Florida Department of Environmental Regulation

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

Bob Martinez, Governor | Dale Twachtmann, Secretary | John Shearer, Assistant Secretary

STATE OF FLORIDA
DEPARTMENT OF ENVIRONMENTAL REGULATION
NOTICE OF PERMIT

Mr. Robert R. Padron
Key West Electric System
1006 James Street
Key West, Florida 33041

June 6, 1989

Enclosed is permit No. AC 44-152197, PSD-FL-135, for the two diesel generator project to be located at the Stock Island facility in Monroe County, Florida. This permit is issued pursuant to Section 403, Florida Statutes.

Any party to this permit has the right to seek judicial review of the permit pursuant to Section 120.68, Florida Statutes, by the filing of a Notice of Appeal pursuant to Rule 9.110, Florida Rules of Appellate Procedure, with the Clerk of the Department in the Office of General Counsel, 2600 Blair Stone Road, Tallahassee, Florida 32399-2400; and by filing a copy of the Notice of Appeal accompanied by the applicable filing fees with the appropriate District Court of Appeal. The Notice of Appeal must be filed within 30 days from the date this permit is filed with the Clerk of the Department.

Executed in Tallahassee, Florida.

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

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

Copy furnished to:

D. Knowles, SF District
W. Aronson, EPA
C. Shaver, NPS
D. Swann, P.E./ M. Henderson, R.W.Beck

CERTIFICATE OF SERVICE

The undersigned duly designated deputy clerk hereby certifies that this NOTICE OF PERMIT and all copies were mailed before the close of business on June 6, 1989.

FILING AND ACKNOWLEDGEMENT
FILED, on this date, pursuant to §120.52(9), Florida Statutes, with the designated Department Clerk, receipt of which is hereby acknowledged.

Iris A. Littleton — Clerk

June 6, 1989 — Date

Final Determination

Utility Board of the City of Key West
Key West, Monroe County, Florida

Diesel Engine Generating Station

Permit Numbers:
AC 44-152197

PSD-FL-135

Florida Department of Environmental Regulation
Bureau of Air Quality Management
Central Air Permitting

June 2, 1989

Final Determination

Key West's permit application for the two diesel engine generator facility at the Stock Island Plant in Monroe County, Florida, has been reviewed by the Bureau of Air Quality Management. Comments were received in response to the Public Notice published in The Key West Citizen on April 19, 1989. The Public Notice was also published in The Florida Keys Keynoter, and The Reporter.

A comment was received from EPA (Attachment 16) requesting a re-evaluation of the BACT determination. EPA has since met with the applicant and DER to discuss and resolve the various BACT issues. The BACT determination will be amended to reflect consideration of EPA's comments.

Comments dated April 25 (Attachment 17) and May 24 (Attachment 18), 1989, were received from the City of Key West justifying the BACT determination and requesting that operational limits be put on a facility basis instead of each engine. The Department will reword Specific Condition Nos. 1 and 4 to reflect agreement with the comment on operational limits. Also the permit expiration date will be extended to allow adequate time for construction.

The final action of the Department will be to issue the permit as proposed in the Preliminary Determination with amended Specific Conditions Nos. 1 and 4, as mentioned above, and a revised expiration date.

THE KEY WEST CITIZEN

Published Daily

Key West, Monroe County, Florida 33040

STATE OF FLORIDA)
ss.
COUNTY OF MONROE)

Before the undersiged authority personally appeared.....

Ruth T. Peeples, who on oath says that she is .....

~~Advertising~~ Manager of the Key West Citizen, a daily newspaper published at Key West in Monroe County, Florida; that the attached copy of advertisement, being a

Legal

in the matter of

State of Fla.
Envir. Regulation
Notice of Intent
to Issue

was published in said newspaper in the issues of

3/29/89

Affiant further says that the said The Key West Citizen is a newspaper published at Key West, in said Monroe County, Florida, and that the said newspaper has heretofore been continuously published in said Monroe County, Florida, each day (except Saturdays) and has been entered as second class mail matter at the Post Office in Key West, in said Monroe County, Florida, for a period of one year next preceeding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Ruth T. Peeples

(SEAL)

NOTARY PUBLIC STATE OF FLORIDA
MY COMMISSION EXP JULY 27,1991
BONDED THRU GENERAL INS. UND.

SWORN AND SUBSCRIBED before me this 31 day of March 1989.

Betty Lusk
NOTARY PUBLIC

COMMISSION EXPIRES:

State of Florida Department of Environmental Regulation

Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit to Key West City Electric System, 1006 James Street, Key West, Florida, 33041, to construct two 10 MW diesel generators at the Stock Island plant in Monroe County, Florida. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

The project will involve the shut down of three 16.5 MW steam units located at the Key West Plant and the construction of two 10 MW diesel generators at the Stock Island plant.

A determination of Best Available Control Technology (BACT) was required. BACT review was conducted for nitrogen oxides, carbon monoxide, sulfur dioxide, particulates and volatile organic compounds. In determining the BACT, the Department has considered toxics and those air pollutants not regulated by the Clean Air Act. A discussion of how BACT was etermined is included in the Department's preliminary determination.

The maximum degree of increment consumed is as follows:

Pollutant	Class I, % Consumed			Class II, % Consumed		
	3-hr	24-hr	Annual	3-hr	24-hr	Annual
SO_2	-	-	-	23	51	2
TSP	-	-	-	-	25	1
NO_2	-	-	2	-	-	22

The maximum combined pollutant concentrations from the two diesel engines and other sources in the area will be less than the National Ambient Air Quality Standards (NAAQS). The NAAQS are levels set by the EPA which identify the ambient concentration necessary to protect human health and welfare with an adequate margin of safety.

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 fourteen (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.

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

Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee FL 32399-2400

Dept. of Environmental Regulation
South Florida District Office
2269 Bay Street
Ft. Myers FL 33901-2898

Dept. of Environmental Regulation
South Florida District Branch Office
11400 Overseas Hwy., Suites 219-224
Marathon FL 33050

Any person may send written comments or request a public hearing on the proposed action to Mr. Bill Thomas at the Department's Tallahassee address. All comments mailed within 30 days of the publication of this notice will be considered in the Department's final determination. Furthermore, a public hearing can be requested by any person. Such requests must be submitted within 30 days of this notice.

March 29, 1989

PROOF OF PUBLICATION

THE FLORIDA KEYS KEYNOTER
Published Twice Weekly
MARATHON, MONROE COUNTY, FLORIDA

STATE OF FLORIDA
COUNTY OF MONROE

Before the undersigned authority personally appeared Charlotte Sikora who on oath says
that he/she is Sales Manager of the FLORIDA KEYS KEYNOTER a twice weekly newspaper published at Marathon, in
Monroe County, Florida; that the attached copy of advertisement, being a Notice of Intent to Issue
in the matter of 2 diesel generators, Key West City Electric System in the
Court was published in said newspaper in the issues of March 29, 1989

Affiant further says that the said FLORIDA KEYS KEYNOTER is a newspaper published at MARATHON in said Monroe County, Florida, and that the said newspaper has heretofore been continuously published in said Monroe County, Florida twice each week for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he/she has neither paid nor promised any person, firm or corporation any discount, rebate, commission or refund for the purpose of securing this advertisement for publication in the said newspaper.

Charlotte Sikora

Sworn to and subscribed before me this 30 day of March AD 1989

Faye Miller
NOTARY PUBLIC STATE OF FLORIDA
MY COMMISSION EXP SEPT 20, 1992
BONDED THRU GENERAL INS UND

State of Florida
Department of Environmental Regulation
Notice of Intent to Issue

The Department of Environmental Regulation hereby gives notice of its inter issue a permit to Key West City Electric System, 1006 James Street, Key W Florida, 33041, to construct two 10 MW diesel generators at the Stock Island p in Monroe County, Florida. The Department is issuing this Intent to Issue for reasons stated in the Technical Evaluation and Preliminary Determination.

The project will involve the shut down of three 16.5 MW steam units located at Key West Plant and the construction of two 10 MW diesel generators at the S Island plant.

A determination of Best Available Control Technology (BACT) was req BACT review was conducted for nitrogen oxides, carbon monoxide, dioxide, particulates and volatile organic compounds. In determining BACT, Department has considered toxics and those air pollutants not regulated by Clean Air Act. A discussion of how BACT was determined is included in the partment's preliminary determination.

The maximum degress of increment consumed is as follows:

Pollutant	Class I, % Consumed 3-hr	24-hr	Annual	Class II, % Consumed 3-hr	24-hr	Annual
SO_2	–	–	–	23	51	2
TSP	–	–	–	–	29	1
NO_2	–	–	2	–	–	22

The maximum combined pollutant concentrations from the two diesel engin and other sources in the area will be less than the National Ambient Air Quali Standards (NAAQS). The NAAQS are levels set by the EPA which identify th ambient concentration necessary to protect human health and welfare with a adequate margin of safety.

A person whose substantial interests are affected by the Department's propose permitting decision may petition for an administrative proceeding (hearing) accordance with Section 120.57, Florida Statutes. The petition must contain t information set forth below and must be filed (received) in the Office of Gener Counsel of the Department at 2600 Blair Stone Road, Tallahassee, Florid 32399-2400, within fourteen (14) days of publication of this notice. Petitioner shal 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 waiver of any right such person may have to request an administrativ determination (hearing) under Section 120.57, Florida Statutes.

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

Dept. of Environmental Regulation
South Florida District Office
2269 Bay Street
Ft. Myers, Florida 33901-2896

Dept. of Environmental Regulation
South Florida District Branch Office
11400 Overseas Hwy., Suites 219-224
Marathon, Florida 33050

Any person may send written comments or request a public hearing on the proposed action to Mr. Bill Thomas at the Department's Tallahassee address. All comments mailed within 30 days of the publication of this notice will be considered in the Department's final determination. Furthermore, a public hearing can be requested by any person. Such requests must be submitted within 30 days of this notice.

The Reporter
SERVING THE UPPER KEYS
BOX 1197, TAVERNIER, FL. 33070

PROOF OF PUBLICATION

STATE OF FLORIDA)

COUNTY OF MONROE)

Before the undersigned authority personally appeared DAGNY WOLFF, who on oath, says that he is EDITOR & PUBLISHER of THE REPORTER, a weekly newspaper published at Tavernier, Monroe County, Florida; that the attached copy of advertisement, being a LEGAL NOTICE

IN THE MATTER OF NOTICE OF INTENT TO ISSUE in the _____ Court, was published in said newspaper in the issues of MARCH 30TH, 1989.

Affiant further says that the said REPORTER is a newspaper published at Tavernier, in said Monroe County, Florida, and that the said newspaper has heretofore been continuously published in the said Monroe County, Florida, each week (on Thursday), and has been entered as second class mail matter at the Post Office in Tavernier, in said County of Monroe, Florida, for a period of one year next preceding the first publication of the attached copy of advertisement; and affiant further says that he has neither paid nor promised any firm, person, or corporation any discount, rebate, commission or refund for the purpose of securing this said advertisement for publication in the said newspaper.

Dagny Wolff

SEAL

SWORN TO AND SUBSCRIBED BEFORE ME THIS 30TH DAY OF MARCH, A.D., 19 89.

NOTARY PUBLIC

NOTARY PUBLIC STATE OF FLORIDA
MY COMMISSION EXP. APR. 2,1991
BONDED THRU GENERAL INS. UND.

MY COMMISSION EXPIRES: _____

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

The Department of Environmental Regulation hereby gives notice of its intent to issue a permit to Key West City Electric System, 1006 James Street, Key West, Florida, 33041; to construct two 10 MW diesel generators at the Stock Island plant in Monroe County, Florida. The Department is issuing this Intent to Issue for the reasons stated in the Technical Evaluation and Preliminary Determination.

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Published: 3/30/89
The Reporter
Tavernier, FL 33070

Best Available Control Technology (BACT) Determination
Key West City Electric System
Monroe County

The applicant proposes to install two diesel generators at their Stock Island Plant at Key West, Monroe County, Florida. The generation facility will consist of two diesel engines with an electric generation capability of 9,605 kw each. The total heat input per engine is 100 MMBtu/hr.

The applicant has indicated the maximum total annual tonnage of regulated air pollutants emitted from the two engines based on 8,760 hours per year operation to be as follows:

Pollutant	Max. Potential Emissions (tons/yr)	PSD Significant Emission Rate tons/yr
NO_x	2,100	40
SO_2	440	40
PM_{10}	90	15
CO	520	100
VOC	260	40
Pb	0.05	0.6
Hg	0.01	0.1
Be	0.0005	0.0004

Rule 17-2.500(2)(f)(3) of the Florida Administrative Code requires a BACT review for all regulated pollutants emitted in an amount equal to or greater than the significant emission rates listed in the previous table.

BACT Determination Requested by the Applicant

The BACT Determinations requested by the applicant on a pollutant by pollutant basis are given below:

Pollutant	Determination
NO_x	8.0 g/hp-hr
SO_2	Low sulfur fuel (sulfur content of diesel will be limited to 0.5%)
PM_{10}	0.1 lb/MMBtu
CO	2.0 g/hp-hr
VOC	1.0 g/hp-hr
Be	0.0005 tons per year

Date of Receipt of a BACT Application

September 23, 1988

Review Group Members

This determination was based upon comments received from the applicant and the Stationary Source Control Section.

BACT Determination Procedure:

In accordance with Florida Administrative Code Chapter 17-2, Air Pollution, this BACT determination will be 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, then 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 Analysis

A review of previous BACT determinations and control measures utilized for stationary large bore diesel engines indicates that

in general the emission rates proposed by the applicant do not represent BACT. The rationale for establishing BACT at a lower than proposed level for the applicable pollutants is presented as follows:

Nitrogen Oxides

The emission of nitrogen oxides from stationary large bore diesel engines has in recent years become a concern in the BACT decision making process. A review of the various technologies used to generate electricity indicates that large bore diesel engines are by far the greatest emitter of nitrogen oxides on a heat input basis. This is illustrated by comparing the proposed emission limit for the diesel engines to New Source Performance Standards or typical BACT determinations for the other common electrical power generating technologies as follows:

Source	NO_x Emission Level (lb/MMBtu)
Key West Diesels (Proposed BACT)	2.35
Steam Generating Units (Industrial-Commercial-Institutional)	0.20
Resource Recovery (uncontrolled)	0.5 - 0.65
Oil Fired Turbines	0.40
Electric Utility Steam Generating Units	0.30

Based on the comparison shown above, the BACT determination will concentrate on the economics and pragmatics of using the following four alternate power production/control strategies.

1) Oil Fired Turbines
2) Combined Cycle
3) Timing Retardation
4) Selective Catalytic Reduction

Turbines, like internal combustion engines, are capable of firing both gaseous and liquid fuels. This ability to fire liquid fuels is an important consideration since natural gas is not available on Key West. From an environmental standpoint the use of turbines is advantageous because the NO_x emissions can be controlled to levels much less than the proposed 8.0 g/hp-hr through the use of inexpensive control techniques such as steam injection.

Similar to the turbine is the combined cycle. A combined cycle configuration typically utilizes a gas turbine as the first means of producing electrical energy, then uses the heat energy of the turbines exhaust to produce steam which is then passed through a steam turbine/generator as the second means of generating electrical energy. The combined cycle, one of the newest and most common cogeneration configurations, is being used increasingly in the State of Florida.

With regard to the use of turbines and combined cycle configurations, the applicant has stated several disadvantages when compared to the proposed diesel engines.

Turbines and combined cycle configurations are typically sized larger than the largest stationary diesel engines and would require that only one unit (rather than two diesel units) be installed to supply the needed 20MW of generation requirement, thereby resulting in a lower reliability. Another disadvantage associated with the combined cycle is the steam cycle which requires more operating personnel to operate the equipment when compared to diesels which operate in an unattended mode. In addition, both the turbine and combined cycle operate at a higher heating rate to produce an equivalent amount of power as the diesel, thereby requiring more fuel on a per kilowatt basis. This increase in cost will be further evaluated in the economic section of this determination.

The emission of nitrogen oxides from stationary large bore diesel engines are minimized by the use of selective catalytic reduction (SCR). Until recently, SCR has not been judged to be a reasonable control technology for diesel engines due to problems encountered with catalyst poisoning. Although catalyst systems are currently under development and have been demonstrated for some applications (i.e, fuel-rich naturally aspirated gas engines, and gas turbines), there have not been any known demonstrations of their effectiveness as a control measure for the broad range of full-scale internal combustion engines manufactured. This has been particularly true of turbocharged engines, fuel-lean gas engines, and diesel engines.

A recent survey of permitting activities, however, indicates that SCR is now being used on stationary large bore diesel engines. This SCR installation (the first in the United States on a diesel engine) is currently operating on a 4.8 megawatt co-generation facility at a chemical plant in Adams, Massachusetts. This co-generation facility is scheduled to operate on a year round basis with dual fuel being used for 8 months per year and diesel for the remaining 4 months. Additional research indicates that although this SCR system is

being used for the first time in the United States, it has been used extensively in Europe. Background information indicates that this system has been used successfully since 1982, serving over 50 engines and gas turbines, operating on gas, dual fuel, diesel and heavy oil with up to 3.5% sulfur content.

Because the use of SCR has such a limited use at this time (especially in the United States) as a control technology for large stationary diesel engines, the Department has contacted the companies using SCR to obtain their impressions. In the case of the Massachusetts facility, the personnel responsible for operating the cogeneration equipment were very pleased with the SCR system, which has been operating for more than 1,500 hours on diesel fuel. These feelings were also expressed by a company in Germany which has recently submitted another order for a diesel engine with the same SCR technology. Based on these conversations, the Department believes that the SCR technology can be considered to proven on diesel applications.

The final alternative to be considered is the use of the additional timing retardation on the diesel engines. Timing retardation has been used extensively as the primary means of reducing NO_x emissions from diesel fueled engines. This reduction is achieved by essentially lowering the peak combustion temperatures, thereby limiting thermal NO_x formation. Depending on the amount of timing retard used, NO_x reductions can range up to 45 percent. Timing retardation does however result in the derating of the diesel, thereby increasing the cost to generate a given amount of power.

With regard to determining the cost effectiveness of air pollution control, the EPA has developed costing guidelines to obtain the highest reduction of emissions per dollars invested. This method of maximizing emission reductions per capital invested is a major factor when New Source Performance Standards (NSPS) are developed by the EPA. For NO_x emissions EPA has determined that a cost of up to $1,000 per ton of emissions controlled ($0.50/lb) is reasonable for NSPS. In accordance with these guidelines and the control alternatives discussed, the cost/benefits are illustrated in Table 1. A review of Table 1 indicates that when operating continuously, the use of SCR is by far the most economical means of control on a cost per ton basis. This cost of $370.00 per ton is well within EPA's guidelines for NSPS purposes and is hence judged to be economically feasible as BACT for the Key West Facility.

With regard to SO_2, emissions the Department does not believe that the applicants proposal to limit diesel sulfur content to 0.5% is representative of BACT. A review of the latest (July 1988) BACT/LAER Clearinghouse indicates that BACT for SO_2

TABLE 1

Comparison of Alternates for NO_x Control

NO_x Cases	Diesel	Gas Turbine	Diesel with Add. Timing Retardation	Combined Cycle	Diesel with SCR
Capital Cost ($/KW)	1250	675	1360	900	1400
Heat Rate (Btu/kWh)	8500	13,600	9500	10,800	8500
Part Load Heat Rate	base	higher	base	higher	base
Amount of Derating (MW)	none	none	1.6	none	none
Reliability	base	lower	base	lower	unknown
Response Time (minute)	10	20	10	90	10
Emission (gm/hp-hr)	8	1.3	6	1.0	0.8
Emission (T/yr)(2)	2100	340	1580	260	210
Increased Cost ($/yr)(1)	base	2,540,000	820,000	980,000	700,000
Cost of Emission Reduction ($/T)	base	1400	1560	530	370

(1) Capital cost amortized at nine percent annual rate; fuel cost of $4/mm Btu, 100% capacity factor, SCR cost includes ammonia and maintenance.
(2) Based on 20 MW output.

emissions from diesel engines has previously been set at limiting sulfur content to 0.2%. This level appears to be the maximum control established and hence is evaluated using the "top down" BACT approach as follows:

Discussions with the applicant's fuel supplier indicate that the additional cost of reducing fuel sulfur content from the proposed level of 0.5% to 0.2% would be approximately 3 cents per gallon. At the maximum firing rate, the additional hourly cost of using the 0.2% sulfur content diesel instead of the proposed 0.5% sulfur content diesel would be $42.00. The sulfur dioxide reductions from switching to the 0.2% sulfur content diesel are estimated to be 60 pounds per hour. Based on this reduction, the hourly cost per pound of sulfur dioxide removal is 70 cents which is less than the EPA NSPS guideline of up to $1.00 per pound ($2,000 per ton) for sulfur dioxide removal. As this is the case, BACT is judged to be represented by limiting the diesel's sulfur content to 0.20%.

With regard to PM_{10} emissions, the Department does not agree with the applicant that the proposed emission level of 0.1 lb/MMBtu is representative of BACT. A recently permitted diesel generating facility proposed a PM_{10} emissions level of 0.03 lb/MMBtu. This emission level (0.03 lb/MMBtu) is consistent with what most large stationary diesel engine manufacturers are guaranteeing for recent permit applications and is representative of NSPS for other types of similar sized fuel burning equipment, thereby being judged to be reasonable as BACT for this facility.

For internal combustion engines there exists a trade-off between the emissions of NOx and the products of incomplete combustion (carbon monoxide (CO) and volatile organic compounds (VOCs)). Generally speaking, attempts to decrease the emissions of NO_x by means other than add-on controls (i.e., ignition timing retardation, air-to-fuel ratio changes, etc.) are accompanied by increases in CO and VOCs. Considering the timing retardation applied, the applicant's guaranteed emission levels of 2.0 and 1.0 grams per horsepower hour, respectively, may be representative of BACT.

Environmental Impact Analyses

A review of the ambient impacts associated with the diesel installation at the Key West Facility indicates that only the pollutants NO_x and SO_2 will contribute significantly when compared to the present background concentrations. Based on the applicant's proposal for BACT, the impacts associated with NO_x and SO_2 are estimated to be 5.8 (annual average) and 146 ug/m, (24 hour average) respectively.

For NO_x the impact is estimated to increase the total ambient concentration by approximately 25 percent resulting in a concentration which is 43.8% of the standard. For SO_2 the impact is estimated to increase the total ambient concentration by more than three times resulting in a concentration which is 81.2% of the standard.

Based on this impact review, the Department has determined that the Key West Facility has the potential to contribute moderately to the NO_x concentration and substantially to the SO_2 concentration in that area. As this is the case, the Department believes that its BACT determination which would reduce the proposed NO_x and SO_2 impacts by 85 and 60 percent, respectively is further justified.

In addition to the criteria pollutants, the impacts of toxic pollutants associated with the combustion of diesel have been evaluated. Three of the toxic pollutants (mercury, beryllium, and lead) have PSD significant levels with only beryllium being in exceedance. The other toxics (polyorganic matter, nickel, chromium, and arsenic) are expected to be emitted in minimal amounts, with the total emissions of all seven toxics combined to be less than one ton per year.

Although the emissions of the toxic pollutants could be controlled by particulate control devices such as a baghouse or scrubber, the amount of emission reductions would not warrant the added expense. As this is the case, the Department does not believe that the BACT determination would be affected by the emissions of the toxic pollutants associated with the firing of diesel.

Potentially Sensitive Concerns

With respect to the Key West Facility there are several sensitive concerns. Although the cost of using SCR was shown to be the most attractive on a cost per ton basis and well within the NSPS guidelines, the applicant is concerned that a requirement to use SCR will result in serious financial burdens.

Due to the large capital cost of the SCR system (approximately $2.3 million) the applicant is concerned that additional bonding coverage would be needed which would require that electrical rates be increased. This would be burdensome to the people in the Key West area where electricity rates are currently among the highest in the State of Florida and have recently had a significant increase to finance the diesel project.

In addition to the cost considerations, the applicant has expressed concern that the experience with the SCR system

relative to diesel fueled generation is very limited and should only be considered in the demonstration category relative to technical risk, not having been proven commercially. The applicant also states that the addition of the SCR system will, in effect, void the Utility Board's existing performance guarantees and warranty on the diesel engine generator set, since the diesel manufacturer will not take any responsibility for the impact of the SCR equipment on the plant operation, performance, and reliability.

With regard to the low sulfur content requirement, the applicant has indicated that due to the size of the diesel facility, it is not likely that diesel fuel with a guaranteed sulfur content not to exceed 0.20% can be obtained. This is based on conversations with fuel suppliers which have indicated that the expected diesel usage is too large to be accommodated by the small shipments of low sulfur content diesel that are shipped in to fuel suppliers, but too small to receive a direct shipment on an ocean going barge.

Finally, the applicant is concerned that the Department's recommended BACT for PM_{10} emissions may be difficult to achieve. Each of these concerns is largely based on the diesel units projected operating schedule which is not likely to exceed more than 2500-3000 hours per year each except in emergency cases.

BACT Determination by DER:

Discussion

Based on the information presented by the applicant, the Department believes that the costs associated with using SCR should be evaluated for various operating schedules. These costs are shown in Table 2.

A review of Table 2 indicates that the cost per ton of NO_x controlled when using SCR is very dependent upon the hours of operation. This variability in cost is attributed to the fixed cost using SCR which is independent of hours of operation. From Table 2, the cost per ton of NO_x removal can be expressed by the following relationship.

$$\text{Cost of } NO_x \text{ Removal } (\$/\text{ton}) = \frac{460{,}000 + 25.64\,X}{.204\,X}$$

Where X = Number of hours operated

The cost analysis shown in Table 2 is useful in comparing other alternatives which can be employed to reduce NO_x emissions from large bore diesel engines.

TABLE 2

Economic Analysis of SCR for NO_x

Capital Costs					
Direct Costs for SCR	$2,300,000				
Financing Costs	625,000				
Total	$2,925,000				
Annual Operating Costs for SCR ($/yr)					
Equivalent Full Load Hrs. of Operation (hrs/yr)	8,760	5,000	2,500	1,500	1,000
Net Generation (MWH(1)	168,192	96,000	48,000	28,000	19,200
Net Debt Service ($)(2)	252,000	252,000	252,000	252,000	252,000
Maintenance ($)(3)	215,000	215,000	215,000	215,000	215,000
NH3 Cost ($)(4)	230,000	131,000	65,000	39,000	26,000
Total Cost	697,000	598,000	532,000	506,000	493,000
(cents/kWh)	.41	.62	1.11	1.76	2.57
NO_x Removal					
Tons/Year (5)	1,814	1,036	518	311	207
$/Ton	384	577	1,027	1,627	2,382

1) Based upon a combined net output for the diesel generators of 19.200 kw.

2) Based on assumed interest rate of 8.25% for municipal tax exempt debt and 25 year amortization period.

3) Average assumed cost for 10-year period based upon letter from SCR equipment supplier.

4) Based upon 90% NH3 removal, and usage of 220 lbs/hr at full load and cost of $0.12/lb.

5) Based upon an uncontrolled emission of 8 gm/hp-hr.

At the maximum operation levels which are likely to occur as stated by the applicant (2,500 - 3,000 hours per year) the cost of using SCR is more comparable to using timing retardation on a cost per ton basis. The annual expense, however, of using timing retardation is much less than using SCR ($176,000 vs $532,000 at 2,500 hours of operation). This large difference in cost supports the applicant's concerns that SCR would be extremely costly for operating schedules which are much less than full time operation.

In accorance with this situation, it appears that a reasonable comparison would be to allow the applicant to use timing retardation providing the diesels would be operated at the level where the cost per ton of using either SCR or timing retardation are equivalent.

The cost of timing retardation at less than full time operation is only a function of additional fuel needed to produce an equivalent amount of power. For a given amount of power generated and the subsequent NO_x reductions acheived by timing retardation, the cost per ton of control is approximately $1,333. When this cost is substituted into the cost equation for SCR, the hours of operation which yield the same cost per ton for both SCR and timing retardation is approximately 1,870.

The Department's finding with regard to the availability of low sulfur content (0.20%) diesel support the applicant's claims. Although other large stationary engines/turbines with diesel firing capability have been recently limited to using diesel with a sulfur content in the 0.2-0.3% range, it appears that the expected diesel consumption by the Key West diesels will not allow such a requirement.

Conversations with the diesel suppliers for the previously permitted facilities with the low sulfur content requirement have indicated that these facilities are only able to get this quality of fuel, which is not readily available, due to the relatively small needs for diesel in general. Each of these facilities is expected to use diesel only during periods of natural gas curtailment. As this is the case, the need for diesel is limited and the low sulfur content batches can be obtained.

With regard to Key West, natural gas is unavailable. This results in a need for diesel engines which are too large to be supplied by these low sulfur content shipments obtained by local suppliers, but too small to be serviced by a direct shipment via an ocean going barge which carries at least four times the amount of fuel that can be stored in the Key West facility's tanks.

Conclusion

In view of the sensitive concerns that have been identified by the applicant concerning this facility, the Department has concluded that at this time, BACT for nitrogen oxides is represented by using timing retardation and limiting the hours of operation. It should be noted that at levels of operation which are greater than the specified 1,870 hours, the use of SCR becomes less costly than timing retardation and should be re-evaluated as BACT for the facility.

With regard to the extent to which SCR has been demonstrated to be a proven technology on diesel applications, the Department feels that there has been sufficient operating experience to indicate that SCR is in fact a viable technology for some diesel applications. Although the Department's impressions with SCR's operating experience on the Massachusetts facility and other diesel facilities in Europe have been favorable, it may be premature to require that SCR be used on the Key West facility.

An in-depth comparison of the Adams, Massachusetts facility and the proposed Key West installation indicates that there are enough differences to question the transfer of the SCR technology from one facility to the other. The Adams, Massachusetts facility is designed primarily for dual fuel firing and is operated in a base loaded mode. This operating scheme differs from that proposed for Key West in which the units are designed for 100 percent diesel firing and will be operated on an "as-needed" mode, resulting in load fluctuations. Based on these differences it is expected that the SCR technology would be subjected to varied operating conditions resulting in a performance which could differ substantially from that demonstrated at the Massachusetts Facility.

In view of these considerations, the Department feels that the decision to require timing retardation in conjunction with limiting the hours of operation is further supported. As more SCR operating experience becomes available for existing facilities capable of firing diesel, and for other research and development programs, the Department will be in a better position to consider SCR as a BACT alternative for all diesel applications.

With regard to limiting diesel sulfur content to levels which are less than requested by the applicant, the Department has determined that such a restriction is not warranted in view of the situation. Although modeling indicated that the sulfur dioxide concentrations would increase by more than three times using the 0.5% diesel for full time operation, the hours of operation restriction imposed to limit NO_x emissions will lower these projections substantially.

With regard to PM_{10} emissions, the Department has determined that the emissions of PM_{10} as well as CO and VOC's can likely be influenced by the measures taken to reduce NO_x emissions. As this is the case, BACT for each of these pollutants will be established at the applicant's guaranteed levels, but will be subject to being adjusted to a lower level based on the stack testing results.

In accordance with this determination, the emission limits on a pollutant by pollutant basis are set as follows:

Pollutant	Emission Limit
NO_x *	6.0 g/hp-hr
SO_2	Diesel sulfur content limited to 0.50%
PM_{10}**	0.10 lb/MMBtu
CO**	2.0 g/hp-hr
VOC**	1.0 g/hp-hr
Be	0.0005 tons per year

*Nitrogen oxides emission limitation is based on limiting hours of operation to 1,870 full load equivalent hours for the facility (total of 3,740 full load equivalent engine hours). If the applicant chooses to operate the facility in excess of 3,740 full load equivalent engine hours, BACT will be re-evaluated for nitrogen oxides.

**PM_{10}, CO, and VOC emission limitations are maximum allowables and are subject to change based on stack testing results. The emission level of these pollutants is sensitive to the level of NO_x control and should be established in accordance with actual test results.

Details of the Analysis May be Obtained by Contacting:

Barry Andrews, P.E., BACT Coordinator
Department of Environmental Regulation
Bureau of Air Quality Management
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Recommended by:

C. H. Fancy, P.E.
Deputy Bureau Chief, BAQM

June 5, 1989
Date

Approved by:

Dale Twachtmann, Secretary

5 June 89 1989
Date

Florida Department of Environmental Regulation

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

Bob Martinez, Governor Dale Twachtmann, Secretary John Shearer, Assistant Secretary

PERMITTEE:

Key West City Electric System
1006 James Street
Key West, Florida 33041

Permit Number: AC 44-152197
PSD-FL-135
Expiration Date: April 1,1991
County: Monroe
Latitude/Longitude: 24°33'49"N
81°44'03"W
Project: Two Diesel Generators

This permit is issued under the provisions of Chapter 403, Florida Statutes, and Florida Administrative Code Rule(s) 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 drawing(s), 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 two Fairbanks Morse diesel generators, each combusting about 700 gals/hr No. 2 fuel oil, 100 MMBtu/hr heat input, generating almost 10-MW of electricity, at the existing Stock Island plant in Monroe County, Florida.

The UTM coordinates of the facility are Zone 17, 425 km East and 2716 km North. The Source Classification Code for the diesel generators is 2-01-001-02.

Construction shall be in accordance with the permit application and plans, documents, and reference material submitted unless otherwise stated herein.

Attachments:

1. Key West's (KW) application received July 15, 1988.
2. DER's letter of incompleteness dated August 11, 1988.
3. RWB's letter received August 24, 1988.
4. RWB's letter received September 20, 1988.
5. DER's letter dated September 21, 1988.
6. RWB's letter received September 23, 1988.
7. EPA's letter dated September 29, 1988.
8. NPS's letter dated October 11, 1988.
9. KW's letter received November 22, 1988.
10. KW's letter received December 15, 1988.
11. RWB's letter received January 18, 1989.
12. RWB's letter received February 10, 1989.
13. RWB's letter received March 2, 1989.
14. RWB's letter received March 6, 1989.

Attachments continued:

15. DER's Preliminary Determination dated March 21, 1989.
16. EPA's letter dated April 19, 1989.
17. KW's letter dated April 25, 1989.
18. KW's letter dated May 24, 1989.
19. DER's Final Determination dated June 2, 1989.

GENERAL CONDITIONS:

1. The terms, conditions, requirements, limitations, and restrictions set forth herein are "Permit Conditions" and as such are binding upon the permittee and enforceable pursuant to the authority of Sections 403.161, 403.727, or 403.859 through 403.861, Florida Statutes. The permittee is hereby placed on notice that the Department will review this permit periodically and may initiate enforcement action for any violation of the "Permit Conditions" by the permittee, its agents, employees, servants or representatives.

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. Nor 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 does not constitute 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, plant or aquatic life or property and penalties therefore caused by the construction or operation of this permitted source, 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.

GENERAL CONDITIONS:

6. The permittee shall at all times 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.

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, access to the premises, at reasonable times, where the permitted activity is located or conducted for the purpose of:

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

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

c. Sampling or monitoring 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 notify and provide the Department with the following information:

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

b. the period of noncompliance, including exact 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.

GENERAL CONDITIONS:

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 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 arising under the Florida Statutes or Department rules, except where such use is proscribed by Sections 403.73 and 403.111, Florida Statutes.

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 17-4.12 and 17-30.30, 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 is required to be kept at the work site of the permitted activity during the entire period of construction or operation.

13. This permit also constitutes:

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

14. The permittee shall comply with the following monitoring and record keeping requirements:

a. Upon request, the permittee shall furnish all records and plans required under Department rules. The retention period for all records will be extended automatically, unless otherwise stipulated by the Department, during the course of any unresolved enforcement action.

GENERAL CONDITIONS:

b. The permittee shall retain 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), copies of all reports required by this permit, and records of all data used to complete the application for this permit. The time period of retention shall be 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;
- the person responsible for performing the sampling or measurements;
- the date(s) 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 submitted or corrected promptly.

SPECIFIC CONDITIONS:

1. The facility shall not operate for more than 1870 full load equivalent hours per year (total of 3740 full load equivalent engine hours). The BACT will be re-evaluated at the time the permittee requests an increase in or exceeds the permitted hours of operation (see Specific Condition 10). Selective Catalytic Reduction for NOx control will be required at a minimum for BACT if deemed technologically feasible. In no event shall the BACT control installation and compliance testing occur later than thirty (30) months from the date that the permittee requested or exceeded the permitted hours of operation.

2. Only No. 2 fuel oil with a maximum of 0.5% sulfur content shall be fired in the engines.

3. The maximum heat input to each engine shall not exceed 100 MMBtu/hr (approx. 700 gals/hr). The derated electrical output (with timing retardation) is expected to be about 8.8 MW for each unit.

SPECIFIC CONDITIONS:

4. The maximum allowable emissions from the project, in accordance with the attached BACT determination, shall not exceed:

Pollutant	Basis	Maximum Allowable Emissions Per Engine lb/hr	Facility Total TPY
PM/PM_{10} *	0.10 lb/MMBtu	19.7	37.4
NOx	6 g/hp-hr	155	290
SO2	0.5% S oil	50.4	96
CO *	2 g/hp-hr	51.7	98
VOC *	1 g/hp-hr	25.8	50
Be	-	0.00054	0.001

* PM_{10}, CO, and VOC emission limitations are maximum allowables and are subject to change based on stack testing results.

The facility may fire up to 2.6 million gallons per year of diesel oil, or operate up to 1870 full load equivalent hours annually (total of 3740 full load equivalent engine hours), as long as the total NOx emissions do not exceed 290 TPY. The fuel usage, NOx emissions, and hours of operation will be based on a 365-day rolling average.

Visible emissions (VE) shall not exceed 20% opacity. This limit is subject to change after testing.

5. Initial (I) and annual (A) compliance tests shall be performed using EPA Methods in accordance with 40 CFR 60 Appendix A, 1987 version:

a. EPA Method 5 for PM (I,A)
b. EPA Method 6 for SO_2, or ASTM D 2880-71 for sulfur in oil (I,A)
c. EPA Method 9 for VE (I,A)
d. EPA Method 10 for CO (I)
e. EPA Method 20 for NOx (I,A)
f. EPA Method 25 for VOC (I)
g. EPA Method 104 for Be, or EPA SW846 Method 3040, 7090/7091 (I)

Other DER approved test methods may be used only after Departmental approval.

Continuous emission monitors shall be installed, calibrated, maintained and operated for opacity and NOx.

6. The project shall comply with all the applicable requirements of Chapters 17-2 and 17-4 of the Florida Administrative Code (F.A.C.).

PERMITTEE:

Key West City Electric System

Permit Number: AC 44-152197
PSD-FL-135

Expiration Date: April 1, 1991

SPECIFIC CONDITIONS:

7. DER's South Florida District office shall be notified in writing a minimum of 15 days prior to source testing. Written reports of the test results shall be submitted to the district office within 45 days of test completion.

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

9. An application for an operation permit must be submitted to the South Florida District office at least 90 days prior to the expiration date of this construction permit or within 45 days after completion of compliance testing, whichever occurs first. 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. 17-4.220).

10. Any change in the method of operation, fuels, equipment or operating hours shall be submitted for approval to the South Florida District office.

11. The three existing 16.5 MW steam units at the Key West Plant shall be shut down and operation permits shall be surrendered for cancellation when operation permits are issued for the two new engines authorized by this permit.

Issued this 5 day
of June, 1989

STATE OF FLORIDA DEPARTMENT
OF ENVIRONMENTAL REGULATION

Dale Twachtmann, Secretary

ATTACHMENTS AVAILABLE UPON REQUEST