

State of Florida  
 DEPARTMENT OF ENVIRONMENTAL REGULATION  
**INTEROFFICE MEMORANDUM**

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TO: Victoria Tschinkel  
 FROM: *Steve Smallwood* Steve Smallwood

DATE: February 17, 1981

SUBJ: BACT Determination for Sebring Utilities Commission

**RECEIVED**  
 FEB 17 1981

Office of the Secretary

Attached please find a BACT determination for two diesel engines to be installed in Sebring, Highlands County, Florida.

We recommend that you approve and sign the determination, the results of which will be made specific conditions of the construction permit.

SS:caa

## Best Available Control Technology (BACT) Determination

Sebring Utilities Commission

Highlands County

The city of Sebring, Florida proposes the construction of two low speed (90-150rpm) two-cycle diesel engines, each engine rated at 19.5 MW capacity at engine shaft. The proposed units will generate electrical power for the community. Heat in the exhaust gases will be recovered and used to generate additional electric power. The fuel will be No. 6 residual oil consumed at an average hourly rate of 23 barrels per engine. Emissions are the normal products of combustion of residual fuel oil: sulfur dioxide, particulates, nitrogen oxides, carbon monoxide and hydrocarbons. The proposed operating schedule is 8,400 hours per year per engine. This will be the first installation in the State using low speed marine type diesel engines in electrical utility service.

A BACT determination is required for NO<sub>x</sub>, SO<sub>2</sub>, PM, CO and HC as is the case for any pollutant that increases ambient concentrations over the baseline.

Summary of Potential Emissions:

<u>Pollutant</u>	<u>lb/hr/unit</u>	<u>TPY/unit</u>	<u>Total TPY</u>
NO <sub>x</sub>	572	2,402	4,804
SO <sub>2</sub>	460	1,932	3,864
CO	99	416	832
HC	45	71	378
Particulates	17	71	142

BACT Determination Requested by the Applicant:

<u>Pollutant</u>	<u>Emission Limit per Engine</u>
Nitrogen oxides	650 ppm corrected for efficiency and oxygen content
Particulates	0.100 lb/10 <sup>6</sup> BTU heat input
Sulfur Dioxide	2.670 lb/10 <sup>6</sup> BTU heat input
Carbon Monoxide	0.575 lb/10 <sup>6</sup> BTU heat input
Hydrocarbons	0.260 lb/10 <sup>6</sup> BTU heat input

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Date of Receipt of a Complete BACT Application:

February 2, 1981

Date of Publication in the Florida Administrative Weekly:

January 23, 1981

BACT Study Group Members:

The applicant requested and received a BACT determination for two 10 MW engines in May 1980. The applicant has submitted a new application requesting a BACT determination for two 19.5 MW engines. Since this request differs only in engine size from the original determination, no study group was selected; however, members of the previous study group were contacted for comments.

BACT Determination by DER:

<u>Pollutant</u>	<u>Emission limit per engine</u>
Nitrogen oxides (NO <sub>x</sub> )	819 ppmv - corrected to 15% oxygen on a dry basis (1).
Sulfur dioxide	2.67 lb/10 <sup>6</sup> BTU heat input (2). Sulfur content of new or virgin (3) fuel oil not to exceed 2.5%.
Particulates	0.100 lb/10 <sup>6</sup> BTU heat input
Carbon Monoxide	0.575 lb/10 <sup>6</sup> BTU heat input
Hydrocarbons	0.260 lb/10 <sup>6</sup> BTU heat input

(1) Test method will be EPA method 20 modified as per proposed NSPS, Subpart FF, Section 60.324(44 FR 43152)

(2) Based on a fuel higher heating value of 18,700 BTU/lb.

(3) Definition taken from the Energy Policy and Conservation Act (EPCA, P.L. 94-163; 42 U.S.C. 6201 et seq.)

Daily Monitoring Requirements:

- A. Intake manifold temperature
- B. Intake manifold pressure
- C. Engine speed
- D. Diesel rack position (fuel flow)
- E. Injector timing
- F. Gross heat of combustion value and percent sulfur content by weight for each fresh supply of fuel added to the fuel storage facilities.

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Justification for DER Determination:

There is a trade-off between NO<sub>x</sub> emissions reduction and CO emissions increase from a diesel engine. Since CO readily reacts to CO<sub>2</sub> and the proposed installation is to be in a remote area, CO is not considered as serious a problem as NO<sub>x</sub>. NO<sub>x</sub> emissions are linked to the formation of photo-chemical oxidants which are subject to long range transport. Therefore, BACT has been determined to minimize NO<sub>x</sub> emissions. NO<sub>x</sub> emissions will be reduced by engine detuning and altering the compression ratio.

There is a proposed NSPS (44FR43152) for Stationary Internal Combustion Engines which limits NO<sub>x</sub> emissions to 600 ppmv, corrected to 15% oxygen on a dry basis. The fuel considered is No. 2 diesel oil, from which the potential contribution of fuel-bound nitrogen to NO<sub>x</sub> emissions is very small. No allowance has been included in the proposed NSPS for the fuel-bound nitrogen content.

The proposed diesel engines use No. 6 oil, high-viscosity residual oil, for fuel. The effect on NO<sub>x</sub> emissions of fuel-bound nitrogen for this grade of oil is recognized in the NSPS (Subpart GG) for Gas Turbines. This NSPS allows a maximum 50 ppm NO<sub>x</sub> emissions increase for the fuel-bound nitrogen content of residual oil. It is determined that 650 ppm NO<sub>x</sub> emission uncorrected for efficiency and oxygen content is reasonable.

The applicant proposed to use the hot engine exhaust gases to produce steam to generate additional electricity, without emitting additional pollutants. An efficiency factor is not used in the NSPS for diesel engines using No. 2 fuel. The proposed diesel engines use No. 6 residual fuel that requires preheating before it can be used. Some of the additional energy will be used for this purpose. The total source is then comparable to the systems analyzed in the NSPS. It is reasonable to correct the 650 ppm NO<sub>x</sub> emission limit for increased efficiency from the heat recovery system. BACT for NO<sub>x</sub> emissions is determined to be 819 ppm corrected to 15% oxygen content on a dry basis.

Particulate emission per AP-42 is 32 lb/hr. The applicant proposed 17.2 lb/hr or 0.1 lb/10<sup>6</sup> BTU input per unit as BACT. The Department agrees with this particulate emission limit as BACT.

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No SO<sub>2</sub> emission limits are set by the proposed NSPS since most diesel engines use low sulfur fuels because of the lower operating and maintenance costs. However, the design of the proposed engines allow the combustion of higher sulfur fuels, an economic consideration favoring their use.

Scrubbing of the engine exhausts to control SO<sub>2</sub> emissions does not appear to be reasonable from an economic viewpoint. However, since the product is electrical power, the SO<sub>2</sub> emission limit should be as stringent as that allowed for existing utilities using the same fuel (17-2.05(6)E(1)b.FAC). Also, the limit should not result in predicted violations of any PSD increment. The SO<sub>2</sub> emission limit determined as BACT in combination with the requirement that the sulfur content of the fuel not exceed 2.5% meets these criteria and is considered reasonable.

Due to the trade-off between NO<sub>x</sub> and CO-HC emissions, the CO and HC limits proposed as BACT by the applicant are deemed reasonable. The Department concurs with these emission limits.

The term "new or virgin oil" means an oil which has been refined from crude oil and has not been used, and which may or may not contain additives. This disallows the use of waste oil, emissions from which were not considered in this BACT analysis.

Certified oil analysis by the applicant's fuel supplier is acceptable providing approved analytical techniques are followed. Since determining nitrogen content of residual oil is not a routine analysis, this data is not required.

The operating monitoring parameters shall be recorded daily for each engine. The operating ranges for each parameter over which the engine complies with the NO<sub>x</sub> emission limit shall be determined during the compliance test. Once established, these parameters will be monitored to ensure proper operation and maintenance of the emission control techniques employed to meet the emission limit.

Records of the analysis and monitored engine parameters shall be recorded and kept for public inspection for a minimum of two years after the data are recorded.

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Details of the Analysis May be Obtained by Contacting:

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

Recommended by:

*Steve Smallwood*  
for Steve Smallwood, Chief, BAQM

Date:

*February 17, 1981*

Approved by:

*Victoria Tschinkel*  
Victoria Tschinkel, Secretary

Date:

*February 17, 1981*