**FINAL DETERMINATION**
**File No. 0990594-001-AC (PSD-FL-317)**
**EL PASO BELLE GLADES ENERGY CENTER**
**600 MW POWER PLANT FACILITY**

The Department distributed a Public Notice package on September 7, 2001 for the project to construct a natural gas electrical power plant to be known as the Belle Glade Energy Center in Belle Glade, Palm Beach County. The project consists of three (3) nominal 170 MW General Electric 7FA combustion turbine-electrical generators, an unfired heat recovery steam generator, a separate steam-electrical generator; three (3) 135-foot stack; a mechanical draft cooling tower; one 2600-hp diesel generator, one 250-hp diesel fire pump, one gas heater, aqueous ammonia storage tank and small diesel storage tanks and other ancillary equipment. The Public Notice of Intent to Issue was published on September 14, 2001, in The Palm Beach Post, Palm Beach County.

Written comments were received during the 30-day public comment period from EPA Region IV, the Palm Beach County Health Department (the County), and from El Paso Merchant Energy Company (El Paso).

The comments from El Paso, the County, and EPA along with the Department's responses are listed below.

**El Paso Comments and Department Responses:**

*In reference to Permit Specific Conditions III.A.2 and 17, related to minimizing startup times and control of startup emissions, El Paso submitted a letter prepared by General Electric dated September 21, 2001. The Department had suggested that this could be done by installation of a separate bypass stack and damper to facilitate startup of the steam cycle while operating the combustion turbine in low emission modes 5, 5Q, and 6Q. GE commented as follows:*

*"Operating the damper door as a modulating valve is not recommended. We are aware of a similar application at a project at KEPCO (Hungary?). Because of the turbulent flows, damage to the damper door and its seals allowed leakage to the atmosphere after the damper was closed resulting in a significant loss in performance".*

*In reference to Condition III.A.8, El Paso submitted the following comment: "The 2000 hour per year limit on steam flow augmentation may be insufficient to meet plant operational objectives. The March 2001 Air Construction permit application submitted to the Department requested up to 8,760 hours per year of steam flow augmentation".*

*Following discussions with the Department, El Paso proposed to install "a HRSG stack damper (without a bypass stack) to reduce the frequency of cold and warm starts" and "an oxidation catalyst control system to minimize CO and VOC emissions occurring during startups and shutdowns ….. and power augmentation operating conditions".*

<u>Department Response</u>:

The Department reviewed General Electric's letter and wrote an e-mail to their representative re-framing the issue and asking <u>how</u> startup emissions can be minimized for a combined cycle configuration and whether modulating valves (instead of dampers) can be designed for this purpose. General Electric's further input will be useful when reviewing future projects, but will not come in time to implement it into the present project.

The Department has determined that El Paso oxidation catalyst proposal is a proper solution for this project. It reflects the first installation of oxidation catalyst in a GE Frame 7FA combined cycle unit in the State of Florida. The oxidation catalyst certainly will reduce high emissions of CO that can occur during the prolonged cold startup of a combined cycle unit when the basic combustion turbine is operated outside of DLN modes.

The oxidation catalyst will further minimize emissions of CO and VOC under all other modes of operation, especially power augmentation. The CO emission limits will be reduced and the permit will be revised as follows:

Section III.A. Emission Unit 001: Combined Cycle Turbine No. CC-1 (Controls): The efficient combustion of pipeline-quality natural gas at high temperature minimizes emissions of CO, PM/PM10, SAM, SO2, and VOC. A selective catalytic reduction (SCR) system combined with Dry Low $NO_X$ combustion technology reduces $NO_X$ emissions. An Oxidation catalyst system combined with DLN combustion technology reduces CO and VOC.

Specific Condition III.A.2 - Combined Cycle Gas Turbine: The permittee is authorized to install, tune, maintain and operate a new combined cycle unit consisting of a General Electric Model PG7241FA gas turbine-electrical generator set, an unfired heat recovery steam generator (HRSG), and a steam turbine-electrical generator set. The combined cycle unit shall be designed as a system to generate a nominal 175 MW of shaft-driven electrical power and less than 75 MW of steam-generated electrical power. Ancillary equipment includes an automated gas turbine control system, an inlet air filtration system, an evaporative inlet air cooling system, a single exhaust stack that is 135 feet tall and 19.0 feet in diameter, and associated support equipment. ~~A separate bypass stack and damper may be installed to facilitate startup of the steam cycle while operating the combustion turbine in Low Emissions Modes 5, 5Q, and 6Q.~~ [Applicant Request; Design]

Specific Condition III.A.8 - Power Augmentation: As an alternate method of operation, the permittee may inject steam into the combined cycle gas turbine for power augmentation. ~~Power augmentation is permitted 2000 hours per 12-consecutive months and is not limited if oxidation catalyst is installed. The 2000 hour limit may be revised at the request of the applicant based upon review of actual performance and control equipment cost-effectiveness following proper public notice.~~
~~[Rule 62-212.400 (BACT), F.A.C.]~~

Specific Condition III.A.11 - Carbon Monoxide (CO);

a. *Initial Test, Standard Operation:* When not operating in the power augmentation mode, CO emissions shall not exceed 9.7 ~~31.0~~ pounds per hour nor 2.5 ~~8.0~~ ppmvd corrected to 15% oxygen based on a 3-hour test average as determined by an initial performance test conducted in accordance with EPA Method 10.
b. *Continuous Compliance, Standard Operation:* When not operating in the power augmentation mode, CO emissions shall not exceed 2.5 ~~8.0~~ ppmvd corrected to 15% oxygen based on a 3-hour block average as determined by valid data collected from the certified CEM system.
c. *Initial Test, Power Augmentation*: When injecting steam for power augmentation and a compressor inlet temperature of 59° F, CO emissions shall not exceed 16.1 ~~48.0~~ pounds per hour nor 4 ~~12.0~~ ppmvd corrected to 15% oxygen based on a 3-hour test average as determined by an initial performance test conducted in accordance with EPA Method 10.
d. *Continuous Compliance, Power Augmentation*: When injecting steam for power augmentation, CO emissions shall not exceed 4.0 ~~12.0~~ ppmvd corrected to 15% oxygen based on a 3-hour block average

as determined by valid data collected from the certified CEM system.
[Rule 62-212.400(BACT), F.A.C.]

Section III.A.16 – Volatile Organic Compounds (VOC): The efficient combustion of clean fuels and good operating practices for the combined cycle gas turbine represent the Best Available Control Technology (BACT) requirements for VOC emissions. Compliance with the fuel specification and CO standards shall serve as indicators of good combustion. {Permitting Note: VOC emissions are expected to be less than 2.4 ~~3.0~~ pounds per hour and 1.1 ~~1.3~~ ppmvd corrected to 15% oxygen as determined by EPA Method 25A measured and reported as methane.} [Design; Rule 62-4.070(3), F.A.C.]

Specific Condition III.A.17 - Excess Emissions Defined: The following permit conditions allow excess emissions or the exclusion of monitoring data for specifically defined periods of startup, shutdown, and malfunction of the combined cycle gas turbine. These conditions apply only if operators employ the best operational practices to minimize the amount and duration of excess emissions during such episodes.

b. *Work Practice BACT*: ~~The unit(s) will reach Mode 5Q (i.e. five burners plus quaternary pegs in operation) within 15 minutes following gas turbine ignition and crossfire~~. A damper shall be installed on the HRSG stack to minimize the frequency of cold and warm starts. An oxidation catalyst control system shall be installed to reduce excess emissions occurring during startups, shutdowns, and malfunctions. A Best Operating Practice procedure for minimizing emissions during startup and shutdown shall be submitted to the Department within 60 days following procurement of the HRSG.

c. *Low-Load Restriction*: Except for startup and shutdown, operation ~~under DLN Modes 1, 2, 3, and 4~~ below 50 percent is prohibited.

Specific Condition III.B.13 - Excess Emissions Defined: The following permit conditions allow excess emissions or the exclusion of monitoring data for specifically defined periods of startup, shutdown, and malfunction of the simple cycle gas turbine. These conditions apply only if operators employ the best operational practices to minimize the amount and duration of excess emissions during such episodes.

c. *Low-Load Restriction*: Except for startup and shutdown, operation ~~under DLN Modes 1, 2, 3, and 4~~ below 50 percent is prohibited.

*In reference to Condition III.A.20, El Paso submitted the following comment: "The procedure for determining $NO_X$ compliance when data is missing or excluded appears to differ than the procedure described in Condition 20.a. for CO compliance. Clarification of these CEM compliance procedures is requested from the Department".*

Department Response:

The Department agrees with El Paso and clarifies the mentioned condition as follows:

Specific Condition III.A.20 - CEM Systems: The permittee shall install, calibrate, maintain, and operate continuous emission monitoring (CEM) systems to measure and record the emissions of CO and $NO_X$ from the combined cycle gas turbine in a manner sufficient to demonstrate continuous compliance with the emission standards of this section. The CEM systems shall comply with the general monitoring requirements specified under "Gas Turbine Common Conditions" in Section III.C.

a. Compliance with the continuous CO emissions standards shall be based on a 3-hour block average starting at midnight of each operating day. The 3-hour block average shall be calculated from 3 consecutive hourly average emission rate values. If a unit operates less than 3 hours during the block, the 3-hour block average shall be the average of available valid hourly average emission rate values for the 3-hour block. The CO monitor shall have a span of no more than 25 ppmvd corrected to 15% oxygen. For purposes of determining compliance with the CEM emission standards of this permit, missing or excluded data shall not be substituted. Instead, the next valid hourly emission rate value

(within the same period of operation) shall be used to complete the 3-hour block average for CO. Each monitoring system shall be installed, calibrated, and properly functioning prior to the initial performance tests and shall be used to demonstrate continuous compliance with the corresponding CO emissions standards specified in this section. [Rule 62-212.400(BACT), F.A.C.]

**Palm Beach County Health Department Comments**

County Comment 1: *"On the issue of "Gross" versus "Net" generating capacity from the steam turbine (Public Notice & Condition III.A.9.), the Health Department is aware that DEP's Siting Office recently determined that new facilities can be exempted from the Power Plant Siting Act provided the "net" steam capacity is below 75 megawatts. The Health Department suggests that the permit reflect "net" capacity for both consistency and environmental purposes".*

Department Response: The Department will issue the present permit in a manner consistent with the previous ones, thus reflecting "gross" rather than "net" capacity. Clarifications may be proposed by the Power Plant Siting Office regarding this matter in the future.

County Comment 2: *"On the issue of the maximum sulfur content of the natural gas (Conditions III.A.6. and III.B.6.), the Health Department believes that these limits are not enforceable by the compliance authority based on the compliance method (Condition III.C.6.). As proposed, compliance is based on monthly records and vendor data. It is suggested that the permit specify the ASTM methods as the reference methods. This will allow the compliance authority to collect samples and enforce the limits".*

Department Response: The facility will use inherently clean pipeline quality natural gas. Typically such gas has a concentration less than 0.25 grains of hydrogen sulfide per 100 standard cubic feet (gr/100 scf). The limitation in the permit is 1.5 gr sulfur/100 scf which is well in excess of the sulfur contained in the gas. The additional sulfur is in the form of odorants (mercaptans) injected by the pipeline operator for safety reasons as required by federal regulations.

Accurate concentrations of hydrogen sulfide and sulfur for gas in a given area are readily available from the pipeline operators. The permit already specifies sufficient (ASTM) methods to determine whether the facility is in compliance with the fuel sulfur conditions.

County Comment 3: *"On the issue of power augmentation (Condition III.A.8.), the Health Department suggests that the relaxation on the hours of operation be tied to a performance standard versus installation of an oxidation catalyst. This is suggested since the amount of catalyst installed plays a significant role in the overall reduction efficiency of the system. Without specifying a performance standard, the permittee could install 3 grams of catalysts with no reduction in emissions and request relaxation of the restriction".*

Department Response: The permittee proposed, during the public notice period, to install CO oxidation catalyst. El Paso has agreed to meet lower emission limits with catalyst than without catalyst. This will clearly require installation of substantial amounts of catalyst as the new limits are well below General Electric's (non-catalyst) guarantees.

County Comment 4: *"The CO emission standards (Conditions III.A.11 and III.B.8.) for normal operation do not appear to reflect the limitations described in the BACT determination (7.4 vs. 8 ppmvd). It is also suggested that the emission limitations clearly state whether or not emissions associated with startup, shut down, or malfunction are included. If excluded, the standard should include an annual cap on emissions. The Health Department also believes that CEMS on the SCGTs should be required given the large number of allowed operating hours each year and the potential for numerous startups".*

Department Response: The CO BACT limits for the combined cycle unit have been reduced to 2.5 and 4 ppmvd for normal and steam augmentation modes respectively. In fact these limits are now lower rather than greater than BACT. Because of the oxidation catalyst, startup emissions of CO will be low for the combined cycle unit.

Start up under simple cycle operation will be short (less than 15 minutes) and the units will quickly achieve the low emissions modes during which emissions are likely to be less than 2 ppmvd, but in any case will be much less than 7.4 or 8 ppmvd.

An annual cap is not necessary as there are sufficient emission controls or startup protocols to insure low short-term and long-term emissions. The Department will require El Paso to install a CO monitor on the combined cycle unit in Belle Glade. The Department will also require El Paso to install a CO monitor at its one of the simple cycle units at the proposed Broward facility to collect information regarding CO emissions during simple cycle startup and shutdown.

County Comment 5: *"The $NO_X$ emission standards (Conditions III.A.12 and III.B.9.) like the CO standards should clearly state whether or not emissions associated with start-up, shut down, or malfunction are included. If excluded, the standard should include an annual cap on emissions. The $NO_X$ emission limitations and limits on hours of operation do not reflect the $NO_X$ emissions reported in the Public Notice (375 vs. 365)".*

Department Response: Condition A. 17 d. (Combined Cycle) along with Specific Condition C.5.e. and f. (Gas Turbine Common Conditions) cover the data exclusion from start up, shutdown and malfunction from the turbines $NO_X$ CEM systems.

The Department believes that sufficient BACT emission limits and BACT-level startup practices have been included in the permit. There is little benefit to add an annual cap on $NO_X$ emissions.

The comment regarding the 375 versus 365 tons per year $NO_X$ emissions estimate is noted.

County Comment 6: *"The VOC emission standards (Conditions III.A.16. and III.B.12.) are not consistent. For the CCGT, efficient combustion and good operating practices are listed BACT. For the SCGTs, emission limitations have been established and an initial compliance test required based on avoiding BACT. It is suggested that the proposed standards apply to both the CCGT and SCGT and that based on emissions, initial and renewal testing required as specified by the Department's rules. The special compliance testing can be a condition of the permit as well".*

Department Response: Refer to response to EPA Comment 6 below.

County Comment 7: *"Excess visible emissions (Conditions III.A.17.a. and III.B.13.a.) during startup and shutdown appear to be excessive for natural gas fired units, specifically the SCGTs. In addition, the allowed time period (ten 6-minute periods) is not consistent with the allowed startup and shutdown periods. It is suggested that if excess visible emissions will be allowed by the Department that the condition read as follows:*

> *Visible Emissions: Visible emissions in excess of 10% opacity shall be allowed during periods of startup and shutdown, as defined in Condition III.A.17.d., provided best operational practices are followed to minimize all emissions and visible emissions do not exceed 20% opacity. Visible emissions in excess of 10% opacity shall be allowed during periods of malfunctions, as defined in Condition III.A.17.d. or III.B.13.d., provided best operational practices are followed to minimize all emissions"*

Department Response: The Department believes this condition as originally written in the draft permit is sufficient when viewed in conjunction with the requirement to reach low emissions modes (DLN 5Q) within 15 minutes.

County Comment 8: *Excess $NO_X$ emissions (Conditions III.A.17.d and III.B.13.d.) for the different periods are understandable for the CCGT but not the SCGTs. For the SCGTs, the exclusion of excess emissions associated with startup and shutdown for a 2-hour period (assumed to be on a per day basis) is acceptable. However, allowing a 3-hour exclusion during periods outside startup or shutdown is not nor is there justification. For malfunctions, excess emissions should be allowed provided best operating practices are followed.*

Department Response: The second paragraph of Condition III.B.13.d. is revised to read as follows:

> *CEM System $NO_X$ Data Exclusion*: No more than two hourly average emission rate values shall be excluded from the continuous $NO_X$ compliance demonstrations due to startup, shutdown, or documented unavoidable malfunction. No more than a total of ~~three~~ two hourly average emission rate values shall be excluded from the continuous $NO_X$ compliance demonstrations for such periods in any calendar day. A "documented unavoidable malfunction" is a malfunction beyond the control of the operator that is documented within 24 hours of occurrence by contacting each Compliance Authority by telephone or facsimile transmittal.

County Comment 9 - 14: *"Section III.D. addresses the other emission units (Cooling Tower, Diesel Generator, Gas Fuel Heater, Fire Pump, $NH_3$ Tank, and Fuel Oil Tanks) at the source. Under the PSD regulations, PSD review and BACT apply to each emission unit that emits a pollutant for which the source emits above the significance thresholds. The Department has applied the BACT requirement to the cooling tower for PM and $PM_{10}$ emissions as would be expected even though the potential emissions are below the Generic Exemption level of Rule 62-210. 300(3)(b), F.A.C. However, for the diesel generator, gas fuel heater, and the fire pump, all sources of NOx, CO, $SO_2$ and PM/$PM_{10}$ the Department has permitted the exemption of the units and not determined BACT as required. Review of Rule 62-210.300(3), F.A.C. appears to exempt units from the permitting requirements of Chapter 62-212. However, the exemptions do not apply if the emissions unit is subject to any unit-specific applicable requirement. The unit-specific applicable requirements in this case include PSD review, BACT, and the conditions of the proposed PSD Permit. It is suggested that the Department redraft the section but address the exemption limitations as BACT.*

- *Cooling Tower (Condition III.D.1.) BACT limitations are not enforceable by the compliance authority from a practical standpoint. It is suggested that the condition include a limitation on total dissolved solids within the cooling tower water since the solids play a significant role in PM/$PM_{10}$ emissions.*
- *Diesel Generator (Condition III.D.2.) is not exempt from PSD permitting or BACT. It is suggested that the Department deem the exemption criteria as BACT.*
- *Gas Fuel Heater (Condition III.D.3.) is not exempt from PSD permitting or PSD BACT. It is suggested that the Department deem Natural Gas firing as BACT for PM/$PM_{10}$ and $SO_2$ and good combustion practices as BACT for NOx and CO. The condition should also limit fuel firing to clean pipeline quality natural gas to ensure compliance with the NSPS Subpart Dc requirements.*
- *Diesel Fire Pump (Condition III.D.4.) is not exempt from PSD permitting or BACT. It is suggested that the Department deem the exemption criteria as BACT.*
- *$NH_3$ and Fuel Oil Tanks (Conditions III.D.5. and III.D.6.) are not subject to any unit-specific applicable requirements, are not subject to BACT review, and have emissions below the generic exemption levels. It is suggested that the Department delete the conditions.*

Department Response:

Based on comments received from the County as well as petitions filed for several projects in Broward County, the Department reviewed the Emission Unit exemptions at Section 62-210.300, F.A.C. The Department's position is that the units mentioned in Section III.D.1-6 are not exempt from permitting and that they should be considered under the facility BACT determinations for each pollutant.

The affected units were already included in the permit. The conditions are revised as follows:

Section III D – Other Emission Units

1. Cooling Tower: BACT for the Cooling Tower was determined to be the use of fresh water and drift eliminators designed and maintained to reduce drift to 0.0005 percent of the circulating water flow rate. A not to exceed limit of 4200 mg/l total dissolved solids shall be maintained within the cooling tower. {Permitting Note: Potential emissions in tons per year are expected to be less than 1.64 for PM and 0.99 for $PM_{10}$}.
[Rule 62-212.400 (5) (c) F.A.C., BACT determination].

2. 2600 HP Diesel Generator: ~~This unit is specifically exempted from permitting and BACT requirements according to Rules 62-210.300 (3) and 62-210.300 (3)(a)20. F.A.C., provided that fuel oil use does not exceed 32,000 gallons per year~~. The unit will be fired with No. 2 diesel fuel with a maximum sulfur content of 0.05%. {Permitting Note: Potential emissions in tons per year are expected to be less than 0.12 for PM, 3.26 for $NO_X$, 0.73 for CO, 0.07 for $SO_2$ and 0.18 for TOC (total organic carbons)}. [Rule 62-212.400 (5) (c) F.A.C., BACT determination].

3. 12.8 MMBtu/hr Gas-fired Natural Gas Fuel Heater: ~~This unit is specifically exempted from permitting and BACT requirements according to Rules 62-210.300 (3) and 62-210.300 (3)(a)2 F.A.C., Categorical Exemptions.~~ This unit is subject to applicable provisions of 40 CFR 60, Subpart Dc. New Source Performance Standards for Small Industrial-Commercial-Institutional Steam Generating Units. [Rule 62-212.400 (5) (c) F.A.C., BACT determination].

4. 250 HP Diesel Fire Pump: ~~This unit is specifically exempted from permitting and BACT requirements according to Rules 62-210.300 (3) and 62-210.300 (3)(a)21 F.A.C., Categorical Permit Exemptions.~~ The unit will be fired with No. 2 diesel fuel with a maximum sulfur content of 0.05%. {Permitting Note: Potential emissions in tons per year are expected to be less than 0.013 for PM, 0.74 for $NO_X$, 0.18 for CO, 0.0014 for $SO_2$ and 0.08 for TOC (total organic carbons)}. [Rule 62-212.400 (5) (c) F.A.C., BACT determination].

5. Aqueous Ammonia Storage Tank: This unit will contain less than a 20 percent concentration of aqueous ammonia by volume and therefore is not subject to applicable provisions of 40 CFR 68, Chemical Accident Provisions. [Rule 62-4.070 (3) F.A.C.]

6. Two Diesel Fuel Storage Tanks (each less than 1000 gallons): ~~This unit is specifically exempted from permitting and BACT requirements according to Rules 62-210.300 (3) and 62-210.300 (3)(b)(iv) F.A.C., Generic and Temporary Exemptions~~.- This unit shall store 0.05% or less sulfur diesel fuel (by weight). [Rule 62-212.400 (5) (c) F.A.C., BACT determination].

County Comments 15-18:

*Appendix BD, page BD-7, paragraph 1, last sentence references fuel oil firing. It is suggested that the reference be deleted since the units are limited to firing natural gas.*

*Appendix BD, page BD-8, $NO_X$ Control Techniques, Wet Injection addresses fuel oil firing. It is suggested that the reference be deleted since the units are limited to firing natural gas.*

*Appendix BD, page BD-11 paragraph 2, references installation of a XONON system on a unit by the summer of 2001. The summer of 2001 is about to pass and it would be more appropriate for the Department to update the statement regarding actual installation of the system.*

*Appendix BD, page BD-11 paragraph 3 references fuel oil firing. It is suggested that the reference be deleted since the units are limited to firing natural gas.*

*Appendix BD, page BD-15, last paragraph contains a typo "establishment of establishment of startup…"*

*Appendix BD, page BD-16 paragraph 6 (full paragraph) states that "…startup emissions will not cause annual emissions greater than the potential-to-emit under continuous operation." If this is the case, it is suggested that the Department cap annual CO and $NO_X$ emissions from the facility.*

Department Response: Information on wet injection was given as a control technology description only. It is actually a viable control technology for gas-fueled units, but has gone out of favor with the advent of Dry Low $NO_X$ (DLN) combustion and selective catalytic reduction (SCR). References to fuel oil are useful in order to put the benefits of gas firing into perspective.

The Enron Pastoria project will install SCR instead of XONON and will start up in 2003 instead of 2001. The Department updated the reference as recommended by the County.

The Department conducted a PSD review and a BACT determination that included sufficient BACT emission limits and BACT-level startup practices. An annual cap including startup emissions would be more appropriate for a similar project seeking to avoid PSD applicability.

County Comments 19-22:

*Appendix BD, page BD-18, second bullet contains a typo "…Hot SCR is not be cost-effective…"*

*Appendix BD, page BD-19, fifth bullet references the North Broward County Resource Recovery Facility which is a significant distance from the proposed Belle Glade facility.*

*Appendix BD, page BD-19, sixth bullet references only Dry Low $NO_X$ for the CCGT when it is the combination of DLN and SCR that achieves the 0.07 lb/MWH performance.*

*Appendix BD, page BD-19, seventh and eighth bullets establish a work practice standard for the startup of the CCGT that includes use of a by-pass stack or duct. These requirements did not appear as permit conditions. It is suggested that if the Department establishes a work practice that the permit reflect the requirements as permit conditions.*

Department Response: The typographical error was corrected as indicated. The reference to the North Broward County facility was deleted. Page 19, sixth bullet, was revised to include the SCR installation on the combined cycle unit. Specific Condition No.17 was revised to include the installation of the damper. El Paso decided to install CO oxidation catalyst for the combined cycle operation. Specific Conditions 17 b. and 13.b of Section III of the permit includes the work practice standard of the BACT determination.

**Environmental Protection Agency (EPA) Comments**

*Many of EPA's comments are favorable critiques of the Department's approach in preparing the draft permit and BACT determination. Following are certain EPA comments that the Department has determined require clarification or a response.*

*<u>EPA Comment 4 - Oxidation Catalysis:</u> "The draft permit CO emission limit of 8 ppmvd for the simple cycle combustion turbines and for the combined cycle combustion turbine when not operating in power augmentation mode is among the lower BACT limits established in Region 4 for combustion turbines. We further understand Florida Department of Environmental Protection's (FDEP) expectation that the turbines will in fact typically operate with even lower emissions based on inherent combustor design and good combustion practices alone. However, please note that the use of catalytic oxidation for further control of combustion turbine CO emissions, especially for combined cycle combustion turbines, has become much more common as part of BACT determinations for combustion turbine projects.*
*Catalytic oxidation has the added advantage of controlling volatile organic compound (VOC) emissions including volatile organic hazardous air pollutants*

*Further related to the CO draft permit emission limit of 8 ppmvd, we note that Appendix BD (the BACT determination) indicates an emission rate of 7.4 ppmvd at full load for either combined cycle or simple cycle combustion turbines. Based on our understanding that the draft permit has precedence over Appendix BD, we presume that 8 ppmvd will be the enforceable limit.*

*Emissions of CO from combustion turbines increase sharply below a certain load level (unless an add-on control device is in use). For GE 7FA combustion turbines, this sharp increase occurs with operation below about a 50-percent load level. It is not clear to us that the draft permit restricts normal operation (that is, operation other than during startup and shutdown) to load levels of 50 percent and higher. Condition A.17.c. prohibits operation of the combined cycle combustion turbine at "DLN Modes 1, 2, 3, and 4" (except during startup and shutdown), and Condition B.13.c. specifies a similar restriction for the simple cycle combustion turbines. Since the load levels equivalent to these modes are not specifically stated, however, we are not certain what load levels are prohibited. Furthermore, we would appreciate your identifying which monitoring requirements in the draft permit serve to track compliance with the low-load restrictions.*

<u>Department Response</u>: In their application, El Paso, submitted cost-effectiveness calculations to control CO emissions by oxidation catalyst. Based on the most conservative case the calculations result in an oxidation catalyst cost estimate of $2,475 per ton of CO removed (combined cycle operation) and $8,981 (simple cycle operation). The Department does not consider oxidation catalyst to be cost-effective for simple cycle operation based on these calculations.

El Paso's cost effectiveness calculations are based on reduction of CO concentrations from the range of 11.7 to 1.2 ppmvd under combined cycle (steam power augmentation mode) and from 7.4 to 0.7 ppmvd under simple cycle operation. Based on data available to the Department, actual emissions without oxidation catalyst are on the order of 1 ppmvd while firing gas or fuel oil at least under normal modes of operation (not steam power augmentation). This is substantially less than even the objective by oxidation catalyst.

The Department has actual no data on CO emissions during steam power augmentation and initially limited operation under this mode to 2000 hours per year. However as discussed in the first comment by El Paso on Page 1, the company will install oxidation catalyst on the combined cycle unit and the Department will reduce CO emission limits while allowing continuous operation under steam power augmentation mode. This will also reduce VOC and HAP emissions. A CO monitor will be installed on the combined cycle unit.

The Department believes that with SCR and oxidation catalyst, there is less reason to limit operations to less than 50 percent of full load. However, El Paso has agreed to a condition that operation at loads less than 50 percent is not allowed except during startup and shutdown.

Startup under simple cycle operation will be short (less than 15 minutes), while emissions under full load operation will be very low even without oxidation catalyst. The Department will require El Paso to install a CO monitor at the El Paso Broward to collect information regarding CO emissions during simple cycle startup and shutdown. The data may be used to set startup limitations at future projects.

*EPA Comment 5 - Startup and Shutdown Data Inclusion and Exclusion: "As we have often commented, startup and shutdown are part of normal combustion turbine operation and need to be addressed in PSD permits. FDEP has done so for this project by establishing a work practice standard and by limiting the number of hours of emissions that can be excluded from $NO_X$ and CO compliance demonstrations for the combined cycle combustion turbine and from $NO_X$ compliance demonstration for the simple cycle combustion turbines. Other permit options that could be considered include limitations on the number of startups and shutdowns in any 12-month period; mass emission limits for $NO_X$ and CO emissions during any 24-hour period to include emissions during startup and shutdown; and future establishment of startup and shutdown BACT emission limits for $NO_X$ and CO derived from test results during the first few months of commercial operation. In addition, compliance with any explicit or implicit annual emissions limits should be assessed with startup and shutdown emissions included. Regarding the option of mass emission limits, we acknowledge FDEP's comments that such limits may be difficult to quantify.*

*"The only definition of startup that we find is in Appendix BD of the package. As mentioned previously, we understand that the provisions of Appendix BD are not necessarily enforceable. Furthermore, the definition in Appendix BD denotes when startup commences but does not state the operating level or other characteristic marking the end of startup and the beginning of normal operation. We recommend that a more complete definition be developed so that the emission measurements eligible for exclusion under the excess emissions provisions can be confirmed easily.*

*"Conditions 17d of the combined cycle section and 13d of the simple cycle section contain provisions allowing certain data during periods of startup and shutdown to be excluded from compliance demonstrations". Condition 17d for the combined cycle combustion turbine exempts up to 2 hourly emission rate values in a calendar day, except for combined cycle cold startups, in which case up to 4 hourly emission rate values in a calendar day can be exempted. Additionally, Condition 17d indicates that no more than a total of 4 hourly emission rate values shall be exempted in a calendar day. It is unclear to us the purpose of the latter restriction on total hourly emission rate values. Also, it should be clarified in what case a total of 4 hours can be exempted when there is no combined cycle cold startup during the calendar day.*

*"Condition 13d for the simple cycle combustion turbines exempts "no more than 2 hourly emission rate values" from the $NO_X$ compliance demonstration as well as restricting the exemption to "no more than a total of 3 hourly emission rate values" in a calendar day. The purpose of the latter restriction is unclear, since the $NO_X$ compliance period is a 24-hour block average. Finally, to remain consistent with previous FDEP simple cycle combustion turbine permits, no more than 2 hours out of a 24-hour period (or calendar day) should be exempted from compliance demonstrations".*

Department Response: The Department does not allow extended operation at low loads for the simple cycle units during which higher emissions typically occur. Startup for the simple cycle units is simply the time it takes to reach DLN Mode 5Q (roughly corresponds to 50 percent of full load). The Work Practice BACT requires that this mode be reached within 15 minutes. Both emissions and the DLN Modes are tracked by the Mark VI control system.

General Electric did not agree with the Department's Work Practice BACT to minimize startup time of the combined cycle unit (i.e. time to achieve Mode 5Q). El Paso proposed the alternative of installing oxidation catalyst for CO and VOC reduction. The facility must also employ good operating practices during periods of excess emissions. This includes, for example, operation of the SCR system on the combined cycle unit as soon and for as long as the temperature conditions within the heat recovery steam generator allow.

The Department believes that the measures described (in addition to exclusive firing of natural gas) will result in the lowest emissions (whether in startup or steady state modes) from any combined or simple cycle projects permitted in the Southeast.

The Department has been progressively implementing EPA's comments regarding startups, high emission modes, inclusion and exclusion of data, etc. The present permit represents a major effort in this regard. Further efforts will be made as emissions data are received from facilities required to demonstrate compliance with $NO_X$ and CO limits by CEMS.

*<u>EPA Comment 6 - Initial and Annual Testing</u>: "Draft permit Condition 14 pertaining to simple cycle combustion turbines requires testing initially and at permit renewal for $PM/PM_{10}$, CO, $NO_X$, and VOC. The draft permit conditions for the combined cycle combustion turbine do not require $PM/PM_{10}$ and VOC initial and renewal testing. We have agreed with FDEP in the past that $PM/PM_{10}$ and VOC testing is not required for combined cycle combustion turbines with continuous emission monitoring systems (CEMS) for CO. However, a permit for a project with both combined cycle and simple cycle combustion turbines that has different initial and renewal testing requirements for the two types of turbines may be perceived as inconsistent. On a related point, we recommend that FDEP give consideration to requiring CO CEMS for the simple cycle combustion turbines as well as for the combined cycle combustion turbine in view of the fact that the simple cycle combustion turbines will be allowed to operate up 5,000 hours per year at full load (and even more hours at a combination of full and partial loads)".*

<u>Department Response</u>: The Department agrees with EPA and revises these conditions to include initial and renewal testing for $PM/PM_{10}$ and VOC emissions for all turbines. The Department will require El Paso to install a CO monitor at the El Paso <u>Broward</u> to collect information regarding CO emissions during the very short simple cycle startup and shutdown periods. The data may be used to set startup limitations at future projects. The Department notes that after the startup period, emissions will be approximately 1 - 2 ppmvd (although the limit is 7.4 ppmvd) based on actual test data. The continuous collection of CO data at <u>all</u> simple cycle units does not appear justified except at those that exhibit inherently higher emissions than the GE 7FA.

*<u>EPA Comment 7- Pipeline Natural Gas</u>: "The term "pipeline-quality natural gas" appears several times in the draft permit. We have sought in the past for a government agency or industry trade group definition of "pipeline-quality" and have never succeeded in finding such a definition. We presume that the term "pipeline-quality natural gas" means natural gas obtained from an intrastate or interstate commercial natural gas pipeline."*

<u>Department Response</u>: The Department confirms that such gas is obtained from a FERC-regulated natural gas pipeline.

*<u>EPA Comment 8 - Ammonia Emissions</u>: "The draft permit contains an emission limit for ammonia of 5 ppmvd. Ammonia is not regulated under the PSD program, and we do not have a definitive policy on ammonia emissions. However, we can comment that the limit in the draft permit is*

*consistent with (although not equal to the lowest) ammonia limits we are aware of from projects outside Region 4."*

*<u>EPA Comment 9 - Air Quality Impact</u>:: "In the air quality impact evaluations prepared for this project, we see no acknowledgment that $NO_X$ emissions are precursors to ground-level ozone formation. Such acknowledgment would help demonstrate why control of $NO_X$ emissions from combustion turbines is important".*

<u>Department Response</u>:

The Department certainly acknowledges that $NO_X$ emissions and VOC emissions are the key precursors in the formation of ground-level ozone.

**CONCLUSION**

The final action of the Department is to issue the permit with the changes noted above.