FLORIDA KEYS ELECTRIC COOPERATIVE ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

RECEIVED
JUL 10 1997
BUREAU OF AIR REGULATION

Mr. Al A. Linero
Dept. of Environmental Protection
Bureau of Air Resources
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

Re: PSD and NAAQS Compliance Assessment 0870004-002-AC

7 July 1997 PSD-FL-237

Dear Mr. Linero:

In accordance with recent conversations with Mr. Cleve Holladay and Mr. Syed Arif, the attached PSD and NAAQS Compliance Assessment is submitted to support Florida Keys Electric Cooperative's (FKEC) PSD permit application for the Unit 8 addition at the Marathon Generating Plant. In order to assure compliance with both PSD and NAAQ Standards, we are proposing to limit annual operations of the existing diesel units at the plant to 50 percent. We propose the following language as an operating limit for the existing units 1 to 7 at the Marathon plant:

> "The existing diesel Units 1 through 7 operations shall be limited to either 4380 hours per year per unit or to a total fuel oil consumption of 6.2 million gallons per year for all seven units, which ever limit is more restrictive."

Note the total fuel consumption value is slightly larger than the earlier discussed 5.9 million gallons. The new value is based on a slightly lower fuel oil heating value. Original calculations assumed a fuel oil heating value of 140,000 Btu/gal. We have checked with our fuel supplier and determined that a more accurate heating value should be 132,000 Btu/gal. The basis for the 6.2 million gallon limit is as follows:

Unit	Capacity (MW)	Design Heat Rate (Btu/kwh)	Capacity Factor (%)	Fuel Consumtion (MM gal/yr)
1	2	10200	50	0.677
2	2	10200	50	0.677
3	3	10200	50	1.015
4	3	10200	50	1.015
5	3	10200	50	1.015
6	2.5	10800	50	0.896
7	2.5	10800	50	0.896
			TOTAL	**6.2**

If you have any questions or need any further information, please do not hesitate to call.

Sincerely,

Deborah A. Shaw

Deborah A. Shaw
Environmental Affairs Coordinator

CC: C. Holladay, BAR
SD-Branch Office
SD
EPA
NPS

PSD AND AMBIENT AIR QUALITY COMPLIANCE ASSESSMENT

FOR

MARATHON DIESEL POWER PLANT

Florida Keys Electric Cooperative

July 1997

R·W·BECK

1. INTRODUCTION

The addition of Unit 8 (a 3.58 MW diesel generating unit) at Florida Key Electric Cooperative's Marathon Diesel Plant will constitute an addition of a major source. Under the provisions of the regulations for Prevention of Significant Deterioration (PSD) of air quality, an air quality compliance assessment is required as technical support for the PSD permit application. The primary objective of this air quality assessment is to demonstrate compliance with applicable PSD Class I and Class II increments and National Ambient Air Quality Standards (NAAQS) for those pollutants emitted from the source in quantities defined by the regulations as significant (40 CFR 52.21 (b)(23)(i) and Table 17-212.400-2, F.A.C.).

Dispersion modeling has been conducted to determine the significance of the impacts from Unit 8 and the existing Units 1 through 7 on the regional ambient air quality due to the emissions of NO_x. This assessment presents the results of the comprehensive air quality assessment which indicates that the addition of the source will not cause or contribute to a violation of the NAAQS. The analysis also demonstrates that Class I and Class II PSD increments will not be exceeded.

2. MODELING METHOD

2.1 MODEL SELECTION

The model used for this air dispersion analysis was USEPA's ISCST3 model. This steady-state Gaussian plume model contains algorithms for predicting area and volume source impacts, modified downwash algorithms for non-buoyant plumes, and an Huber-Snyder algorithm which incorporates wind-direction specific building heights and widths similar to the Schulman-Scire algorithm. This software also allows each model run to include several averaging intervals and multiple receptors.

2.2 TOPOGRAPHICAL FEATURES

Vaca Key, on which Marathon is located, and the surrounding islands are essentially flat. The Marathon Plant site is at approximately 2.5 m msl, with the surrounding area dropping to about 2 m msl. Since the variation in terrain is minimal and is less than the height of the Unit 8 exhaust stack (11.79 m), the use of a flat terrain dispersion model is appropriate for the analysis.

2.3 METEOROLOGICAL LAND USE CLASSIFICATION

The meteorological land use classification is used to determine the profile of the vertical wind speed and associated mechanical turbulence due to surface roughness. The wind speed profile is then used to extrapolate wind speeds at various heights for use in the estimates of atmospheric pollutant dispersion. USEPA Guidelines on Air Quality Models stipulates that the land use within the total area circumscribed by a 3-km radius around the source can be classified using Auer's scheme of meteorological land use typing proposed in the Journal of Applied Meteorology (1976). Auer's classifications are as follows:

Type	Description
I1	Heavy Industrial
I2	Light/Moderate Industrial
C1	Commercial
R1	Common Residential
R2/R3	Compact Residential
R4	Estate Residential
A1	Metropolitan Natural
A2	Agricultural Rural
A3/A4	Undeveloped
A5	Water Surfaces

According to the Guidelines, if more than 50 percent of the total area in the circle is classified by land use as I1, I2, C1, R2, or R3, urban dispersion coefficients should be used in the modeling, otherwise, appropriate rural dispersion coefficients should be used. A USGS 7.5-minute series topographical map was used to estimate the land use around the project site as more than 50% in type "A5: Water Surfaces". Therefore, default rural dispersion coefficients were used in the analysis.

2.4 BACKGROUND AMBIENT AIR QUALITY

Marathon is designated attainment or unclassified for all criteria pollutants. This designation is consistent with several features of the area. First, there are no large sources of air pollution nearby. Second, there is no significant terrain which could trap pollution and cause exceedances of the NAAQS. Third, the prevailing winds are east and southeast bringing clean air off of the Atlantic Ocean.

2.5 SOURCE DATA

The existing diesel stacks and their emissions at the Marathon Plant are described in Table 1 under unrestricted conditions. The installation of Unit 8, one nominal 3.58-MW diesel generator, is the proposed addition to the site. Emissions of NO_x from the unit will be controlled by using a combination of fuel injection timing retardation 4°, a 4-pass aftercooler circuit with a separately cooled aftercooler circuit, good combustion practices and the use of low sulfur fuel (≤0.05%). The modeling parameters presented in Table 1 represent Unit 8 operating at 100% of capacity with these controls in place.

2.6 METEOROLOGICAL DATA

The refined analysis presented herein used five complete years (1987 through 1991) of wind and stability data consisting of actual surface observations in Key West and twice-per-day upper air soundings concurrently recorded at a station in Miami. Default wind speed profile exponents (indicative of increasing wind speed with increasing distance from the surface) and vertical potential temperature gradients (indicative of decreasing temperature with increasing distance above the surface) were used in the modeling. Five years of meteorology were processed using unrestricted source parameters. After reviewing the first-high concentration results for each of the five years, it was determined that 1991 had the highest concentration, and therefore would be used in further analyses (Table 2).

2.7 STACK HEIGHT CONSIDERATIONS

According to 40 CFR 51.100(hh), a good engineering practice (GEP) stack height is the greater of:

65 meters

or

$H_g = H_b + 1.5L$

where: H_g = the GEP stack height
H_b = the height of the dominant nearby building, and
L = the lesser dimension of the height or projected width of the dominant nearby building.

As shown in Table 1, the Unit 8 stack and the stacks of the existing units are less than 65 m. This in combination with the building dimensions indicate the potential for building downwash. For this reason, building downwash analysis was included in the dispersion modeling.

Structures tend to disrupt air flow across a region and create turbulence around the structure. This disruption is referred to as the building wake effect or building downwash effect. This effect can result in high local ground-level pollutant concentrations if the emission point of the source is not far enough above or away from the structure to avoid the effect. A stack constructed at a height approximately 2.5 times the height of a nearby building is not likely to be affected by structural turbulence. If a stack is located within 5L of a building, and the building height is greater than approximately 40 percent of the stack height, then the stack is considered to be affected by building downwash.

The ISCST model used in the ambient air quality assessment uses a combination of two algorithms for predicting building wake effects. The Schulman-Scire algorithm is applicable when the stack height is less than 1.5 H_b and takes into account wind-direction-specific building heights and widths when determining wake effects. The Huber-Snyder algorithm is applicable when the stack height is between 1.5 H_b and 2.5 H_b and uses the actual building height and maximum projected width for all wind directions. Software packages are available to determine the values of the building heights and widths which can influence each stack and one such package, Building Profile Input Program (BPIP), has been used for this analysis to estimate the wake effects caused by the structures at the Marathon Plant. The only structure at the Marathon Plant site with the potential to affect air flow is the Power Plant Building, with a height of 30 feet.

After BPIP was run, it was found that the Units 6 and 7 were located at a distance greater than 5L from the building and were therefore not included in the building downwash analysis. All other units were included, and the results of BPIP can be found in the input for the modeling run (Attachment 1).

2.8 RECEPTOR NETWORKS

The receptor grid for the refined air quality analysis consists of a polar coordinate system centered on the Unit 8 stack. The grid system consisted of 36 direction radials separated by 10-degree increments. Receptors were placed at ground level at 50, 100, 200, 300, 400, 500, 750 and 1000m intervals. The orientation of the polar grid is rotated so that 0° is located 104° off True North. This grid analysis provided sufficient resolution and downwind coverage to identify the areas of expected maximum concentrations.

3. RESULTS OF MODELING ANALYSIS

3.1 REFINED ANALYSIS

ISCST was used with real-time meteorological data to account for the consistency of the meteorology from the east and southeast. Further, the influence of structural downwash on the exhaust plumes was included in the refined calculations.

The preliminary analysis that was conducted to determine the year of meteorology (1991) which resulted in the significant impact (Table 2), also showed that when all eight units are run under unrestricted conditions, the AAQS standards for NO_x are exceeded. Therefore, another run was performed where Units 1 through 7 were operating at 50 percent of emissions, and Unit 8 remained at 100 percent. This run produced a first-high concentration of 127.61 : g/m^3 for NAAQS and 25.10 : g/m^3 for PSD - Class II (Attachment 1). In accordance with USEPA-approved practices and consistent with modeling protocol, these concentrations can be reduced by 25 percent for NO_x, due to the ratio of NO_2 to NO_x. (Supplement C to the Guideline on Air Quality Models (revised) (Appendix W of 40 CFR Part 51), EPA, August 1995). Therefore, the first-high concentrations for NAAQS and PSD - Class II are 95.71 : g/m^3 and 18.83 : g/m^3, respectively. Both these concentrations fall below the annual NAAQS NO_x standard of 100 : g/m^3 and the annual PSD NO_x increment standard of 25 : g/m^3, respectively.

3.2 CLASS I INCREMENT ANALYSIS

The National Park Service (NPS) has developed a draft guidance document for assessing source impacts on Class I areas. Modeling levels of significance, similar to those applicable in Class II areas, have been developed by the NPS for Class I areas. Those levels of significance were used in this application to show that the net effect of adding Unit 8 will be insignificant.

The receptors used in this analysis were similar to those used in the PSD Class II and NAAQS analysis except the distance was increased. The receptors were limited to represent only the intersection of the direction radials from 10° to 60° and the nearest boundary of the Everglades Class I area (see Figure 1). The receptors are identified in Table 3. Table 4 sets forth the annual first and second high impact concentrations of the Marathon Unit 8 on the Everglades over five years (1987 through 1991). The distance between Marathon and the Everglades is approximately 30 km. At this distance, the addition of Unit 8 will have an insignificant impact on the Class I area.

3.3 AIR QUALITY RELATED ISSUES

Due to the small size of the proposed new diesel unit and the nature of operation (peaking operation), the air quality impacts on growth, visibility, soils, vegetation, and aquatic life are considered insignificant.

Data
Available
upon
Request

Cleve has it -

FLORIDA KEYS ELECTRIC COOPERATIVE
ASSOCIATION, INC. - FKEC
91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

Mr. Clair Fancy
Chief
Bureau of Air Regulation
Dept. of Environmental Protection
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

RECEIVED
JUN 20 1997
BUREAU OF
AIR REGULATION

Re: Air modeling analysis for Marathon Generating Plant.

19 June 1997

Dear Mr. Fancy:

Enclosed is the final document required to answer Florida Department of Environmental Protection's (FDEP) Incompleteness Letter issued on 2/13/97 for the Prevention of Significant Deterioration review for Florida Keys Electric Cooperative's (FKEC) new diesel engine. After completing the air modeling analysis, FKEC's consultants recommend that to comply with NAAQS and PSD increments, the Marathon Generating Plant existing units 1-7 be limited to a 50% capacity factor and that the new unit #8 be unlimited. FKEC requests that the operating limits placed on units 1-7 be based on annual fuel consumption. A 50% capacity factor would be achieved by limiting fuel consumption to approximately 5.9 million gallons of No. 2 diesel oil. Please see the attached letter from Ivan Clark, R.W. Beck Senior Director of Environmental Services, for details.

Submission of the air modeling analysis should complete FKEC's permit application packet for the Prevention of Significant Deterioration review of FKEC's new diesel engine. Please advise me if any further information is needed.

Sincerely,

Deborah A. Shaw
Environmental Affairs Coordinator

Enc:
1)Letter from Ivan Clark
2) Air modeling run (partial copy - 15 pages)

PC:
C.A. Russell, CEO/GM, FKEC
T.E. Planer, Supt. Transmission , FKEC

cc: Syed Arif, BAR
Cleve Holladay, BAR
R.J. Hebling, Marathon
SD
EPA
NPS

June 17, 1997

R·W·BECK

via Federal Express

Ms. Deborah A. Shaw
Environmental Affairs Coordinator
Florida Keys Electric Cooperative
91605 Overseas Highway
PO Box 700377
Tavernier, FL 33070-0377

Subject: **NOx Modeling for Marathon Generating Plant**

Dear Deborah:

Enclosed is a portion (exclusive of receptor-by-receptor results for various averaging times) of the ISC3 input/output indicating NAAQS and PSD increment analysis for the subject plant with emission rates for Units 1-7 at 50%. NAAQS modeling considered all eight diesel generators, while PSD included only Unit 8. Key West 1991 meteorology (annual worst case for 1987-1991) was used to predict concentrations at polar receptors located at eight downwind distances from Unit 8 (50m, 100m, 200m, 300, 400m, 500m, 750m, 1000m). As discussed, in order to achieve compliance with the annual NAAQS of 100ug/m3 and the PSD increment of 25ug/m3 it is necessary to limit the capacity factor of Units 1-7 to 50% and to use a 0.75 conversion factor for NO2/NOx (reference Supplement C to the Guideline on Air Quality Models, revised June 1994). As indicated on the output, calculated values are128ug/m3 for Units 1-8 and 25ug/m3 for Unit 8.

We recommend that DEP consider an enforceable permit condition for Units 1-7 based on annual fuel consumption. To achieve a 50% capacity factor, this condition would be annual No. 2 fuel oil consumption of 5.9million gallon (18MW, average heat rate of 10,500Btu/kWh and HHV of 140,000Btu/gallon).

If we can be of further assistance do not hesitate to call.

Sincerely,

R. W. BECK, INC.

Ivan L. Clark
Senior Director
Environmental Services

ILC/smm

Enclosure
c: Mike Henderson, R. W. Beck

02-00576-02000-1000| g:\002557\02-00576\smm001ic.doc

6/12/97 all except 8 @ 50%

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SO LOCATION       unit3    POINT        -6.7     0.0      0.0
SO LOCATION       unit4    POINT       -14.8     0.0      0.0
SO LOCATION       unit5    POINT       -20.4     0.0      0.0
SO LOCATION       unit6    POINT       -74.0    -48.9     0.0
SO LOCATION       unit7    POINT       -74.0    -43.0     0.0
SO LOCATION       unit8    POINT        0.0      0.0      0.0

** POINT:    SRCID           QS        HS       TS       VS          DS
SO SRCPARAM  unit1           2.96      6.15     669      27.3        0.71
SO SRCPARAM  unit2           3.85      6.15     669      27.3        0.71
SO SRCPARAM  unit3           4.64      11.43    677      38.9        0.66
SO SRCPARAM  unit4           4.44      11.43    677      38.9        0.66
SO SRCPARAM  unit5           5.11      11.43    677      38.9        0.66
SO SRCPARAM  unit6           4.72      7.20     664      23.8        0.76
SO SRCPARAM  unit7           4.40      7.20     664      23.8        0.76
SO SRCPARAM  unit8           7.80      11.79    625      34.6        0.71
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SO	BUILDWID	unit3	27.11	28.50	34.89	40.22	44.33	47.09
SO	BUILDWID	unit3	48.42	48.28	46.68	43.65	44.36	47.11
SO	BUILDWID	unit3	48.43	48.27	46.65	43.61	39.24	33.69
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SO	BUILDWID	unit4	27.11	28.50	34.89	40.22	44.33	47.09
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SO	BUILDWID	unit4	48.43	48.27	46.65	43.61	39.24	33.69
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SO	BUILDWID	unit7	.00	.00	.00	.00	.00	.00
SO	BUILDHGT	unit8	10.00	10.00	10.00	10.00	10.00	10.00
SO	BUILDHGT	unit8	10.00	10.00	10.00	10.00	10.00	10.00
SO	BUILDHGT	unit8	10.00	10.00	10.00	10.00	10.00	10.00
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SO BUILDHGT unit8      10.00   10.00   10.00   10.00   10.00   10.00
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SO BUILDWID unit8      27.11   28.50   34.89   40.22   44.33   47.09
SO BUILDWID unit8      48.42   48.28   46.68   43.65   44.36   47.11
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SO BUILDWID unit8      48.43   48.27   46.65   43.61   39.24   33.69
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SO SRCGROUP NAAQS unit1-unit8
SO SRCGROUP PSD unit8
SO FINISHED

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RE GRIDPOLR POL DIST   50.0  100. 200. 300. 400. 500. 750. 1000.
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RE GRIDPOLR POL END
RE FINISHED

ME STARTING
ME INPUTFIL  KYWPRE91.LST
ME ANEMHGHT    6.700 METERS
ME SURFDATA  12836  1991             key west
ME UAIRDATA  12844  1991             miami
ME FINISHED

OU STARTING
OU RECTABLE  ALLAVE FIRST SECOND
OU FINISHED

***********************************
*** SETUP Finishes Successfully ***
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 *** ISCST3 - VERSION 96113 ***      *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
                                     *** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC                                   RURAL  FLAT         DFAULT

                                                   ***      MODEL SETUP OPTIONS SUMMARY
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**Intermediate Terrain Processing is Selected

**Model Is Setup For Calculation of Average CONCentration Values.

  --  SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION.  DDPLETE =  F
**Model Uses NO WET DEPLETION.  WDPLETE =  F
**NO WET SCAVENGING Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations

**Model Uses RURAL Dispersion.

**Model Uses Regulatory DEFAULT Options:
           1. Final Plume Rise.
           2. Stack-tip Downwash.
           3. Buoyancy-induced Dispersion.
           4. Use Calms Processing Routine.
           5. Not Use Missing Data Processing Routine.
           6. Default Wind Profile Exponents.
           7. Default Vertical Potential Temperature Gradients.
           8. "Upper Bound" Values for Supersquat Buildings.
           9. No Exponential Decay for RURAL Mode

**Model Assumes Receptors on FLAT Terrain.

**Model Assumes No FLAGPOLE Receptor Heights.

**Model Calculates  2 Short Term Average(s) of:   3-HR  24-HR
    and Calculates PERIOD Averages

**This Run Includes:    8 Source(s);      2 Source Group(s); and    288 Receptor

**The Model Assumes A Pollutant Type of:  OTHER

**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
         Model Outputs Tables of PERIOD Averages by Receptor
         Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE

**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                m for Missing Ho
                                                                b for Both Calm

**Misc. Inputs:  Anem. Hgt. (m) =     6.70 ;    Decay Coef. =  0.0000      ;
                 Emission Units = (GRAMS/SEC)                              ;  Em
                 Output Units   = (MICROGRAMS/CUBIC-METER)

**Input Runstream File: fexist50.i91                               ;  **Output Prin
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*** ISCST3 - VERSION 96113 ***   *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
*** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (USER UNITS)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	S EX (
UNIT1	0	0.29600E+01	-71.1	-34.8	0.0	6.15	669.00	
UNIT2	0	0.38500E+01	-71.1	-28.2	0.0	6.15	669.00	
UNIT3	0	0.46400E+01	-6.7	0.0	0.0	11.43	677.00	
UNIT4	0	0.44400E+01	-14.8	0.0	0.0	11.43	677.00	
UNIT5	0	0.51100E+01	-20.4	0.0	0.0	11.43	677.00	
UNIT6	0	0.47200E+01	-74.0	-48.9	0.0	7.20	664.00	
UNIT7	0	0.44000E+01	-74.0	-43.0	0.0	7.20	664.00	
UNIT8	0	0.78000E+01	0.0	0.0	0.0	11.79	625.00	

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*** ISCST3 - VERSION 96113 ***       *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
                                     *** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC                          RURAL  FLAT          DFAULT


                                            *** SOURCE IDs DEFINING SOURCE GROUPS

GROUP ID                                                  SOURCE IDs


 NAAQS     UNIT1    , UNIT2    , UNIT3    , UNIT4    , UNIT5    , UNIT6    , UNIT7    ,

 PSD       UNIT8    ,
```

*** ISCST3 - VERSION 96113 ***   *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
*** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSI

SOURCE ID: UNIT1

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	
1	0.0,	0.0,	0	2	0.0,	0.0,	0	3	0.0,	0.0,	0	4	0.0,	
7	0.0,	0.0,	0	8	0.0,	0.0,	0	9	0.0,	0.0,	0	10	0.0,	
13	0.0,	0.0,	0	14	0.0,	0.0,	0	15	0.0,	0.0,	0	16	0.0,	
19	0.0,	0.0,	0	20	0.0,	0.0,	0	21	0.0,	0.0,	0	22	0.0,	
25	0.0,	0.0,	0	26	0.0,	0.0,	0	27	0.0,	0.0,	0	28	0.0,	
31	0.0,	0.0,	0	32	0.0,	0.0,	0	33	10.0,	46.6,	0	34	10.0,	4

SOURCE ID: UNIT2

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	
1	10.0,	27.1,	0	2	0.0,	0.0,	0	3	0.0,	0.0,	0	4	0.0,	
7	0.0,	0.0,	0	8	0.0,	0.0,	0	9	0.0,	0.0,	0	10	0.0,	
13	0.0,	0.0,	0	14	0.0,	0.0,	0	15	0.0,	0.0,	0	16	0.0,	
19	0.0,	0.0,	0	20	0.0,	0.0,	0	21	0.0,	0.0,	0	22	0.0,	
25	0.0,	0.0,	0	26	0.0,	0.0,	0	27	0.0,	0.0,	0	28	0.0,	
31	0.0,	0.0,	0	32	0.0,	0.0,	0	33	0.0,	0.0,	0	34	10.0,	4

SOURCE ID: UNIT3

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	
1	10.0,	27.1,	0	2	10.0,	28.5,	0	3	10.0,	34.9,	0	4	10.0,	4
7	10.0,	48.4,	0	8	10.0,	48.3,	0	9	10.0,	46.7,	0	10	10.0,	4
13	10.0,	48.4,	0	14	10.0,	48.3,	0	15	10.0,	46.6,	0	16	10.0,	4
19	10.0,	27.1,	0	20	10.0,	28.5,	0	21	10.0,	34.9,	0	22	10.0,	4
25	10.0,	48.4,	0	26	10.0,	48.3,	0	27	10.0,	46.7,	0	28	10.0,	4
31	10.0,	48.4,	0	32	10.0,	48.3,	0	33	10.0,	46.6,	0	34	10.0,	4

SOURCE ID: UNIT4

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	
1	10.0,	27.1,	0	2	10.0,	28.5,	0	3	10.0,	34.9,	0	4	10.0,	4
7	10.0,	48.4,	0	8	10.0,	48.3,	0	9	10.0,	46.7,	0	10	10.0,	4
13	10.0,	48.4,	0	14	10.0,	48.3,	0	15	10.0,	46.6,	0	16	10.0,	4
19	10.0,	27.1,	0	20	10.0,	28.5,	0	21	10.0,	34.9,	0	22	10.0,	4
25	10.0,	48.4,	0	26	10.0,	48.3,	0	27	10.0,	46.7,	0	28	10.0,	4
31	10.0,	48.4,	0	32	10.0,	48.3,	0	33	10.0,	46.6,	0	34	10.0,	4

*** ISCST3 - VERSION 96113 ***   *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
*** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSI

SOURCE ID: UNIT5

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	
1	10.0,	27.1,	0	2	10.0,	28.5,	0	3	10.0,	34.9,	0	4	10.0,	4
7	10.0,	48.4,	0	8	10.0,	48.3,	0	9	10.0,	46.7,	0	10	10.0,	4
13	10.0,	48.4,	0	14	10.0,	48.3,	0	15	10.0,	46.6,	0	16	10.0,	4
19	10.0,	27.1,	0	20	10.0,	28.5,	0	21	10.0,	34.9,	0	22	10.0,	4
25	10.0,	48.4,	0	26	10.0,	48.3,	0	27	10.0,	46.7,	0	28	10.0,	4
31	10.0,	48.4,	0	32	10.0,	48.3,	0	33	10.0,	46.6,	0	34	10.0,	4

SOURCE ID: UNIT8

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	
1	10.0,	27.1,	0	2	10.0,	28.5,	0	3	10.0,	34.9,	0	4	10.0,	4
7	10.0,	48.4,	0	8	10.0,	48.3,	0	9	10.0,	46.7,	0	10	10.0,	4
13	10.0,	48.4,	0	14	10.0,	48.3,	0	15	10.0,	46.6,	0	16	10.0,	4
19	10.0,	27.1,	0	20	10.0,	28.5,	0	21	10.0,	34.9,	0	22	10.0,	4
25	10.0,	48.4,	0	26	10.0,	48.3,	0	27	10.0,	46.7,	0	28	10.0,	4
31	10.0,	48.4,	0	32	10.0,	48.3,	0	33	10.0,	46.6,	0	34	10.0,	4

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** GRIDDED RECEPTOR NETWORK SUMMARY ***

*** NETWORK ID: POL   ; NETWORK TYPE: GRIDP

*** ORIGIN FOR POLAR NETWORK ***

X-ORIG =   0.00 ;   Y-ORIG =   0.00   (METE

*** DISTANCE RANGES OF NETWORK ***
(METERS)

50.0,	100.0,	200.0,	300.0,	400.0,	500.0,	750.0

*** DIRECTION RADIALS OF NETWORK ***
(DEGREES)

10.0,	20.0,	30.0,	40.0,	50.0,	60.0,	70.0
110.0,	120.0,	130.0,	140.0,	150.0,	160.0,	170.0
210.0,	220.0,	230.0,	240.0,	250.0,	260.0,	270.0
310.0,	320.0,	330.0,	340.0,	350.0,	360.0,	

**MODELOPTs: CONC   RURAL FLAT   DFAULT

* SOURCE-RECEPTOR COMBINATIONS FOR WHICH CALCULATIONS MAY N
LESS THAN 1.0 METER OR 3*ZLB IN DISTANCE, OR WITHIN OP

SOURCE ID	- - RECEPTOR LOCATION - - XR (METERS)	YR (METERS)	D (
UNIT5	-50.0	0.0	

*** ISCST3 - VERSION 96113 ***   *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
*** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** METEOROLOGICAL DAYS SELECTED FOR
(1=YES; 0=NO)

```
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1 1 1 1 1   1 1
1 1 1 1 1 1 1 1 1 1   1 1 1 1 1 1
```

NOTE: METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON

*** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPE
(METERS/SEC)

1.54,   3.09,   5.14,   8.23,   1

*** WIND PROFILE EXPONENTS ***

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4
A	.70000E-01	.70000E-01	.70000E-01	.70000
B	.70000E-01	.70000E-01	.70000E-01	.70000
C	.10000E+00	.10000E+00	.10000E+00	.10000
D	.15000E+00	.15000E+00	.15000E+00	.15000
E	.35000E+00	.35000E+00	.35000E+00	.35000
F	.55000E+00	.55000E+00	.55000E+00	.55000

*** VERTICAL POTENTIAL TEMPERATURE GRAD
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4
A	.00000E+00	.00000E+00	.00000E+00	.00000
B	.00000E+00	.00000E+00	.00000E+00	.00000
C	.00000E+00	.00000E+00	.00000E+00	.00000
D	.00000E+00	.00000E+00	.00000E+00	.00000
E	.20000E-01	.20000E-01	.20000E-01	.20000
F	.35000E-01	.35000E-01	.35000E-01	.35000

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** THE FIRST 24 HOURS OF METEOROLOGICAL DATA ***

FILE: KYWPRE91.LST   FORMAT: (4I2,2F9.4,F6.
SURFACE STATION NO.: 12836   UPPER AIR STATION NO.:
NAME: KEY   NAME:
YEAR: 1991   YEAR:

YEAR	MONTH	DAY	HOUR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEI RURAL
91	1	1	1	251.0	6.69	297.0	4	1073.0
91	1	1	2	238.0	6.17	296.5	4	1069.0
91	1	1	3	234.0	6.17	296.5	4	1065.0
91	1	1	4	233.0	3.60	295.9	4	1061.0
91	1	1	5	223.0	4.63	295.9	4	1057.0
91	1	1	6	222.0	4.63	295.9	5	1053.0
91	1	1	7	235.0	4.12	295.9	4	1049.0
91	1	1	8	273.0	5.14	295.4	4	1045.0
91	1	1	9	257.0	4.63	295.4	4	1041.0
91	1	1	10	231.0	4.63	297.0	4	1037.0
91	1	1	11	274.0	4.63	299.3	3	1033.0
91	1	1	12	316.0	5.66	299.8	4	1029.0
91	1	1	13	313.0	7.20	299.8	4	1025.0
91	1	1	14	309.0	7.20	299.8	4	1021.0
91	1	1	15	292.0	6.69	299.8	4	1021.0
91	1	1	16	284.0	5.66	299.8	4	1021.0
91	1	1	17	301.0	7.20	299.3	4	1021.0
91	1	1	18	297.0	7.20	298.2	4	1029.8
91	1	1	19	294.0	6.17	298.2	4	1066.0
91	1	1	20	297.0	6.69	298.2	4	1102.2
91	1	1	21	300.0	6.69	297.6	4	1138.4
91	1	1	22	292.0	5.66	298.2	4	1174.6
91	1	1	23	300.0	5.66	298.2	4	1210.8
91	1	1	24	280.0	5.14	297.6	5	1247.0

*** NOTES: STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.

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*** ISCST3 - VERSION 96113 ***      *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
                                    *** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC                          RURAL  FLAT          DFAULT

                                            *** THE SUMMARY OF MAXIMUM PERIOD (

                                        ** CONC OF OTHER    IN (MICROGRAMS/CUBIC-

GROUP ID                       AVERAGE CONC                  RECEPTOR  (XR, YR, ZEL
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

NAAQS    1ST HIGHEST VALUE IS     127.60801 AT (     -86.60,       50.00,       0
         2ND HIGHEST VALUE IS     112.25087 AT (     -93.97,       34.20,       0
         3RD HIGHEST VALUE IS     104.11713 AT (     -76.60,       64.28,       0
         4TH HIGHEST VALUE IS      78.18972 AT (     -98.48,       17.36,       0
         5TH HIGHEST VALUE IS      68.92725 AT (     -43.30,       25.00,       0
         6TH HIGHEST VALUE IS      60.77991 AT (     -64.28,       76.60,       0

PSD      1ST HIGHEST VALUE IS      25.10266 AT (     -38.30,       32.14,       0
         2ND HIGHEST VALUE IS      23.47974 AT (     -43.30,       25.00,       0
         3RD HIGHEST VALUE IS      22.83569 AT (     -76.60,       64.28,       0
         4TH HIGHEST VALUE IS      21.04785 AT (     -86.60,       50.00,       0
         5TH HIGHEST VALUE IS      14.62818 AT (    -153.21,      128.56,       0
         6TH HIGHEST VALUE IS      13.59366 AT (     -32.14,       38.30,       0

 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY
```

*** ISCST3 - VERSION 96113 ***   *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
*** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC   RURAL FLAT   DFAULT

*** THE SUMMARY OF HIGHEST 3-HR

** CONC OF OTHER IN (MICROGRAMS/CUBIC-

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)		RECEPTO
NAAQS	HIGH 1ST HIGH VALUE IS	4307.21631	ON 91051506:	AT (	-93.97,
	HIGH 2ND HIGH VALUE IS	3296.98706	ON 91030724:	AT (	-93.97,
PSD	HIGH 1ST HIGH VALUE IS	983.10052	ON 91121924:	AT (	-43.30,
	HIGH 2ND HIGH VALUE IS	836.16162	ON 91052124:	AT (	-38.30,

*** RECEPTOR TYPES: GC = GRIDCART
GP = GRIDPOLR
DC = DISCCART
DP = DISCPOLR
BD = BOUNDARY

```
*** ISCST3 - VERSION 96113 ***       *** 1991 FLORIDA KEYS ELECTRIC COOP - NO2 - A
                                     *** GENERAL SCREENING GRID ANNUAL 24-HR AND 3

**MODELOPTs: CONC                              RURAL  FLAT          DFAULT

                                                    *** THE SUMMARY OF HIGHEST 24-HR

                                            ** CONC OF OTHER    IN (MICROGRAMS/CUBIC-

                                                          DATE
GROUP ID                                  AVERAGE CONC   (YYMMDDHH)               RECEPTO
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

NAAQS     HIGH  1ST HIGH VALUE IS    1091.23096  ON 91052124: AT (      -43.30,
          HIGH  2ND HIGH VALUE IS     913.11652  ON 91030224: AT (      -86.60,

PSD       HIGH  1ST HIGH VALUE IS     489.74548  ON 91052124: AT (      -38.30,
          HIGH  2ND HIGH VALUE IS     382.71411  ON 91120424: AT (        0.00,

 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY
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FLORIDA KEYS ELECTRIC COOPERATIVE
ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

Mr. Cleve Holladay
Dept. of Environmental Protection
Bureau of Air Resources
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

RECEIVED
MAY 28 1997
BUREAU OF
AIR REGULATION

Re: Florida Keys Electric Cooperative (FKEC) property boundaries for air modeling.

27 May 1997

Dear Mr. Holladay:

As per our discussion of last Friday, I am sending you a Marathon Generating Plant site plan with 10° radial overlay at 50, 100 and 150 meter distances from the stack of unit # 8. Please note that FKEC owns 5.1 acres of bay bottom adjoining the plant site and extending south into Boot Key Harbor. Most of this area is too shallow for boating traffic so there is very limited public use of this area (as can be seen from the distribution of boats in the aerial photo). In addition, FKEC owns a 14+ acre parcel adjoining the plant site to the east. Part of this parcel (Kelly's Marina) will be sold and is accessible by the public. The remaining area is open grassland east of the plant and south of US Highway 1. This area is fenced and has no public access.

Please treat the site plan as a confidential document for security reasons. Please call me if you have questions. Thank you for your assistance with the air modeling.

Sincerely,

Deborah A. Shaw
Environmental Affairs Coordinator

Enc:

MGP site plan with radial overlay.
Redi aerial photo.

PC:

C. Russell
T. Planner

FLORIDA KEYS ELECTRIC COOPERATIVE
ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

Mr. Syed Arif
Dept. of Environmental Protection
Bureau of Air Resources
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

Re: Vendor contact for EMD 20-710G4B.

RECEIVED
MAY 22 1997
BUREAU OF
AIR REGULATION

20 May 1997

Dear Mr. Arif:

For your records, you may list Michael J. Thiel, Sales Support Engineer, for Engine Systems, Inc. as our vendor contact. His address is:

Engine Systems, Inc.
1220 S. Washington St.
Rocky Mount, NC 27801

Telephone: 919/407-8228

Please call me if you require any further information.

Sincerely,

Deborah A. Shaw
Environmental Affairs Coordinator

PC:
T.E. Planer, Supt. Transmission , FKEC

FLORIDA KEYS ELECTRIC COOPERATIVE
ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

Mr. Clair Fancy
Chief
Bureau of Air Regulation
Dept. of Environmental Protection
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

RECEIVED
MAY 20 1997
BUREAU OF
AIR REGULATION

Re: BACT Analysis response to Incompleteness Letter of 2/13/97.

19 May 1997

Dear Mr. Fancy:

Enclosed is Florida Keys Electric Cooperative Association, Inc.'s (FKEC) response to the letter of incompleteness issued by your department. The letter requested additional information regarding FKEC's application for an air construction/operating permit for a new 3.58 MW diesel engine for the Marathon Generating Plant. I have been working closely with Mr. Syed Arif and Mr. Cleve Holladay during the development of the Best Available Control Technology (BACT) analysis, therefore, I faxed the response to Mr. Arif to expedite his technical analysis. He has asked that I send the original to you.

FKEC will submit the air modeling data as soon as possible in order to complete the permit application packet for the Prevention of Significant Deterioration review of FKEC's new diesel engine.

I would like to add that the Bureau of Air Regulation staff (particularly Syed Arif and Cleve Holladay) has been very helpful during this long process.

Sincerely,

Deborah A. Shaw

Deborah A. Shaw
Environmental Affairs Coordinator

Enc:
Response to Incompleteness Letter
Stack Sketch
BACT Analysis

PC:
C.A. Russell, CEO/GM, FKEC
T.E. Planer, Supt. Transmission, FKEC

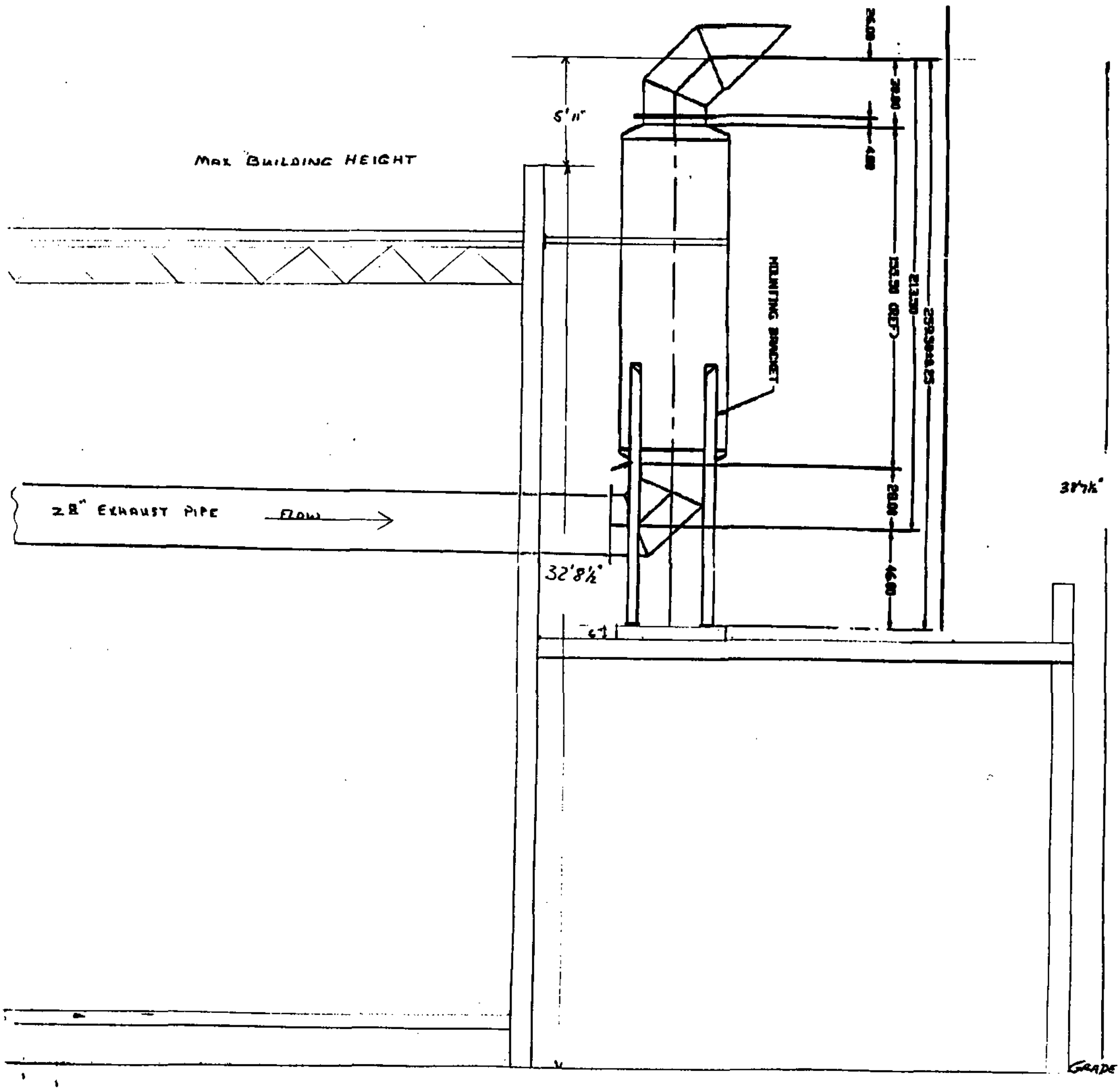
cc: S. Arif, BAR
R.J. Hebbins, Marathon
SD
EPA
NPS

FLORIDA KEYE ELECTRIC COOPERATIVE

ENGINE GEN. # 8

STACK ELEVATION DWG.

SCALE 1/4" = 1'



FLORIDA KEYS ELECTRIC COOPERATIVE
ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

Addendum to:

Air Construction/Operation Permit Application

19 May 1997

BEST AVAILABLE CONTROL TECHNOLOGY ANALYSIS

Introduction

This Best Available Control Technology (BACT) analysis is submitted as part of Florida Keys Electric Cooperative Association, Inc's (FKEC) Prevention of Significant Deterioration (PSD) application. The review is being conducted as part of the permitting process for a 3.58 MW turbocharged diesel engine (EMD 20-710G4B) to be installed at FKEC's Marathon generating plant.

The BACT analysis will be conducted for nitrogen oxides (NO_x) as the diesel engine has the potential to emit this pollutant in significant quantities if the unit were operated continuously at its maximum capacity (Table 1). Carbon monoxide (CO) emissions for this diesel if operated continuously with no emissions reductions, are estimated to be about 111 tons per year (tpy), just over the PSD significance limit of 100 tpy. The least restrictive emissions reduction technology which might be used on this engine would reduce CO emissions to a level below the PSD limit, therefore, CO will not be subjected to a full BACT analysis. Particulate matter (PM) and particulate matter less than 10 microns diameter (PM_{10}) will be emitted in less than significant levels, therefore, will not be included in the BACT analysis. Sulfur dioxide (SO_2) emissions will be reduced below significant levels by restricting fuel sulfur content to $\leq$0.05%, therefore, SO_2 will also not be included in the BACT analysis.

Table 1. Potential and expected emissions from EMD 20-710G4B (tpy).

Pollutant	Significant Levels[1]	Uncontrolled Emissions[2]	Controlled Emissions[3]	Expected Emissions[4]
NO_x	40	423 (96.6 lb/hr)	271 (36%reduction)	24.2
CO	100	111	<100	6.4
PM	25	9.5	9.1 (4% reduction)	0.6
PM_{10}	15	7.9		0.5
SO_2	40	7.2		0.5

[1] Florida Administrative Code 212.400-2.

[2] Based on operating at 100% capacity for 8760 hr/yr.

[3] Based on emissions control package offered by diesel engine vendor.

[4] Based on FKEC's historical and projected actual operating hours of 500 or less.

Best Available Control Technology

A search of the U. S. Environmental Protection Agency's (USEPA) BACT/LAER Clearinghouse database and discussions with industry vendors yielded the following NOx control technologies to be considered as BACT for diesel fired internal combustion engines listed in order from most stringent control to least:

1. Selective Catalytic Reduction (SCR)
2. Combined technologies of injection timing retardation, turbocharger with aftercoolers
3. Good combustion design/practices
4. Low sulfur fuel

Table 2 summarizes the feasibility of using these control technologies with the EMD 20-710G4B as designed for installation in FKEC's Marathon Generating Plant.

Table 2. NOx BACT Summary

Control Technology	Emission Reduction (%)	Technically Feasible	Cost Effective	Adverse Environ. Impacts	Adverse Energy Impacts
SCR with ammonia	60-90	No	No	Yes	No Data
SCR with urea	80	No	No	Yes	No Data
Timing retard; turbo charger with aftercoolers	40	Yes	Yes	No	0.3%
Dry/Low NOx	18	No			
Low sulfur fuel		Yes	Yes	No	No

Technical Analysis

Introduction

Oxides of nitrogen (NOx) are formed in combustion sources by the thermal oxidation of nitrogen in the combustion air and the reduction and subsequent oxidation of organic nitrogen chemically bound in the fuel. The rate of formation of thermal NOx is a function of residence time, free oxygen, turbulence, and peak flame temperature. Primary control techniques for NOx are aimed at minimizing one or more of these variables. Secondary control methods, involving post-combustion techniques, remove NOx from the exhaust stream.

Each of the listed control technologies will be reviewed and eliminated until a technology is reached that cannot be eliminated for technological, economic, or environmental reasons. That control technology will be selected as BACT for FKEC's EMD 20-710G4B.

Selective Catalytic Reduction

Selective Catalytic Reduction (SCR) is more widely used in Japan and Germany than it is in the United States and the technology is being improved such that some of the hazards and costs have been reduced. It remains, however, a very costly technology that has significant environmental hazards associated with the use and storage of ammonia. SCR is not generally used with diesel engines of this size. In addition, it is less effective with diesel because contaminants in diesel and lube oil (phosphorus) can render the catalyst inactive through coating the catalyst surface or contaminating it. The BACT/LEAR database lists only a single facility (Philadelphia Southwest Water Treatment Plant) (Table 3) which used SCR on diesel engines. SCR was selected in that instance because local ordinance mandated strict limits on emissions without regard to cost.

Even though, in FKEC's case, SCR is not a preferred technology because of high costs, and because of environmental and human safety factors associated with the storage and use of large quantities of ammonia in close proximity to residential areas, this technology initially appeared to be feasible for FKEC's EMD20-710G4B, therefore, it was thoroughly investigated as a possible control technology. However, FKEC was informed by the vendor that design alterations necessary to install an SCR system on this engine are impractical and that SCR should not be considered for this unit. Exhaust back pressure maximum allowance for the EMD 20-710G4B is 5 inches H_2O. An SCR system will add 5 to 6 inches H_2O back pressure, far exceeding the manufacturers specifications and recommendations. Even if the manufacturer would warrant a redesigned exhaust system, such a system would exceed the spacial limitations of the engine site. In addition re-engineering the system would add significantly to the already high cost of SCR. For the above reasons, SCR cannot be considered BACT for this unit and, therefore, will not be considered further in this analysis.

Table 3. Summary of BACT Determinations for Diesel Engines as of March 1997. (U.S.E.P.A. BACT/LEAR Clearinghouse)

RBLCID	FACILITY	UPDATE	PROCESS	THRUPUT	THRUPUTUNT	POLL.	EMISS.	PRIMEUNIT	CONTROL DESCRIPTION	%EFF.	BASIS
CA-0422	RYAN-MURPHY INCORPORATED	3/24/95	GENERATOR, DIESEL-FIRED, NON-EMERGENC	211.0	BHP @ 1800 RP	CO	0.0	LB/H	3-WAY CATALYTIC CONVERTER	90	BACT-PSD
HI-0011	CITIZENS UTILITIES CO., KAUAI ELECT. DIV	3/24/95	ENGINE, I.C. DIESEL-FIRED, 4 EACH	7.9	MW EACH	CO	156.0	PPMVD FULL LOAD	HIGH COMBUSTION EFFICIENCY	0	BACT-PSD
HI-0016	MAUI ELECTRIC COMPANY LIMITED	2/27/96	ENGINE GENERATOR, DIESEL (3)	2.2	MW	CO	210.0	PPMVD	COMBUSTION TECHNOLOGY/DESIGN	0	BACT-PSD
HI-0017	MAUI ELECTRIC COMPANY, LTD.	8/19/96	ENGINE GENERATORS (3), DIESEL	2.2	MW	CO	210.0	PPMVD	COMBUSTION TECHNOLOGY/DESIGN	0	BACT-PSD
NY-0044	BROOKLYN NAVY YARD COGENERATION PARTNERS L	6/30/95	TURBINE, OIL FIRED	240.0	MW	CO	5.0	PPM @ 15% O2		0	LAER
NY-0044	BROOKLYN NAVY YARD COGENERATION PARTNERS L	6/30/95	GENERATOR, 3000 KW EMERGENCY	3000.0	KW	CO	0.3	LB/MMBTU		0	LAER
NY-0047	PASNY/HOLTSVILLE COMBINED CYCLE PLANT	9/13/94	FIRE PUMP (DIESEL)	1.3	MMBTU/HR	CO	0.7	LB/MMBTU	COMBUSTION CONTROL	0	BACT-OTHER
NY-0072	KAMINE/BESICORP SYRACUSE LP	4/27/95	DIESEL GENERATOR (EP #00006)	22.0	MMBTU/HR	CO	0.4	LB/MMBTU, 8.27 LB/	NO CONTROLS	0	BACT-OTHER
NY-0081	LILCO SHOREHAM	3/30/95	(3) GE FRAME 7 TURBINES (EP #8 00007-	850.0	MMBTU/HR	CO	10.0	PPM, 19 7 LB/HR	NO CONTROLS	0	BACT-OTHER
PA-0083	NORTHERN CONSOLIDATED POWER	7/20/94	GENERATORS, DIESEL, 2	1135.0	KW EACH	CO	7.9	LB/H EACH		0	OTHER
PA-0096	PHILADELPHIA SOUTHWEST WATER TREATMENT PLA	3/24/95	ENGINES (11) (DIESEL)	1156.0	KW (EACH)	CO	0.0		SCR	0	OTHER
PA-0097	PHILADELPHIA NORTHEAST WATER TREATMENT PLA	3/24/95	ENGINES (7) (DIESEL)	1635.0	KW (EACH)	CO	0.0		SCR	0	OTHER
SC-0027	SOUTH CAROLINA ELECTRIC AND GAS COMPANY	3/24/95	GENERATOR, NO 2 OIL - EMERGENCY	400.0	KILOWATTS	CO	1.0	LB/HR		0	BACT-PSD
VA-0191	RW POWER PARTNERS, L.P.	3/24/95	GENERATORS, ELECTRIC (DIESEL) (3)	1200.0	KW (EACH)	CO	3.4	LB/HR	GOOD COMBUSTION PRACTICES	0	BACT-OTHER
VA-0207	PORTSMOUTH NAVAL HOSPITAL	3/24/95	GENERATORS, DIESEL, 6		GAL/YR	CO	6.4	LB/HR	RETARDING THE TIMING BY 5 DEGREES	22	NSPS
WI-0083	CARDINAL FLAT GLASS	8/11/95	GENERATOR, BACK-UP, DIESEL	0.0		CO	12.4	LBS/HR	FUEL SPEC: LOW SULFUR (0.05%) DIESEL FUEL	0	BACT-PSD
MN-0022	LSP-COTTAGE GROVE, L.P.	5/29/95	DIESEL ENGINE-DRIVEN FIRE PUMP	2.7	MMBTU/HR	H2SO4	0.0	LB/HR	FUEL SELECTION	0	BACT-PSD
AK-0026	COMINCO ALASKA INC.	3/24/95	GENERATOR, WARTSILLA #2 & #5	0.0		NO2	135 0	LB/HR	3 DEGREE TIMING RETARD	66	BACT-PSD
AK-0028	CITY OF UNALASKA	7/29/96	POWER GENERATION, DIESEL	6 5	MW	NO2	632.6	TPY	LIMIT OPERATION HOURS AND AFTERCOOLERS	0	BACT-PSD
AK-0029	CITY OF ST.PAUL POWER PLANT	7/29/96	POWER GENERATION, DIESEL	3 4	MW	NO2	427.0	TPY	AFTERCOOLERS	0	BACT-PSD
MD-0017	SOUTHERN MARYLAND ELECTRIC COOPERATIVE (SM	3/24/95	TURBINE, OIL FIRED ELECTRIC	90 0	MW	NO2	400.0	LB/HR	WATER INJECTION	0	BACT-PSD
MD-0018	PEPCO - CHALK POINT PLANT	7/20/94	TURBINE, 105 MW OIL FIRED ELECTRIC	105.0	MW	NO2	25.0	PPM @ 15% O2	DRY PREMIX BURNER	0	BACT-PSD
MD-0018	PEPCO - CHALK POINT PLANT	7/20/94	TURBINE, 84 MW OIL FIRED ELECTRIC	84.0	MW	NO2	58.0	PPM @ 15% O2	QUIET COMBUSTION AND WATER INJECTION	0	BACT-PSD
MD-0019	BALTIMORE GAS & ELECTRIC - PERRYMAN PLANT	3/24/95	TURBINE, 140 MW OIL FIRED ELECTRIC	140.0	MW	NO2	65.0	PPM @ 15% O2	WATER INJECTION	72	BACT-PSD
MD-0021	PEPCO - STATION A	7/20/94	TURBINE, 124 MW OIL FIRED	125.0	MW	NO2	77.0	PPM @ 15% O2	WATER INJECTION	0	BACT-PSD
AK-0026	COMINCO ALASKA INC	3/24/95	GENERATOR, TRANSPORTABLE	0.0		NOX	26 3	LB/HR	RESTRICTED TO 3,000 HRS/YR AND MANUF.INSTALLED CTL	0	BACT-PSD
AK-0026	COMINCO ALASKA INC.	3/24/95	GENERATOR, CATERPILLAR #1, #2 & #3	0.0		NOX	71.1	LB/YR	RESTRICTED TO 1,000,000 KWH/YR	0	BACT-PSD
CA-0417	UPF CORPORATION	3/24/95	ENGINE, DIESEL, EMERGENCY POWER GENER	410 0	HP	NOX	0 0		TURBOCHARGER/AFTERCOOLER, TIMING RETARD > OR = TO 4	40	BACT-PSD
CA-0422	RYAN-MURPHY INCORPORATED	3/24/95	GENERATOR, DIESEL-FIRED, NON-EMERGENC	211 0	BHP @ 1800 RP	NOX	2.9	LB/H	TIMING RETARDED, TURBOCHARGED WATER INJECTION*	64	BACT-PSD
CA-0453	UPF CORPORATION	3/24/95	ENGINE, DIESEL	410 0	HP	NOX	0.0		TURBOCHARGER W/ AFTERCOOLER	40	BACT-PSD
CA-0562	RESOURCE RENEWAL TECHNOLOGIES, INC	3/24/95	ENGINE, I.C.	951 0	BHP	NOX	6.6	G/B-HP-H	TURBOCHARGER, AFTERCOOLER, INJ. TIMING RETARD	40	BACT-OTHER
CA-0586	ROBISON, CARLON AND CARLON	8/5/94	GENERATOR, DIESEL	0.0		NOX	4.0	DEGREE TIMING RETA	4 DEGREE TIMING RETARD	0	BACT-OTHER
CA-0611	BANK OF AMERICA LOS ANGELES DATA CENTER	3/24/95	TURBINE, DIESEL & GENERATOR (SEE NOTE	0.0		NOX	163 0	PPM @ 15% O2	FUEL SPEC: LOW NOX DIESEL FUEL (SEE NOTES)	0	BACT-OTHER
HI-0011	CITIZENS UTILITIES CO., KAUAI ELECT. DIV.	3/24/95	ENGINE, I.C. DIESEL-FIRED, 4 EACH	7.9	MW EACH	NOX	590 0	PPMVD FULL LOAD	VARIABLE FITR, TURBOCHARGING AND INTERCOOLING	19	BACT-PSD
HI-0016	MAUI ELECTRIC COMPANY LIMITED	2/27/96	ENGINE GENERATOR, DIESEL (3)	2.2	MW	NOX	656.0	PPMVD	FUEL INJECTION TIMING RETARD WITH INTAKE AIR COOLING	0	BACT-PSD
HI-0017	MAUI ELECTRIC COMPANY, LTD.	8/19/96	ENGINE GENERATORS (3), DIESEL	2.2	MW	NOX	656.0	PPMVD	FUEL INJECTION TIMING RETARD WITH INTAKE AIR COOLING	0	BACT-PSD
MA-0015	PEABODY MUNICIPAL LIGHT PLANT	3/24/95	TURBINE, 38 MW OIL FIRED	412.0	MMBTU/HR	NOX	40.0	PPM @ 15% O2	WATER INJECTION	0	BACT-OTHER
MN-0022	LSP-COTTAGE GROVE, L.P.	5/29/95	DIESEL ENGINE-DRIVEN FIRE PUMP	2 7	MMBTU/HR	NOX	5.0	LB/HR	RETARD ENGINE TIMING, TURBOCHARGER, AFTERCOOLER	0	BACT-PSD
NY-0044	BROOKLYN NAVY YARD COGENERATION PARTNERS L	6/30/95	TURBINE, OIL FIRED	240.0	MW	NOX	10.0	PPM @ 15% O2	SCR	0	LAER
NY-0044	BROOKLYN NAVY YARD COGENERATION PARTNERS L	6/30/95	GENERATOR, 3000 KW EMERGENCY	3000.0	KW	NOX	2.6	LB/MMBTU		0	LAER
NY-0072	KAMINE/BESICORP SYRACUSE LP	4/27/95	DIESEL GENERATOR (EP #00006)	22.0	MMBTU/HR	NOX	1.2	LB/MMBTU, 26.0 LB/	NO CONTROLS	0	BACT-OTHER
NY-0081	LILCO SHOREHAM	3/30/95	(3) GE FRAME 7 TURBINES (EP #8 00007-	850.0	MMBTU/HR	NOX	55.0	PPM +FBN & HEAT RA	WATER INJECTION	30	BACT
PA-0083	NORTHERN CONSOLIDATED POWER	7/20/94	GENERATORS, DIESEL, 2	1135.0	KW EACH	NOX	36.0	LB/H EACH		0	OTHER
PA-0096	PHILADELPHIA SOUTHWEST WATER TREATMENT PLA	3/24/95	ENGINES (11) (DIESEL)	1156.0	KW (EACH)	NOX	2.0	G/B-HP-H	SCR	80	BACT-OTHER
PA-0097	PHILADELPHIA NORTHEAST WATER TREATMENT PLA	3/24/95	ENGINES (7) (DIESEL)	1635.0	KW (EACH)	NOX	2.0	G/B-HP-H	SCR	80	BACT-OTHER
SC-0027	SOUTH CAROLINA ELECTRIC AND GAS COMPANY	3/24/95	GENERATOR, NO 2 OIL - EMERGENCY	400.0	KILOWATTS	NOX	13.1	LB/HR		0	BACT-PSD
VA-0191	RW POWER PARTNERS, L.P.	3/24/95	GENERATORS, ELECTRIC (DIESEL) (3)	1200.0	KW (EACH)	NOX	137.3	LB/HR	TURBOCHARGER AND INNER COOLER	0	BACT-OTHER
VA-0207	PORTSMOUTH NAVAL HOSPITAL	3/24/95	GENERATORS, DIESEL, 6		GAL/YR	NOX	33.2	LB/HR	RETARDING THE TIMING BY 5 DEGREES	22	NSPS
WI-0083	CARDINAL FLAT GLASS	8/11/95	GENERATOR, BACK-UP, DIESEL	0.0		NOX	67.5	LBS/HR	FUEL SPEC: LOW SULFUR (0.05%) DIESEL FUEL	0	BACT-PSD
HI-0011	CITIZENS UTILITIES CO., KAUAI ELECT. DIV.	3/24/95	ENGINE, I.C. DIESEL-FIRED, 4 EACH	7.9	MW EACH	PM	0.1	LB/MMBTU FULL LOAD	DIESEL FUEL OIL, HIGH COMB. EFF.	0	BACT-PSD
HI-0017	MAUI ELECTRIC COMPANY, LTD.	8/19/96	ENGINE GENERATORS (3), DIESEL	2.2	MW	PM	0.1	GR/DSCF @ 12% CO2	COMBUSTION DESIGN	0	BACT-PSD
MA-0015	PEABODY MUNICIPAL LIGHT PLANT	3/24/95	TURBINE, 38 MW OIL FIRED	412.0	MMBTU/HR	PM	0.1	LB/MMBTU	FUEL SPECIFICATION: NO. 2 LIGHT OIL	0	BACT-OTHER
PA-0096	PHILADELPHIA SOUTHWEST WATER TREATMENT PLA	3/24/95	ENGINES (11) (DIESEL)	1156.0	KW (EACH)	PM	0.3	G/B-HP-H	SCR	0	BACT-OTHER
PA-0097	PHILADELPHIA NORTHEAST WATER TREATMENT PLA	3/24/95	ENGINES (7) (DIESEL)	1635.0	KW (EACH)	PM	0.3	G/B-HP-H	SCR	0	BACT-OTHER
WI-0083	CARDINAL FLAT GLASS	8/11/95	GENERATOR, BACK-UP, DIESEL	0.0		PM	4.8	LBS/HR	FUEL SPEC: LOW SULFUR (0.05%) DIESEL FUEL	0	BACT-PSD
NY-0072	KAMINE/BESICORP SYRACUSE LP	4/27/95	DIESEL GENERATOR (EP #00006)	22.0	MMBTU/HR	PM,PM10	0 0	LB/MMBTU, 0.53 LB/	NO CONTROLS	0	BACT-OTHER
HI-0016	MAUI ELECTRIC COMPANY LIMITED	2/27/96	ENGINE GENERATOR, DIESEL (3)	2.2	MW	PM/PM10	0.1	GR/DSCF @ 12% CO2	COMBUSTION DESIGN	0	BACT-PSD

Table 3. Summary of BACT Determinations for Diesel Engines as of March 1997. (U.S.E.P.A. BACT/LEAR Clearinghouse)

RBLCID	FACILITY	UPDATE	PROCESS	THRUPUT	THRUPUTUNT	POLL.	EMISS.	PRIMEUNIT	CONTROL DESCRIPTION	%EFF.	BASIS
CA-0422	RYAN-MURPHY INCORPORATED	3/24/95	GENERATOR, DIESEL-FIRED, NON-EMERGENC	211 0	BHP @ 1800 RP	PM10	0 1	LB/H	WATER INJECTION	40	BACT-PSD
MN-0022	LSP-COTTAGE GROVE, L.P.	5/29/95	DIESEL ENGINE-DRIVEN FIRE PUMP	2.7	MMBTU/HR	PM10	0 7	LB/HR	FUEL SELECTION; GOOD COMBUSTION	0	BACT-PSD
NY-0081	LILCO SHOREHAM	3/30/95	(3) GE FRAME 7 TURBINES (EP # 00007-	850.0	MMBTU/HR	PM10	0 0	LB/MMBTU, 10.2 LB/	NO CONTROLS	0	BACT-OTHER
AK-0026	COMINCO ALASKA INC.	3/24/95	GENERATOR, WARTSILLA #2 & #6	0.0		SO2	49 2	TPY	FUEL SPEC: 0.25% S IN FUEL	0	BACT-PSD
AK-0026	COMINCO ALASKA INC.	3/24/95	GENERATOR, TRANSPORTABLE	0.0		SO2	3.4	TPY	FUEL SPEC: 0.25% S IN FUEL	0	BACT-PSD
AK-0026	COMINCO ALASKA INC.	3/24/95	GENERATOR, CATERPILLAR #1, #2 & #3	0.0		SO2	2.3	TPY	FUEL SPEC: 0.25% S IN FUEL	0	BACT-PSD
CA-0417	UPF CORPORATION	3/24/95	ENGINE, DIESEL, EMERGENCY POWER GENER	410.0	HP	SO2	0.0		FUEL SPEC: FUEL OIL W/ < 0.05% SULFUR CONTENT	0	BACT-PSD
CA-0562	RESOURCE RENEWAL TECHNOLOGIES, INC	3/24/95	ENGINE, I.C	951.0	BHP	SO2	0 2	G/B-HP-H	FUEL SPEC: LOW SULFUR FUEL (<= 0 05% S BY WT)	75	BACT-OTHER
HI-0011	CITIZENS UTILITIES CO . KAUAI ELECT DIV.	3/24/95	ENGINE, I.C. DIESEL-FIRED, 4 EACH	7.9	MW EACH	SO2	95.0	PPMVD	FUEL SPEC: MAX FUEL S CONTENT 0.5% BY WEIGHT	0	BACT-PSD
HI-0016	MAUI ELECTRIC COMPANY LIMITED	2/27/96	ENGINE GENERATOR, DIESEL (3)	2.2	MW	SO2	76.0	PPMVD	FUEL SPEC: SULFUR CONTENT .47 BY WEIGHT	0	BACT-PSD
HI-0017	MAUI ELECTRIC COMPANY, LTD.	8/19/96	ENGINE GENERATORS (3), DIESEL	2.2	MW	SO2	76 0	PPMVD	FUEL SPEC: SULFUR CONTENT 0.4% BY WEIGHT	0	BACT-PSD
MD-0017	SOUTHERN MARYLAND ELECTRIC COOPERATIVE (SM	3/24/95	TURBINE, OIL FIRED ELECTRIC	90.0	MW	SO2	0 0		FUEL SPEC: FUEL LIMITED AND 0.3 % S	0	BACT-PSD
SC-0027	SOUTH CAROLINA ELECTRIC AND GAS COMPANY	3/24/95	GENERATOR, NO 2 OIL - EMERGENCY	400.0	KILOWATTS	SO2	1 2	LB/HR	FUEL SPEC 0.3% S CONTENT FUEL, LIMIT OPER <500 HR	0	BACT-PSD
VA-0191	RW POWER PARTNERS, L.P	3/24/95	GENERATORS, ELECTRIC (DIESEL) (3)	1200 0	KW (EACH)	SO2	18 1	LB/HR	FUEL SPEC. USE OF 0 5% SULFUR FUEL	0	BACT-OTHER
VA-0207	PORTSMOUTH NAVAL HOSPITAL	3/24/95	GENERATORS, DIESEL, 6		GAL/YR	SO2	5 4	LB/HR	RETARDING THE TIMING BY 5 DEGREES	22	NSPS
WI-0083	CARDINAL FLAT GLASS	6/11/95	GENERATOR, BACK-UP, DIESEL	0.0		SO2	0 7	LBS/HR	FUEL SPEC. LOW SULFUR (0.05%) DIESEL FUEL	0	BACT-PSD
CA-0422	RYAN-MURPHY INCORPORATED	3/24/95	GENERATOR, DIESEL-FIRED, NON-EMERGENC	211.0	BHP @ 1800 RP	SOX	0.0	LB/H AS SO4	FUEL SPEC: 0.05% DIESEL FUEL SULFUR CONTENT	0	BACT-PSD
CA-0453	UPF CORPORATION	3/24/95	ENGINE, DIESEL	410.0	HP	SOX	0 0		FUEL SPEC: FUEL OIL W/ < 0 05% SULFUR CONTENT	0	BACT-PSD
VA-0191	RW POWER PARTNERS, L P	3/24/95	GENERATORS, ELECTRIC (DIESEL) (3)	1200.0	KW (EACH)	TSP/PM10	3 4	LB/HR	GOOD COMBUSTION PRACTICES	0	BACT-OTHER
VA-0207	PORTSMOUTH NAVAL HOSPITAL	3/24/95	GENERATORS, DIESEL, 6		GAL/YR	TSP/PM10	3 6	LB/HR	RETARDING THE TIMING BY 5 DEGREES	22	NSPS
CA-0417	UPF CORPORATION	3/24/95	ENGINE, DIESEL, EMERGENCY POWER GENER	410.0	HP	VE	0.0	% OPACITY	CRANKCASE COLLECTOR	90	BACT-PSD
CA-0422	RYAN-MURPHY INCORPORATED	3/24/95	GENERATOR, DIESEL-FIRED, NON-EMERGENC	211.0	BHP @ 1800 RP	VE	0.0	% OPACITY	POSITIVE CRANKCASE VENT VALVE	100	BACT-PSD
SC-0027	SOUTH CAROLINA ELECTRIC AND GAS COMPANY	3/24/95	GENERATOR, NO 2 OIL - EMERGENCY	400.0	KILOWATTS	VE	20.0	% OPACITY		0	BACT-PSD
AK-0026	COMINCO ALASKA INC.	3/24/95	GENERATOR, WARTSILLA #2 & #6	0.0		VOC	6.1	LBS/HR	3 DEGREE TIMING RETARD	0	BACT-PSD
CA-0422	RYAN-MURPHY INCORPORATED	3/24/95	GENERATOR, DIESEL-FIRED, NON-EMERGENC	211.0	BHP @ 1800 RP	VOC	0.1	LB/H	3-WAY CAT. CONVERTER, POSITIVE CRANKCASE VENT.	30	BACT-PSD
CA-0562	RESOURCE RENEWAL TECHNOLOGIES, INC	3/24/95	ENGINE, I.C	951.0	BHP	VOC	0 3	G/B-HP-H	POSITIVE CRANKCASE VENTILATION	0	BACT-OTHER
HI-0011	CITIZENS UTILITIES CO., KAUAI ELECT. DIV.	3/24/95	ENGINE, I.C. DIESEL-FIRED, 4 EACH	7.9	MW EACH	VOC	228.0	PPMVD FULL LOAD	HIGH COMBUSTION EFFICIENCY	0	BACT-PSD
HI-0016	MAUI ELECTRIC COMPANY LIMITED	2/27/96	ENGINE GENERATOR, DIESEL (3)	2 2	MW	VOC	81 0	PPMVD	COMBUSTION DESIGN (INCLUDING FITR)	0	BACT-PSD
HI-0017	MAUI ELECTRIC COMPANY, LTD	8/19/96	ENGINE GENERATORS (3), DIESEL	2 2	MW	VOC	81 0	PPMVD	COMBUSTION DESIGN, INCLUDING FITR	0	BACT-PSD
MN-0022	LSP-COTTAGE GROVE, L.P.	5/29/95	DIESEL ENGINE-DRIVEN FIRE PUMP	2.7	MMBTU/HR	VOC	1 9	LB/HR	FUEL SELECTION; GOOD COMBUSTION	0	BACT-PSD
NY-0072	KAMINE/BESICORP SYRACUSE LP	4/27/95	DIESEL GENERATOR (EP #00005)	22.0	MMBTU/HR	VOC	0 0	LB/MMBTU, 0 34 LB/	NO CONTROLS	0	BACT-OTHER
PA-0096	PHILADELPHIA SOUTHWEST WATER TREATMENT PLA	3/24/95	ENGINES (11) (DIESEL)	1156.0	KW (EACH)	VOC	0 0		SCR	0	OTHER
PA-0097	PHILADELPHIA NORTHEAST WATER TREATMENT PLA	3/24/95	ENGINES (7) (DIESEL)	1635.0	KW (EACH)	VOC	0.0		SCR	0	OTHER
VA-0191	RW POWER PARTNERS, L.P.	3/24/95	GENERATORS, ELECTRIC (DIESEL) (3)	1200.0	KW (EACH)	VOC	4 6	LB/HR	GOOD COMBUSTION PRACTICES	0	BACT-OTHER
VA-0207	PORTSMOUTH NAVAL HOSPITAL	3/24/95	GENERATORS, DIESEL, 6		GAL/YR	VOC	0.9	LB/HR	RETARDING THE TIMING BY 5 DEGREES	22	NSPS

Injection Timing Retardation/Aftercoolers

The next most stringent control technology is to modify the combustion process through a combination of fuel injection timing retardation and cooling of combustion air resulting in exhaust temperature reduction. The design specific to FKEC's EMD 20-710G4B includes 4° injection timing retardation and a 4-pass aftercooler circuit with the addition of a separately cooled aftercooler circuit. The combination of retarded injection timing and lowered combustion air temperature results in less NOx formation. Vendor's data indicate that retarding injection timing will reduce NOx formation by about 20%, but will increase PM emissions by about 10% and fuel consumption by 1.5%. The 4-pass aftercooler will reduce both NOx and PM emissions by about 10% while reducing fuel consumption by about 0.7%. The separately cooled aftercooling circuit will decrease both NOx and PM by another 10% and fuel consumption by 0.5%. The net result will be a 40% reduction in NOx, a 5% increase in PM and about a 0.3% increase in fuel consumption. The use of low sulfur fuel will reduce PM emissions thus reducing or eliminating the increase in PM caused by NOx controls. This combination of NOx controls, proper engine design, good combustion practices, and the use of low sulfur fuel should provide effective emissions control.

The cost of this emissions control package is about $1285/ton of NOx reduction (Tables 4 - 7) which is within Florida Department of Environmental Protection's acceptable limits. There are no significant adverse environmental or energy impacts associated with this technology, therefore, BACT for FKEC's EMD 20-710G4B is determined to be a combination of fuel injection timing retardation 4°, a 4-pass aftercooler circuit with a separately cooled aftercooler circuit, good combustion practices and the use of low sulfur fuel ($\leq$0.05%).

Table 4. Capital Cost Estimation Factors

COSTS	FORMAT
DIRECT COSTS	
1) Purchased Equipment	
a) Basic Equipment	Vendor Data
b) Auxiliaries	Vendor Data
c) Instrumentation	0.10(1a+1b)
d) Structural Support	0.10(1a+1b)
e) Freight	0.05(sum 1a...1d)
2) Direct Installation	0.25 - 0.30 (sum 1a...1e)
Total Direct Cost (TDC)	(1) + (2)
INDIRECT COSTS	
3) Indirect Installation	
a) Engineering	(0.05 to 0.10) (TDC)
b) Construction and Field Expenses	0.10(TDC)
c) Construction Fee	0.05(TDC)
d) Contingencies	0.20(TDC)
4) Start-up and Testing	0.01(TDC)
Total Indirect Costs (TIC)	(3) + (4)
Total Capital Costs	TDC + TIC

Source: EPA OAQPS Cost Manual, 1990.

Table 5. Capital Costs for NOx Controls for EMD 20-210G4B

DIRECT COSTS	
1) Purchased Emissions Reduction Package:	
a) Timing Retardation 4 °	$ 5,700.
b) Separately Cooled aftercooler	26,100.
c) Turbocharger/Aftercooler	107,500.
d) Instrumentation	13,930.
e) Structural Support	13,930.
f) Freight	8,358.
2) Direct Installation	52,655.
Total Direct Costs	228,173.
INDIRECT COSTS	
3) Indirect Installation	
a) Engineering	22,817.
b) Construction and Field Expenses	22,817.
c) Construction Fee	11,407.
d) Contingencies	45,635.
4) Start-up and Emissions Testing	20,420. (Vendor Data)
Total Indirect Costs	123,096.
Total Capital Costs	$351,269.

Table 6. Annualized Cost Factors

DIRECT OPERATING COSTS	FACTOR
1) Labor	
a. Operating	$40.00/man-hr
b. Supervisor	15% of Operating Labor
2) Maintenance	5% of Direct Costs
3) Replacement Parts	3% of Direct Costs
4) Utilities	
a. Electricity	$0.07/kW-hr
c. Fuel Penalty	
INDIRECT OPERATING COSTS	
6) Overhead	30% Labor + 12% Maintenance
7) Property Tax	1% Total Capital Cost
8) Insurance	1% Total Capital Cost
9) Administration	2% Total Capital Cost
10) Capital Recovery	Capital Recovery x TDC
Total Annualized Cost	Sum (1...10)
Cost Effectiveness	Annual Cost/Tons Removed

Source: EPA OAQPS Cost Manual, 1990.

Table 7. Annualized Cost Factors

DIRECT OPERATING COSTS	FACTOR
1) Labor	
a. Operating	$ 41,600.
b. Supervisor	6,240.
2) Maintenance	11,408.
3) Replacement Parts	68,452.
4) Utilities	
a. Electricity	34,309.
c. Fuel Penalty	3,513.
INDIRECT OPERATING COSTS	
6) Overhead	15,721.
7) Property Tax	3,513.
8) Insurance	3,513.
9) Administration	7,025.
10) Capital Recovery	
Total Annualized Cost	195,294. (w/o Cap. Recovery)
Cost Effectiveness	$1,285.

FLORIDA KEYS ELECTRIC COOPERATIVE
ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

Mr. Syed Arif
Dept. of Environmental Protection
Bureau of Air Resources
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

Re: BACT Analysis response to Incompleteness Letter of 2/13/97.

14 May 1997

Dear Mr. Arif:

I will address the three items of your incompleteness letter in order as they appeared in your letter.

1. Sulfur content of fuel - The EMD 20-710G4B will burn low sulfur diesel ($\leq$ 0.05%S) which will reduce sulfur dioxide emission below Prevention of Significant Deterioration (PSD) levels.

2. PSD pollutants - The original emissions calculations were based on outdated factors taken from the Environmental Protection Agency (EPA) BACT/LEAR Clearinghouse database. After consulting with EPA personnel, I was referred to the current database (FIRE v 5.1B, 1997) for emission factors. Using the new emission factors, PM and PM_{10} emissions are below PSD levels. NO_x emissions remain above PSD levels and are the subject of the attached BACT analysis. CO emissions are marginally above the PSD levels, but EPA acknowledges that its emission factors are imprecise and that, FKEC's CO levels might actually be below PSD levels. It is believed that the control measures to be used for NO_x in addition to good combustion practices and the use of low S fuel will result in net CO emissions below PSD levels therefore no separate control should be necessary for CO.

3. Ambient air quality standards (AAQS) air modeling - The flat terrain of the Marathon area, its air modeling classification of "rural" (because more than 50% of the surrounding area is "water surfaces" - *USEPA Guideline on Air Quality Models*) combined with the ESE prevailing wind which brings relatively clean air from the open ocean and the lack of heavy industry in the area contribute to the area's designation as attainment for all criteria pollutants. Discussions with DEP's Cleve Halladay (DEP air modeler) and "screening" air modeling based on the Marathon

Generating Plant site predicted that only PM and PM_{10} emissions would exceed AAQS (based on the original calculations). Calculations using EPA's new factors show those emissions to be below PSD levels, therefore, the engine's emissions will not exceed AAQS. The exhaust stack follows good engineering design and has been raised an additional 45 inches to minimize any local air entrapment (drawing attached).

Attached, please find the BACT analysis for Florida Keys Electric Cooperative's PSD review. In order to expedite the review process, I am faxing it to you. I will mail the original to you. Please call me if any additional information is required. Thank you for your continued assistance in this long process.

Sincerely,

Deborah A. Shaw
Environmental Affairs Coordinator

Enc:
Stack Sketch
BACT Analysis

PC:
C.A. Russell, CEO/GM, FKEC
T.E. Planer, Supt. Transmission , FKEC

FLORIDA KEYS ELECTRIC COOPERATIVE ASSOCIATION, INC. - FKEC

91605 OVERSEAS HIGHWAY P.O. BOX 700377, TAVERNIER, FL 33070-0377 PHONE (305) 852-2431 FAX: (305) 852-4794

RECEIVED
APR 09 1997
BUREAU OF
AIR REGULATION

Mr. Syed Arif
Dept. of Environmental Protection
Bureau of Air Resources
Mail Station 5505
2600 Blairstone Rd.
Tallahassee, FL 32399-2400

Re: Changes to application for air construction permit.

0870004-002-AC
PSD-FL-237

7 April 1977

Dear Mr. Arif:

As per my discussions with you and Cleve Holladay, I have modified the calculations for engine emissions using the most recent EPA emissions standards (FIRE version 5.1B, 1997). Please use the enclosed applications sheets (7) to replace the corresponding sheets in our application packet. I am also sending replacement sheets to Cleve and Art Lyall.

Please call me if you have any questions. Thank you.

Sincerely,

Deborah A. Shaw

Deborah A. Shaw
Environmental Affairs Coordinator

pc:
C.A. Russell, CEO/GM, FKEC
T.E. Planer, Supt. Transmission , FKEC
C. Holladay, Air Modeling, FDEP-Tallahassee
A.E. Lyall, Engr., FDEP- Ft. Myers
EPA
NPS
R.J. Hebling, Marathon
D. Knowles, SD

F. SEGMENT (PROCESS/FUEL) INFORMATION
(Regulated and Unregulated Emissions Units)

Segment Description and Rate: Segment 1 of 1

1. Segment Description (Process/Fuel Type and Associated Operating Method/Mode) (limit to 500 characters):

   No. 2 Fuel Oil burned in diesel engine.

2. Source Classification Code (SCC): 2 - 02 - 004 - 01

3. SCC Units: Thousand gallons burned

4. Maximum Hourly Rate: 0.229 Thousand gal.

5. Maximum Annual Rate: 2,006

6. Estimated Annual Activity Factor:

7. Maximum Percent Sulfur: 0.1%

8. Maximum Percent Ash:

9. Million Btu per SCC Unit: 132

10. Segment Comment (limit to 200 characters):

    Florida Keys Electric Cooperative Association, Inc., is voluntarily switching to 0.05% sulfur diesel for this engine to reduce SO_2 emissions.

H. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units Only - Emissions Limited Pollutants Only)

Pollutant Detail Information:

1. Pollutant Emitted: CO

2. Total Percent Efficiency of Control: %

3. Potential Emissions: 25.4 lb/hour 111 tons/year [See # 9]

4. Synthetically Limited?
   ☐ Yes ☒ No

5. Range of Estimated Fugitive/Other Emissions:
   ☐ 1 ☐ 2 ☐ 3 ______ to ______ tons/year

6. Emission Factor: 0.84 lbs/MMBtu
   Reference: EPA FIRE v.5.1B, 1997

7. Emissions Method Code:
   ☐ 0 ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5

8. Calculation of Emissions (limit to 600 characters):

   0.84 lbs/MMBtu x 30.2 MMBtu/hr = 25.4 lbs/hr

   25.4 lbs/hr x 8760 hrs/yr ÷ 2000 lbs/ton = 111.3 tpy

   229 gal/hr Fuel Consumption

9. Pollutant Potential/Estimated Emissions Comment (limit to 200 characters):

   Based on anticipated, actual operating hours of < 500 hrs/yr, actual CO emissions will be < 6.4 tpy.

H. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units Only - Emissions Limited Pollutants Only)

Pollutant Detail Information:

1. Pollutant Emitted: NO_x

2. Total Percent Efficiency of Control: 36 %

3. Potential Emissions: 96.6 lb/hour 423 tons/year [See # 9]

4. Synthetically Limited?
☐ Yes ☒ No

5. Range of Estimated Fugitive/Other Emissions:
☐ 1 ☐ 2 ☐ 3 ______ to ______ tons/year

6. Emission Factor: 3.2 lbs/MMBtu
Reference: EPA FIRE v.5.1B, 1997

7. Emissions Method Code:
☐ 0 ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5

8. Calculation of Emissions (limit to 600 characters):

3.2 lbs/MMBtu x 30.2 MMBtu/hr = 96.6 lbs/hr

96.6 lbs/hr x 8760 hrs/yr ÷ 2000 lbs/ton = 423 tpy.

9. Pollutant Potential/Estimated Emissions Comment (limit to 200 characters):

Based on anticipated, actual operating hours of < 500 hrs/yr, actual NO_x emissions will be < 24.2 tpy.

H. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units Only - Emissions Limited Pollutants Only)

Pollutant Detail Information:

1. Pollutant Emitted: PM

2. Total Percent Efficiency of Control: %

3. Potential Emissions: 2.18 lb/hour 9.5 tons/year [See # 9]

4. Synthetically Limited?
☐ Yes ☒ No

5. Range of Estimated Fugitive/Other Emissions:
☐ 1 ☐ 2 ☐ 3 ______ to ______ tons/year

6. Emission Factor: 9.55 lbs/1000 gal
Reference: EPA FIRE v.5.1B, 1997

7. Emissions Method Code:
☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5

8. Calculation of Emissions (limit to 600 characters):

9.55 lbs/1000 gal x 1000 gal/132 MMBtu x 30.2 MMBtu/hr = 2.18 lbs/hr

2.18 lbs/hr x 8760 hrs/yr ÷ 2000 lbs/ton = 9.5 tpy.

9. Pollutant Potential/Estimated Emissions Comment (limit to 200 characters):

Based on anticipated, actual operating hours of < 500 hrs/yr, actual PM emissions will be < 0.6 tpy.

H. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units Only - Emissions Limited Pollutants Only)

Pollutant Detail Information:

1. Pollutant Emitted: PM_{10}

2. Total Percent Efficiency of Control: %

3. Potential Emissions: 1.80 lb/hour 7.9 tons/year [See # 9]

4. Synthetically Limited?

   ☐ Yes ☒ No

5. Range of Estimated Fugitive/Other Emissions:

   ☐ 1 ☐ 2 ☐ 3 ______ to ______ tons/year

6. Emission Factor: 7.85 lbs/1000 gal

   Reference: EPA FIRE v.5.1B, 1997

7. Emissions Method Code:

   ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☒ 5

8. Calculation of Emissions (limit to 600 characters):

   7.85 lbs/1000 gal x 1000 gal/132 MMBtu x 30.2 MMBtu/hr = 1.80 lbs/hr

   1.80 lbs/hr x 8760 hrs/yr ÷ 2000 lbs/ton = 7.9 tpy.

9. Pollutant Potential/Estimated Emissions Comment (limit to 200 characters):

   Based on anticipated, actual operating hours of < 500 hrs/yr, actual PM_{10} emissions will be < 0.5 tpy.

H. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units Only - Emissions Limited Pollutants Only)

Pollutant Detail Information:

1. Pollutant Emitted: SO_2

2. Total Percent Efficiency of Control: %

3. Potential Emissions: 1.65 lb/hour 7 tons/year [See # 9]

4. Synthetically Limited?
   ☐ Yes ☒ No

5. Range of Estimated Fugitive/Other Emissions:
   ☐ 1 ☐ 2 ☐ 3 ______ to ______ tons/year

6. Emission Factor:
   Reference: Mass Balance

7. Emissions Method Code:
   ☐ 0 ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5

8. Calculation of Emissions (limit to 600 characters):

   1000 gal/132 MMBtu x 7.2 lbs/gal x 0.05% S x 2 = 0.0545 lbs/MMBtu

   0.0545 lbs/MMBtu x 30.2 MMBtu/hr = 1.65 lbs/hr

   1.65 lbs/hr x 8760 hrs/yr ÷ 2000 lbs/ton = 7.2 tpy.

9. Pollutant Potential/Estimated Emissions Comment (limit to 200 characters):

   Based on anticipated, actual operating hours of < 500 hrs/yr, actual SO_2 emissions will be < 0.5 tpy.

H. EMISSIONS UNIT POLLUTANT DETAIL INFORMATION
(Regulated Emissions Units Only - Emissions Limited Pollutants Only)

Pollutant Detail Information:

1. Pollutant Emitted: VOC

2. Total Percent Efficiency of Control: %

3. Potential Emissions: 3.13 lb/hour 13.7 tons/year [See # 9]

4. Synthetically Limited?
   ☐ Yes ☒ No

5. Range of Estimated Fugitive/Other Emissions:
   ☐ 1 ☐ 2 ☐ 3 ______ to ______ tons/year

6. Emission Factor: 13.7 lbs/1000 gal
   Reference: EPA FIRE v.5.1B, 1997

7. Emissions Method Code:
   ☐ 0 ☐ 1 ☐ 2 ☒ 3 ☐ 4 ☐ 5

8. Calculation of Emissions (limit to 600 characters):

   13.7 lbs/gal x 1000 gal/132 MMBtu x 30.2 MMBtu/hr = 3.13 lbs/hr

   3.13 lbs/hr x 8760 hrs/yr ÷ 2000 lbs/ton = 13.7 tpy.

9. Pollutant Potential/Estimated Emissions Comment (limit to 200 characters):

   Based on anticipated, actual operating hours of < 500 hrs/yr, actual VOC emissions will be < 0.8 tpy.

Department of Environmental Protection

Lawton Chiles
Governor

Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Virginia B. Wetherell
Secretary

February 13, 1997

CERTIFIED MAIL - RETURN RECEIPT REQUESTED

Ms. Deborah A. Shaw
Environmental Affairs Coordinator
Florida Keys Electric Cooperative Association,
Inc. - FKEC
91605 Overseas Highway
P.O. Box 700377
Tavernier, FL 33070-0377

Re: DRAFT Permit No. 087004-002-AC, PSD-FL-237
Marathon Generating Plant

Dear Ms. Shaw:

The Department has reviewed your application for an air construction/operation permit for a 3.58 MW diesel generator for your Marathon Generating Plant. The application was received on January 27, 1997. We need the additional information listed below to process this request.

1. The application states that No. 2 fuel oil with maximum sulfur content of 0.5% will be burned in the Diesel Engine. Later, in the application, calculations were done using a different sulfur content of 0.05% to determine if SO_2 will trigger Prevention of Significant Deterioration (PSD) review. Based on those calculations, SO_2 was non-PSD. Please indicate what is the correct sulfur content of the No. 2 fuel oil. If it is 0.5%, SO_2 will also be a PSD pollutant, and a Best Available Control Technology (BACT) determination will be required for that pollutant.

2. Based on the calculations submitted with the application, CO, NO_x, PM and PM_{10} are PSD pollutants. Please provide the available control technologies for those pollutants for a diesel generator. Documentation, including actual cost data, should be provided for the chosen control technology as well as those that are economically infeasible for this project.

3. PSD regulations require air quality impact analyses for all pollutants subject to PSD review. The analyses required for each pollutant are the following: (1) an analyis of existing air quality, (2) a significant impact analysis to determine whether multiple source modeling is required, (3) a PSD increment analysis for both the PSD Class II area in the vicinity of the generating plant and for the Everglades National Park (ENP) Class I area, (4) an ambient air quality standards analysis (AAQS) in the vicinity of the plant, (5) an additional impacts analysis to include an air quality related values (AQRV) analysis for both PSD Class I area in the vicinity of the generating plant and the ENP PSD Class I area, and (6) a good engineering stack height

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analysis. Please provide these analyses using department approved models and modeling methods for all pollutants subject to PSD review.

We are enclosing a New Source Review Workshop Manual for your review that will be of some help in answering the incompleteness questions. Please return the manual at your earliest convenience. The Department will resume processing this application after receipt of the requested information.. If you have any questions on this matter, please call Al Linero, Syed Arif or Cleve Holladay at 904/488-1344.

Sincerely,

2/13

A. A. Linero, P.E.
Administrator
New Source Review Section

AAL/sa

cc: Mr. Brian Beals, EPA
Mr. John Bunyak, NPS
Mr. David Knowles, DEP
Mr. R. J. Hebling, Marathon Office

P 265 659 168

US Postal Service

Receipt for Certified Mail

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Street & Number	Fla. Keys Elect.
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Postage	$
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Return Receipt Showing to Whom, Date, & Addressee's Address	
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087004-002-AC
PSD-FI-237

PS Form 3800, April 1995

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- 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 below the article number.
- The Return Receipt will show to whom the article was delivered and the date delivered.

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:
Deborah A. Shaw, EAC
Fla. Keys Electric Coop
91605 Overseas Hwy
PO Box 700377
Tavernier, Fl
33070-0377

4a. Article Number
P 265 659 168

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

7. Date of Delivery

5. Signature (Addressee)

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

6. Signature (Agent)
Janice Nagy (KE)

PS Form 3811, December 1991 ★U.S. GPO: 1993—352-714 **DOMESTIC RETURN RECEIPT**

Thank you for using Return Receipt Service.