of Florida Department of Environmental Protection.

Based on these circumstances, we regretfully inform you that the financial closing now tentatively scheduled to occur by December 31, 1993, cannot take place until Polk Power Partners obtains an appropriate modification of the CO emission limit in Permit PSD-FL-187. We hope that you can remedy this deficiency as soon as possible

Sincerely,

Andrew Beaton
Vice President

AB/ss

KBN

August 12, 1992

Mr. John Reynolds
Bureau of Air Regulation
Florida Department of Environmental Regulation
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RE: Mulberry Cogeneration Project

Dear John:

The developers of the Mulberry Cogeneration Project and I appreciate the time you spent last week concerning the dry low-nitrogen oxide (NO_x) combustion technology being developed by General Electric (GE). As discussed, the developers of the project and GE have reviewed the development schedule for this technology and have reached agreement to offer lower NO_x emissions for the Department's consideration. In addition, as suggested by Preston Lewis, the proposed permit for the Auburndale Power Partners project was reviewed. Elements of this permit are directly applicable to the Mulberry Project and should be of assistance in drafting the permit for our project. Based on these efforts, I am transmitting on behalf of the project developers of the Mulberry Cogeneration Project the following emission and fuel limiting standards for your consideration. These proposed limitations are applicable as best available control technology (BACT) and are consistent with those proposed for the Auburndale Project.

1. First 3 Years of Operation: The full load equivalent capacity factor on fuel oil will be no more than 78 percent; the capacity factor for natural gas will be 22 percent. The NO_x emission limits will be limited to no more than 25 parts per million by volume dry (ppmvd) (corrected to 15 percent oxygen) when firing natural gas and 42 ppmvd (corrected) when firing fuel oil.

2. After the First 3 Years of Operation: The emissions limits for NO_x will not exceed 15 ppmvd (corrected) when firing natural gas and 42 ppmvd (corrected) when firing fuel oil. Natural gas will be used as the primary fuel when available from the Florida Gas Transmission Phase III pipeline expansion. When available from the expansion, fuel oil would be limited to no more than 30 days of full load operation per year, and the NO_x emissions would not exceed 42 ppmvd (corrected). The limit for natural gas firing (i.e., 15 ppmvd corrected to 15 percent O_2) would apply no later than April 30, 1997.

Please be advised that our discussion of higher heat input for the secondary heat recovery steam generator (HRSG) has been evaluated, and it has been concluded that an increase will not be requested. Therefore, the heat input as proposed in the application of 99 million British thermal units per hour (MMBtu/hr) will not change.

91193A1/11

KBN ENGINEERING AND APPLIED SCIENCES, INC.
1034 Northwest 57th Street Gainesville, Florida 32605 904/331-9000 FAX: 904/332-4189

KBN

As we discussed at the meeting, the timing of receipt of the proposed permit is not only important to the project developers but to the State of Florida. This project has been approved by the Public Service Commission, and power from this facility is needed to meet future power requirements in the state. The proposed permit for the Auburndale project should be helpful in drafting the proposed permit for our project. Your expeditious issuance of the proposed permit would be greatly appreciated.

If you have any questions please call me or Ward Marshall of Central & Southwest Services (214) 754-1374.

Sincerely,

Kennard F. Kosky, P.E.
President

KFK/abb

cc: William Malenius
File (2)

File Copy

Florida Department of Environmental Regulation

Twin Towers Office Bldg. • 2600 Blair Stone Road • Tallahassee, Florida 32399-2400

Lawton Chiles, Governor

Carol M. Browner, Secretary

August 13, 1992

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Mr. William R. Malenius
Senior Program Manager
Polk Power Partners
23293 South Pointe Drive
Laguna Hills, California 92653

Dear Mr. Malenius:

Re: Permit Application AC 53-211670, PSD-FL-187
Mulberry Cogeneration Project

This letter is in response to KBN's August 12, 1992, revision of the proposed emission and fuel limits for the subject project. Although the effect of this application revision will be to restart the 90-day permitting clock, the Department will make every effort to process the revised application as expeditiously as possible.

Sincerely,

C. H. Fancy, P.E.
Chief
Bureau of Air Regulation

CHF/JR/plm

cc: W. Thomas, SWD
J. Harper, EPA
C. Shaver, NPS
D. Martin, Planner
K. Kosky, P.E.
Reading File
John Reynolds } 8/14/92 prm

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Mr. William R. Malenius
Senior Program Manager
Polk Power Partners
23293 South Pointe Drive
Laguna Hills, California 92653

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8-19-92

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6. Signature (Agent)
C. Coll

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P 062 921 986

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PS Form 3800, June 1991

Polk POWER
P A R T N E R S

John

BD INFO Bruce Mike H. Needs

1125 U.S. 98 SOUTH
SUITE 100
LAKELAND, FLORIDA 33801
813-682-6338
FAX 813-683-8257

December 6, 1994

Mr. Clair H. Fancy, P.E. Chief
Bureau of Air Regulation
Florida Department of Environmental Protection (FDEP)
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, FL 32399-2400

RECEIVED
DEC 7 1994
Bureau of Air Regulation

RE: Mulberry Cogeneration Project, PSD-FL-187 (AC53-211670)
New Source Performance Standards (NSPS) - Compliance Test
FDEP Air Permit - Compliance Test

Dear Mr. Fancy:

This correspondence is submitted on behalf of the Polk Power Partners to notify you that the Mulberry Cogeneration Facility began NSPS and state air permit compliance testing the week of November 28, 1994. The testing should be completed by December 19. If you have any questions regarding the testing schedule, I may be contacted at (813) 682-6338.

Sincerely,

Nancy Henning Jones

Nancy Henning Jones
Vice President & General Manager
Polk Power GP, Inc.

cc: John Paul Jones, CSW-Mulberry
Ms. Jewell A. Harper, Chief Air Enforcement Branch
Dr. Richard D. Garrity, Director, Southeast District Fla Dept of Env. Prot.