DESTEC ENERGY

DESTEC ENERGY, INC.
2500 CITYWEST BLVD., SUITE 150
P.O. BOX 4411
HOUSTON, TEXAS 77210-4411
(713) 735-4000

July 30, 1993

D.E.R.

AUG 0 5 1993

SOUTHWEST DISTRICT
TAMPA

Mr. Preston Lewis, P.E.
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: FDER Permit No. AC53-214903 & PSD-FL-190
Tiger Bay cogeneration facility
Central Florida Power, L.P.

Dear Mr. Lewis:

Since the Florida Department of Environmental Regulation (FDER) issued the above-referenced permit to construct the Tiger Bay cogeneration facility, Destec on behalf of the Central Florida Power, L.P. has been finalizing the design details of the facility. During this period, several design changes have been identified which differ from information previously supplied to FDER; the purpose of this letter is to apprise you of these changes in accordance with the requirements of general condition 2 and specific condition 6 of the permit. We do not anticipate this project having any significant impacts to your agency and, in that respect, we are asking for your concurrence. August 9, 1993 is the projected start date for construction activities.

Thank you in advance for your prompt consideration of this information. Should you need additional information, or have any questions, please feel free to contact me at your convenience at (713) 735-4087. Written confirmation of the conclusion reached in this correspondence is respectfully requested.

Sincerely,

Robert S. Chatham, P.E.

Attachments
RSC/tk

cc: Harry Kerns - FDEP, Southwest District
Robert Taylor
Ken Kosky - KBN

A. Need for Additional Temporary Construction Yard

Efforts to schedule construction activities has convinced Destec of the need to develop a temporary laydown area during the approximate 16 month construction period. As shown in Attachment A, the areas proposed to be used are (1) a parcel located immediately south of the cogeneration site boundary which will be used for equipment laydown and (2) a parcel of land located to the east of the cogeneration site which will be used for the construction trailer village and parking.

Laydown Area

Presently, this site is being used as a laydown area by USAC, therefore, Destec anticipates no improvements will be required. Because no earthmoving or grading will be performed in this area, Destec is not proposing to regrade this site to drain into the permitted construction sedimentation pond along the north end of the project site adjacent to County Road 630.

The purpose of this area will be to receive and store in an orderly manner the components and materials needed to construct the facility during the period after they have been shipped by the manufacturer until needed for installation. The materials and equipment to be stored in this area will consist of structural steel, pipe, and equipment such as the transformers, waste water treatment system, and the like.

Trailer Village and Construction Parking

This site has been previously mined and relatively flat. Mobile office trailers and parking will be provided for construction personnel. No earthmoving or grading will be performed in this area. In order to protect against erosion, portions of this site will be graveled and a silt fences will be installed along its perimeter as shown on Attachment A. Upon completion of construction, the gravel will be removed (if requested) and the site will be stabilized.

B. Plot Plan Changes

Attachment B contains the current plot plan and reflects the most recent design information. By incorporating this information you will notice more detail and some minor changes, such as:

1. Elimination of the fuel oil storage tanks.
2. The relocation of the administration and maintenance buildings.
3. The stormwater pond configuration.
4. Other minor equipment changes or moves.

Storm Water Pond

Environmental Consulting & Technology, Inc. (ECT) has investigated the potential for flotation or uplift of the proposed stormwater management pond liner due to buoyant forces. In evaluating the potential for uplift, the minimum groundwater elevation which could be expected to cause uplift was calculated and compared to expected groundwater elevations. ECT has recommended that measures to prevent pond liner uplift should be taken because the occurrence of groundwater levels necessary for pond liner uplift is expected. Based upon this analysis, ECT recommends placement of the liner elevation at 151.00 ft and applying a soil cover measuring 2.75 ft thick. The pond volume and bottom elevation would remain the same. The application of a soil layer is preferable to a drainage layer from both construction cost and environmental performance data.

ATTACHMENTS

1. Cogeneration Facility Plot Plan

2. Site Plan

Dave

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

JUN 18 1993

RECEIVED
JUN 23 1993
Division of Air
Resources Management

4APT-AEB

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

RE: Central Florida Power Limited Partnership,
Tiger Bay Cogeneration Plant (PSD-FL-190)

Dear Mr. Fancy:

This is to acknowledge receipt of the final determination and Prevention of Significant Deterioration (PSD) permit for the above referenced facility, by your correspondence dated May 19, 1993. The proposed facility will be a 258 megawatt combined cycle cogeneration power plant. The proposed project consists of one advanced technology heavy-duty industrial gas turbine electric generating unit, with a duct burner-fired heat recovery steam generator, and a steam turbine generator.

Your determination proposes to limit NO_x emissions from the combustion turbine through advanced dry low-NO_x combustors and water injection, to limit NO_x emissions from the duct burner through combustion design, to limit CO and VOC emissions from the combustion turbine and duct burner through combustion control, and to limit PM/PM_{10}, Be, and As emissions from the combustion turbine through combustion control and the use of clean fuels. In addition, this facility will meet revised, lower NO_x limits no later than December 31, 1997, through advanced combustor technology or the use of selective catalytic reduction.

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

Sincerely yours,

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

cc: J. Heron
C. Hollandsworth
B. Thomas SWD
Q. Bunyak, NPS
K. Yoke, P.E., KBN
L. Novak, Polk Co

KBN

March 11, 1993

Mr. Clair H. Fancy, P.E.
Chief, Bureau of Air Regulation
Florida Department of Environmental Regulation
Twin Towers Office Building
2600 Blair Stone Road
Tallahassee, Florida 3299-2400

RE: Central Florida Power Limited Partnership (CFPLP)
Tiger Bay Cogeneration Plant
AC 53-214903; PSD-FL-190

Dear Clair:

This correspondence provides technical information for the Department's consideration concerning the comments received from the U.S. Fish and Wildlife Service (USFWS) dated February 5, 1993 on the above referenced project. Specifically, the USFWS suggested the final permit for the project include a statement that selective catalytic reduction (SCR) be installed if the 15 ppmvd (corrected to 15 percent oxygen) emission limit is not met and that the Department re-establish an allowable emissions limit as best available control technology (BACT) if actual emissions are tested less than 15 ppmvd. The information contained herein and in the permit record clearly suggest that the final permit should not contain the suggestions made by the USFWS. The rationale is presented below.

Mandating SCR

Modifying the proposed language of the permit to include a provision mandating SCR is unwarranted. The condition as proposed by the Department clearly recognizes that it will be at the determination of the Department whether SCR will be installed. This allows flexibility to incorporate other design features to meet the 15 ppmvd NOx emission limit if desired by the Department. As "pollution prevention" technology progresses over the next several years there may be other options of lowering NOx to meet emission limits. For example, the combined use of dry-low NOx combustion and wet injection may prove to be a viable technique. Research is also being performed in the area of fuel additives. Mandating the installation of SCR, if a permit limit is not met, does not recognize the development of future technologies and does not provide the Department or CFPLP the inherent flexibility to make an appropriate decision.

Lowering the Permit/BACT Limit

Incorporating a provision in the permit that will require the lowering the BACT limit is not appropriate for several reasons. First, there have been no criteria proposed for establishing such a lower limit. While the initial performance tests may find a NOx emission rate lower than 15 ppmvd corrected, this tested rate will only be an accurate representation of NOx emissions that occurred during the specific conditions observed during the tests. Combustion turbines are sensitive to ambient meteorological

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

conditions such as temperature and relative humidity. Changes in meteorological conditions, for which CFPLP will have no control, may cause changes in NOx emissions. Such conditions are recognized in the margins incorporated into the design features of the control equipment. An example of how operational conditions can affect NOx emissions was previously supplied to the Department for the Orlando CoGen Limited, L.P. Project. Information was supplied to the Department that indicated that actual NOx tested as low as 9 to 13 ppmvd for the combustion turbine proposed for the project. However, the vendor would only guarantee 15 ppmvd since margins are required to assure compliance with the permit limits under all operating scenarios. The Department accepted this rationale in this permit decision.

Second, the proposed project is being designed for operation in late 1994 to early 1995. While it is recognized that combustion turbine units proposed for operation in the future (> 1997) have proposed lower limits, equipment proposed for these projects may not be applicable to the proposed project. The earlier commercial operation date for the CFPLP facility suggests that differences in equipment may result.

Third, all equipment degrades whether it be dry low-NOx combustors, SCR or a fabric filter. The emission margins built into all control equipment recognizes this fact and an appropriate emission limit must be established to account for emission changes as a result of equipment degradation.

Apparent Preference for Technology Comments by USFWS

The State of Florida has full authority for implementing the federally mandated Prevention of Significant Deterioration program through approval of its regulations and State Implementation Plan (SIP). The federal agencies comment on the PSD applications and have differing authority. The USFWS which is the designated Federal Land Manager for National Wilderness Areas Class I areas has review authority of air quality related values in such areas. The Environmental Protection Agency has authority in establishing the implementing regulations for PSD review and approval, and establishing guidelines for modeling and control technology review. For the CFPLP project, the EPA comments (see letter dated February 16, 1993), suggest that the Department's permitting decision was appropriate. The EPA is clearly the appropriate agency regarding control technology issues. In contrast, the USFWS which is the appropriate agency for air quality related values, had no adverse comments regarding the NOx impacts in the Class I area. Indeed, the USFWS indicated that the NOx impacts at the emission limits proposed by the Department were not significant. The USFWS comments should be viewed in this context; i.e., lowering the NOx emission limit will not change the conclusion reached regarding impacts (i.e., impacts will still not be significant). Moreover, the EPA comments concerning control technology (as well as emission limits) should take preference over USFWS comments.

Conclusion

The technical information presented herein and the permit record clearly indicate that the emission limits proposed by the Department in the draft permit are appropriate. Taken together with the commercial concerns expressed by CFPLP (see letter of March 10, 1993, from Destec Energy the controlling partner), we respectively request the Department not incorporate the comments made by the USFWS into the final permit.

KBN

As always, the assistance of you and your staff are greatly appreciated. Please call if you have any questions.

Sincerely,

Kennard F. Kosky

Kennard F. Kosky, P.E.
President and Principal Engineer
Florida Registration No. 14996

cc: Terrsa Heron
Preston Lewis
R. Chatham
C. Halladay
attachment
Q. Harper, EPA
KFK/mlb Q. Bunyak, NPS
B. Thomas, SWD

12018A1/15

DESTEC ENERGY

March 10, 1993

DESTEC ENERGY, INC.
2500 CITYWEST BLVD., SUITE 150
P.O. BOX 4411
HOUSTON, TEXAS 77210-4411
(713) 735-4000

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

VIA FEDERAL EXPRESS

Re: Central Florida Power, L.P. - DER No. AC53-214903 & PSD-FL-190

Dear Mr. Fancy:

On behalf of Central Florida Power, L.P. (CFPLP), I respectfully request the following comments be entered into the Department's record:

We have given serious consideration to the issue of revising emission limits after performance testing and emission data if such a lower rate is achievable. Our experience with lenders indicates that they would be unlikely to commit funds to a project with such a permit condition. We, as well as the financial community, are well aware that the regulatory agencies have the authority to impose new requirements on existing facilities. This "regulatory risk" is taken into account during the development of the project financing. A specific condition in the permit stating the Department's authority to revise the allowable emission limit would bring the "reliance on" the permit into question. Therefore, we request that no such condition be in the final permit for a change in the emission limits based on actual emission rates and that the Department rely on the regulation to provide for revision to the allowable limits.

We respectfully request that you consider our comment and would be pleased to address any other questions or concerns you might have. We appreciate the efforts on the part of the Department in reviewing our permit application and we look forward to receiving our permit.

Sincerely,

Frost W. Cochran
Project Finance Manager

FWC/nl

cc: Bob Taylor
Ken Kosky

FWC/nl

g:\secty\fwc-93\fancy.310

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

4APT-AEB

FEB 16 1993

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

RE: Central Florida Power Limited Partnership,
Tiger Bay Cogeneration Plant (PSD-FL-190)

Dear Mr. Fancy:

This is to acknowledge receipt of the preliminary determination and draft Prevention of Significant Deterioration (PSD) permit for the above referenced facility, by your letter dated January 15, 1993. The proposed facility will be a 258 megawatt combined cycle cogeneration power plant. The proposed project consists of one advanced technology heavy-duty industrial gas turbine electric generating unit, with a duct burner-fired heat recovery steam generator, and a steam turbine generator.

Your determination proposes to limit NO_x emissions from the combustion turbine through advanced dry low-NO_x combustors and water injection, to limit NO_x emissions from the duct burner through combustion design, to limit CO and VOC emissions from the combustion turbine and duct burner through combustion control, and to limit PM/PM_{10}, Be, and As emissions from the combustion turbine through combustion control and the use of clean fuels. In addition, this facility will meet revised, lower NO_x limits no later than December 31, 1997, through advanced combustor technology or the use of selective catalytic reduction.

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

Sincerely yours,

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

cc: J. Burger
C. Holladay
B. Thomas, SW Dist
G. Bunyak, NPS
K. Kosky, KBN
L. Novak, P. County

RECEIVED
FEB 22 1993
Division of Air
Resources Management

DESTEC ENERGY

DESTEC ENERGY, INC.
2500 CITYWEST BLVD., SUITE 150
P.O. BOX 4411
HOUSTON, TEXAS 77210-4411
(713) 735-4000

September 15, 1993

Mr. Preston Lewis, P.E.
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: FDER Permit No. AC53-214903, PSD-FL-190, and AC53-230744
Tiger Bay cogeneration facility
Tiger Bay Limited Partnership

Dear Mr. Lewis:

The purpose of this letter is to notify you on behalf of Tiger Bay Limited Partnership that construction of the Tiger Bay cogeneration plant commenced on August 16, 1993.

Should you have any questions, please feel free to contact me at your convenience at (713) 735-4087.

Sincerely,

Robert S. Chatham, P.E.

Enclosures
RSC/tk

cc: Harry Kerns - FDEP, Southwest District
Robert Taylor
Ken Kosky - KBN

A:\CONST2.WPR

Florida Department of
Environmental Protection

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

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

August 5, 1993

Mr. Robert S. Chatam, P.E.
DESTEC ENERGY, INC.
2500 Citywest Blvd., Suite 150
P.O. Box 4411
Houston, Texas 77210-4411

Dear Mr. Chatam:

RE: Central Florida Power L.P.
Permit No. AC53-214903, PSD -FL-190

The Department is in receipt of your letter dated July 30, 1993 regarding several design changes to your proposed Tiger Bay Cogeneration facility.

We have reviewed your letter and have no adverse comments. An "as built" plot and site plan should be included with the Certificate of Completion when you apply for an operation permit for this facility. Thank you for the opportunity to review and comment on this letter.

Sincerely,

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

CHF/TH/bjb

DESTEC ENERGY

DESTEC ENERGY, INC.
2500 CITYWEST BLVD., SUITE 150
P.O. BOX 4411
HOUSTON, TEXAS 77210-4411
(713) 735-4000

July 30, 1993

RECEIVED
AUG 03 1993
Division of Air
Resources Management

Mr. Preston Lewis, P.E.
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: FDER Permit No. AC53-214903 & PSD-FL-190
Tiger Bay cogeneration facility
Central Florida Power, L.P.

Dear Mr. Lewis:

Since the Florida Department of Environmental Regulation (FDER) issued the above-referenced permit to construct the Tiger Bay cogeneration facility, Destec on behalf of the Central Florida Power, L.P. has been finalizing the design details of the facility. During this period, several design changes have been identified which differ from information previously supplied to FDER; the purpose of this letter is to apprise you of these changes in accordance with the requirements of general condition 2 and specific condition 6 of the permit. We do not anticipate this project having any significant impacts to your agency and, in that respect, we are asking for your concurrence. August 9, 1993 is the projected start date for construction activities.

Thank you in advance for your prompt consideration of this information. Should you need additional information, or have any questions, please feel free to contact me at your convenience at (713) 735-4087. Written confirmation of the conclusion reached in this correspondence is respectfully requested.

Sincerely,

Robert S. Chatham, P.E.

Attachments
RSC/tk

cc: Harry Kerns - FDEP, Southwest District
Robert Taylor
Ken Kosky - KBN

A. Need for Additional Temporary Construction Yard

Efforts to schedule construction activities has convinced Destec of the need to develop a temporary laydown area during the approximate 16 month construction period. As shown in Attachment A, the areas proposed to be used are (1) a parcel located immediately south of the cogeneration site boundary which will be used for equipment laydown and (2) a parcel of land located to the east of the cogeneration site which will be used for the construction trailer village and parking.

Laydown Area

Presently, this site is being used as a laydown area by USAC, therefore, Destec anticipates no improvements will be required. Because no earthmoving or grading will be performed in this area, Destec is not proposing to regrade this site to drain into the permitted construction sedimentation pond along the north end of the project site adjacent to County Road 630.

The purpose of this area will be to receive and store in an orderly manner the components and materials needed to construct the facility during the period after they have been shipped by the manufacturer until needed for installation. The materials and equipment to be stored in this area will consist of structural steel, pipe, and equipment such as the transformers, waste water treatment system, and the like.

Trailer Village and Construction Parking

This site has been previously mined and relatively flat. Mobile office trailers and parking will be provided for construction personnel. No earthmoving or grading will be performed in this area. In order to protect against erosion, portions of this site will be graveled and a silt fences will be installed along its perimeter as shown on Attachment A. Upon completion of construction, the gravel will be removed (if requested) and the site will be stabilized.

B. Plot Plan Changes

Attachment B contains the current plot plan and reflects the most recent design information. By incorporating this information you will notice more detail and some minor changes, such as:

1. Elimination of the fuel oil storage tanks.

2. The relocation of the administration and maintenance buildings.

3. The stormwater pond configuration.

4. Other minor equipment changes or moves.

Storm Water Pond

Environmental Consulting & Technology, Inc. (ECT) has investigated the potential for flotation or uplift of the proposed stormwater management pond liner due to buoyant forces. In evaluating the potential for uplift, the minimum groundwater elevation which could be expected to cause uplift was calculated and compared to expected groundwater elevations. ECT has recommended that measures to prevent pond liner uplift should be taken because the occurrence of groundwater levels necessary for pond liner uplift is expected. Based upon this analysis, ECT recommends placement of the liner elevation at 151.00 ft and applying a soil cover measuring 2.75 ft thick. The pond volume and bottom elevation would remain the same. The application of a soil layer is preferable to a drainage layer from both construction cost and environmental performance data.

ATTACHMENTS

1. Cogeneration Facility Plot Plan

2. Site Plan

DESTEC ENERGY

DESTEC ENERGY, INC.
2500 CITYWEST BLVD., SUITE 150
P.O. BOX 4411
HOUSTON, TEXAS 77210-4411
(713) 735-4000

March 16, 1994

Mr. Preston Lewis, P.E.
Florida Department of Environmental Protection
Bureau of Air Regulation
2600 Blair Stone Road
Tallahassee, Florida 32399-2400

Re: FDER Permit No. AC53-214903 & PSD-FL-190
Tiger Bay cogeneration facility
Tiger Bay Limited Partnership

Dear Mr. Lewis:

Since the Florida Department of Environmental Regulation (now the Florida Department of Environmental Protection, FDEP) issued the above-referenced permit to construct the Tiger Bay cogeneration facility, Destec on behalf of the Tiger Bay Limited Partnership has been finalizing the design details of the facility. Since our last update, several design changes have been identified which differ from information supplied to the FDEP; the purpose of this letter is to apprise you of these changes in accordance with the requirements of general condition 2 and specific condition 6 of the permit. We do not anticipate these changes, the addition of a waste water tank and two fuel oil tanks (the original application referenced four fuel oil tanks), will have any significant impact to your agency and, in that respect, we are asking for your concurrence.

Thank you in advance for your prompt consideration of this information. Should you need additional information, or have any questions, please feel free to contact me at your convenience at (713) 735-4087. Written confirmation of the conclusion reached in this correspondence is respectfully requested.

Sincerely,

Robert S. Chatham, P.E.

Enclosures
RSC

cc: Harry Kerns - FDEP, Southwest District
Robert Taylor
Ken Kosky - KBN

A:\CONST3.WPR

A. Waste Water Tank

During August 1993, Tiger Bay Limited Partnership (TBLP) notified the Florida Department of Environmental Protection (FDEP), Industrial Waste Water Section, that our steam host had requested that TBLP route any water USAC considers usable to USAC for use rather than unnecessarily sending it to the zero liquid discharge system (ZLD). This option is not intended to void the use of the ZLD.

In conjunction to the routing of waste water to USAC, TBLP proposes to construct and operate an open-top 1,400,000 gallon waste water tank. The tank dimensions are 92 feet diameter and 32 feet tall. This system has been designed to continuously transfer the 120 gpm (normal operation) flow of waste water from this waste water tank to the steam host. The tank is design to hold a minimum of five days (at maximum flow conditions) of waste water. This volume includes appropriate freeboard to account for the 8 inch storm event, therefore, the tank should have no significant impact on storm water flow.

The tank will normally operate near empty, between low level (30") and high level (54"), in order to provide the maximum amount of storage capacity in the event of an interruption of USAC's demand. Protection from an overflow event is provided by automatic closure of a block valve on the influent line, upon a high-high level (30 feet) alarm. A low-low level (18") alarm will shut down the export pumps for protection against operating dry. The current site plan, SK-1253-G-100.14 Rev A, reflects the most recent design information (see Attachment A).

B. Fuel Oil Tanks

The above referenced site plan shows the location of the two fuel oil storage tanks. The capacity of each tank is approximately 150,000 gallons. The original application, permit and SPCC plan referenced four fuel oil tanks. These fuel oil tanks will comply with the applicable sections of the application, permit and Florida Chapter 17-762.

ATTACHMENT A

permit file

Florida Department of Environmental Protection

Lawton Chiles
Governor

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

Virginia B. Wetherell
Secretary

April 11, 1994

Mr. Robert S. Chatham, P.E.
Destec Energy, Inc.
2500 Citywest Blvd., Suite 150
Houston, Texas 77210-4411

Dear Mr. Chatham:

Re: Tiger Bay Cogeneration Facility
FDEP Permit No. AC53-214903 & PSD-FL-190

This is in response to your March 16, 1994, letter notifying the Department of several design changes to your proposed Tiger Bay Cogeneration Facility. These design changes, as stated in your letter, will neither increase emissions nor result in a different ambient air impact. However, it is required that this and all other substantive changes in the final design and construction be reported in the operation permit application.

Thank you for the opportunity to review and comment on this letter.

Sincerely,

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

CHF/TH/bjb

cc: Robert Taylor
Harry Kerns - FDEP, Southwest District
Ken Kosky - KBN

RECEIVED
APR 13 1994
Department of Environmental Protection
SOUTHWEST DISTRICT

Florida Department of
Environmental Protection

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

Lawton Chiles
Governor

Virginia B. Wetherell
Secretary

October 11, 1993

Mr. Kennard F. Kosky, P.E.
President
KBN Engineering and Applied Sciences, Inc.
1034 N.W. 57th Street
Gainesville, Florida 32605

Dear Mr. Kosky:

This in response to your recent letter notifying the Department of a design change for the Tiger Bay Cogeneration Facility (PSD-FL-190) consisting of a lower operating load of 60 percent. This design change will neither increase emissions nor result in a substantially different ambient impact. This operation will have no impact as far as the construction permit emission limits are concerned. Consequently, a construction permit modification is not required for this design change. However, it is required that this and all other substantive changes in the final design and construction be reported in the operation permit application.

If you have further questions, please contact Preston Lewis, Teresa Heron or Cleve Holladay at (904-488-1344).

Sincerely,

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

CHF/CH

cc: Robert Chatham, Destec Energy, Inc.
Robert I. Taylor, Tiger Bay L.P.
Bill Thomas, SWD

August 27, 1993

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

Re: Tiger Bay Limited Partnership (formerly Central Florida Power L.P.)
Tiger Bay Cogeneration Plant
AC 53-214903, PSD-FL-190; AC 53-230744

Dear Mr. Fancy:

Enclosed please find an air quality impact analysis for the proposed cogeneration facility with the combustion turbine operating at 60 percent load. This information is provided for this operating load since the air quality impacts for the combustion turbine were originally modeled at 100 and 70 percent operating loads. Based on current operating plans for the unit, an operating load of 60 percent is anticipated to be the lower range of operation for the turbine. The air quality impact analysis is being submitted to inform the Department of this operational change and meet the requirements of the general conditions of the permit. The proposed operating load does not represent a significant change to the project's ambient air quality impacts nor will it affect the permit conditions.

As you know, the proposed facility consists of one combustion turbine and an associated duct-burner-fired heat recovery steam generator (HRSG). These air emission sources received an air construction permit (AC 53-214903) in May 1993. The facility also includes a natural-gas-fired spray dryer unit and baghouse associated with the wastewater treatment system for which an air construction permit (AC 53-230744) was received in June 1993. As part of the permit applications, the maximum pollutant concentrations were predicted for those emission sources. For this submittal, the air quality impact analysis was based on the methods and assumptions used in the previous analyses, which included the use of the ISC2 model using 5 years of meteorological data. The source and emission data for the combustion turbine operating at 60 percent load and the duct burner at 100 percent load are presented in Attachment 1. Information on the spray dryer is presented in Attachment 2. The stack, operating, and emission data considered in the air quality impact modeling are presented in Table 1. The emission rates of the criteria and regulated pollutants for the combustion turbine operating at 60 percent load are compared to the permitted emissions rates in Tables 2 and 3.

A summary of the maximum concentrations predicted for the facility with the combustion turbine operating at 60 percent load for ambient temperatures of 27 and 97 degrees Fahrenheit is presented in Table 4. These results are compared to the results presented in the original application. The total concentration also includes impacts due to duct firing and the spray dryer. For predicting short-term impacts, the emission rates for the combustion turbine were based on firing distillate fuel oil (emissions from firing natural gas are lower than those for natural gas firing) coupled with the exit velocity from firing natural gas (exit velocity from firing fuel oil was lower). For predicting annual impacts, the

KBN ENGINEERING AND APPLIED SCIENCES, INC.

1034 Northwest 57th Street, Gainesville, Florida 32605, 904-331-9000, FAX 904-332-4189
5680 West Cypress Street, Suite I, Tampa, Florida 33607, 813-287-1717, FAX 813-287-1716
1801 Clint Moore Road, Suite 105, Boca Raton, Florida 33487, 407-994-9910, FAX 407-994-9393
6821 Southpoint Drive North, Suite 216, Jacksonville, Florida 32216, 904-296-9663, FAX 904-296-0146
One Church Street, Suite 801, Rockville, Maryland 20850, 301-738-1100, FAX 301-738-1105

cumulative emissions rates for distillate oil and natural gas (based on 300 and 8,460 hours, respectively) were used. This approach results in a conservative estimate of ambient impacts. As shown, the maximum concentrations for this analysis are well below the significant impact levels for the applicable pollutants and are generally less than or within 10 percent of the results presented in the original application. It should be noted that the impacts presented in the original application were based on the maximum concentrations predicted for a combustion turbine from two vendors [i.e., General Electric (GE) and Westinghouse] being considered at the time of the permit application. The combustion turbine selected for this project is the GE PG7221(FA) equipped with a dry low NOx combustor.

Because these results are less than the significant impact levels and are not significantly different from the previous results, the proposed operation of the combustion turbine at 60 percent load does not represent a significant change to the project's ambient air quality impacts and will not affect the permit conditions.

If you have any questions regarding this information, please do not hesitate to call. We appreciate your efforts in reviewing these results and written confirmation of the conclusion reached in this correspondence is respectfully requested.

Sincerely,

Kennard F. Kosky, P.E.
President

KFK/lcb

Enclosure

cc: Robert I. Taylor, Tiger Bay L.P.
Robert Chatham, Destec Energy, Inc.
Teresa Heron, FDEP
File (2)

Table 1. Stack, Operating, and Emission Data Considered in the Air Quality Impact Modeling for the Proposed Facility

Parameter	General Electric Turbine - 60% Load				Duct Burner	Spray Dryer/ Evaporator[c]
	Oil		Gas			
	27°F	97°F	27°F	97°F		
Stack Data (ft)						
Height	180	180	180	180	NA	73
Diameter	18	18	18	18	NA	1.3
Operating Data						
Temperature (°F)	190	190	190	190	NA	340
Velocity (ft/sec)	47.7	43.6	46.0[b]	42.6[b]	NA	63.4

Pollutant	Units	General Electric Turbine - 60% Load				Duct Burner	Spray Dryer/ Evaporator
		Oil		Gas			
		27°F	97°F	27°F	97°F		
PM	lb/hr	17.0	17.0	9.0	9.0	1.0	0.021
	TPY[a]	2.6	2.6	38.1	38.1	4.4	0.092[c]
NO_2	TPY[a]	35.3	29.2	493.0	419.4	43.8	1.41[c]
CO	lb/hr	68.2	62.2	34.4	31.2	10.0	0.061

Note: Attachment 1 presents emissions and stack parameter information used to develop this table. Total modeled gas turbine emission rate includes emissions from the duct burner. Higher emission rate of distillate oil used in the modeling to produce maximum short-term impacts. Cumulative emission rates for oil and natural gas (for 300 and 8,460 hours, respectively) for a given temperature were used to produce maximum annual impacts.
NA = Not applicable.

[a] Annual emission rates are based on burning distillate oil and natural gas for 300 and 8,460 hours, respectively, in the gas turbine and natural gas for 8,760 hours in the duct burner.

[b] Lower exit velocity of two fuels used in the modeling to produce maximum short-term impacts for given ambient temperature. Does not include additional exhaust from duct burner.

[c] At design conditions. Assume 8,760 hours of operation for annual emission rates.

Table 2. Maximum Emissions for Criteria Pollutants for the Tiger Bay Cogeneration Facility- GE PG7221(FA), Dry Low NOx II Combustion System, 60 Percent Load, and Duct Burner

Pollutant	Gas Turbine- Distillate Oil			Gas Turbine- Natural Gas			Duct Burner- Natural Gas			Maximum Emissions		
	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a
A			C			C			C			
Particulate:												
lb/hr	17.00	17.00	17.00	9.00	9.00	9.00	1.00	1.00	1.00	18.00	18.00	18.00
TPY	2.55	2.55	2.60	38.07	38.07	39.40	4.38	4.38	4.38	45.00	45.00	46.38
Sulfur Dioxide:												
lb/hr	73.03	60.39	99.70	3.55	3.02	4.86	0.30	0.30	0.30	73.33	60.69	100.00
TPY	10.95	9.06	15.00	15.03	12.77	21.30	1.32	1.32	1.32	27.30	23.15	37.62
Nitrogen Oxides:												
lb/hr	235.22	194.67	326.00	116.55	99.16	161.90	10.00	10.00	10.00	245.22	204.67	336.00
TPY	35.28	29.20	48.90	492.99	419.44	709.10	43.80	43.80	43.80	572.07	492.44	801.80
Carbon Monoxide:												
lb/hr	68.24	62.17	98.40	34.39	31.16	48.80	10.00	10.00	10.00	78.24	72.17	108.40
TPY	10.24	9.32	14.80	145.49	131.82	213.70	43.80	43.80	43.80	199.52	184.94	272.30
VOCs (as methane):												
lb/hr	5.46	2.01	7.50	2.23	2.02	2.80	2.90	2.90	2.90	8.36	4.91	10.40
TPY	0.82	0.30	1.10	9.42	8.54	12.30	12.70	12.70	12.70	22.94	21.54	26.10
Lead:												
lb/hr	1.21E-02	9.97E-03	1.65E-02	NA	NA	NA	NA	NA	NA	1.21E-02	9.97E-03	1.65E-02
TPY	1.81E-03	1.50E-03	2.47E-03	NA	NA	NA	NA	NA	NA	1.81E-03	1.50E-03	2.47E-03

^a Permitted emission rate at 100 percent load.

Table 3. Maximum Emissions of Other Regulated Pollutants for the Tiger Bay Cogeneration Facility
GE PG7221(FA), Dry Low NOx II Combustion System, 60 Percent Load, and Duct Burner

Pollutant		Gas Turbine- Distillate Oil			Gas Turbine- Natural Gas			Duct Burner- Natural Gas			Maximum Emissions		
		27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a
Arsenic	lb/hr	5.69E-03	4.70E-03	7.77E-03	NA	NA	NA	NA	NA	NA	5.69E-03	4.70E-03	7.77E-03
	TPY	8.53E-04	7.06E-04	1.17E-03	NA	NA	NA	NA	NA	NA	8.53E-04	7.06E-04	1.17E-03
Beryllium	lb/hr	3.39E-03	2.80E-03	4.62E-03	NA	NA	NA	NA	NA	NA	3.39E-03	2.80E-03	4.62E-03
	TPY	5.08E-04	4.20E-04	6.94E-04	NA	NA	NA	NA	NA	NA	5.08E-04	4.20E-04	6.94E-04
Mercury	lb/hr	4.06E-03	3.36E-03	5.55E-03	NA	NA	NA	NA	NA	NA	4.06E-03	3.36E-03	5.55E-03
	TPY	6.10E-04	5.04E-04	8.32E-04	NA	NA	NA	NA	NA	NA	6.10E-04	5.04E-04	8.32E-04
Fluoride	lb/hr	4.41E-02	3.64E-02	NA	NA	NA	NA	NA	NA	NA	4.41E-02	3.64E-02	NA
	TPY	6.61E-03	5.47E-03	NA	NA	NA	NA	NA	NA	NA	6.61E-03	5.47E-03	NA
Sulfuric Acid Mist	lb/hr	8.95E+00	7.40E+00	1.22E+00	4.35E-01	3.70E-01	5.95E-01	3.68E-02	3.68E-02	3.70E-02	8.98E+00	7.43E+00	1.22E+00
	TPY	1.34E+00	1.11E+00	1.83E-01	1.84E+00	1.56E+00	2.60E+00	1.61E-01	1.61E-01	1.61E-01	3.34E+00	2.84E+00	2.78E+00

^a Permitted emission rate at 100 percent load.

Table 4. Summary of Screening and Refined Air Modeling Impacts for the CT/DB and Spray Dryer/Evaporator Unit

DTIMP60
08/27/93

Ambient Temperature (°F)	Pollutant	Averaging Period	Highest Concentration ($\mu g/m^3$) 100% Load CT/DB Only^a	100% Load CT/DB + SD/Evap^b	70% Load CT/DB Only^a	70% Load CT/DB + SD/Evap^b	60% Load CT/DB Only^c	60% Load CT/DB + SD/Evap^b	Significant Impact Level ($\mu g/m^3$)
SCREENING IMPACTS									
27	PM	24-Hour	0.63	0.28	1.59	0.86	NM	1.35	5
		Annual	0.015	0.015	0.020	0.021	NM	0.024	1
	NO2	Annual	0.26	0.26	0.29	0.29	NM	0.31	1
	CO	1-Hour	25.8	16.9	34.3	19.3	NM	20.6	2000
		8-Hour	6.38	3.97	19.5	7.94	NM	8.75	500
97	PM	24-Hour	0.88	0.49	1.94	1.31	NM	1.49	5
		Annual	0.017	0.018	0.022	0.023	NM	0.026	1
	NO2	Annual	0.25	0.26	0.26	0.27	NM	0.29	1
	CO	1-Hour	29.8	18.0	33.0	19.3	NM	20.5	2000
		8-Hour	10.5	5.61	19.4	8.22	NM	8.91	500
REFINED IMPACTS									
97	PM	24-Hour	NM	NM	2.12	1.31	NM	1.49	5
		Annual	NM	NM	0.022	0.023	NM	0.026	1
27	NO2	Annual	NM	NM	0.29	0.29	NM	0.31	1
27/97	CO	1-Hour	NM	NM	45.8	20.4	NM	21.6	2000
		8-Hour	NM	NM	20.8	12.2	NM	13.2	500

Note: NM = not modeled.
Refinements presented for highest impacts for either the 100 or 70 percent load case, and the 60 percent load case.

^a As presented in the original PSD permit application. Emissions modeled were based on the highest emission rate from the GE or Westinghouse gas turbines. Stack velocity and temperature based on GE design information. Short-term rates are based on burning distillate oil in the gas turbine and natural gas in the duct burner. Annual emission rates are based on burning distillate oil and natural gas for 300 and 8,460 hours, respectively, in the gas turbine and natural gas for 8,760 hours in the duct burner.

^b Based on GE gas turbine emission rates and the spray dryer/evaporator operating at design conditions for 8,760 hours per year.

^c This scenario not modeled for this load condition.

ATTACHMENT 1

DESIGN INFORMATION AND STACK PARAMETERS FOR THE COMBUSTION TURBINE AT 60 PERCENT OPERATING LOAD AND DUCT BURNER AT 100 PERCENT OPERATING LOAD

Table 1. Design Information and Stack Parameters for the Tiger Bay Cogeneration Facility-GE PG7221(FA), Dry Low NOx II Combustion System, Distillate Oil, 60 Percent Load

Data		Gas Turbine Fuel Oil 27 °F	* Not Available * Gas Turbine Fuel Oil 64 °F	Gas Turbine Fuel Oil 72 °F	* Not Available * Gas Turbine Fuel Oil 79 °F	Gas Turbine Fuel Oil 97 °F
A	B	C	D	E	F	G
General						
Power (kW)		111,400.0		95,700.0		86,500.0
Heat Rate (Btu/kwh)		12,160.0		12,570.0		12,950.0
CT Exhaust Flow						
Mass Flow (lb/hr)		2,602,000		2,450,000		2,372,000
Temperature (oF)		1,194		1,200		1,200
Moisture (% Vol.)		11.84		12.09		12.18
Oxygen (% Vol.)		10.63		11.03		11.30
Molecular Weight		28.24		28.18		28.15
Heat Input (MMBtu/hr)= Power (kW) x Heat Rate (Btu/kwh) ÷ 1,000,000 Btu/MMBtu						
Power (kW)		111,400.0		95,700.0		86,500.0
Heat Rate (Btu/kwh)		12,160.0		12,570.0		12,950.0
Heat Input (MMBtu/hr)		1,354.6		1,202.9		1,120.2
Fuel Oil Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/lb)						
Heat Input (MMBtu/hr)		1,354.6		1,202.9		1,120.2
Heat Content,LHV (Btu/lb)		18,550		18,550		18,550
Fuel Oil (lb/hr)		73,025.6		64,849.0		60,386.8
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)		2,602,000		2,450,000		2,372,000
Temperature (°F)		1,194		1,200		1,200
Molecular Weight		28.24		28.18		28.15
Volume Flow (acfm)		1,853,998		1,755,772		1,701,700
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F + 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
Mass Flow (lb/hr)		2,602,000		2,450,000		2,372,000
Temperature (°F)		68		68		68
Molecular Weight		28.24		28.18		28.15
Volume Flow (scfm)		591,845		558,462		541,264
HRSG Stack Data						
Stack Height (ft)		180		180		180
Diameter (ft)		18.0		18.0		18.0
Volume Flow (acfm) from HRSG= [Volume flow (acfm) x (HRSG temp.(°F)+ 460°F)] ÷ [CT temp.(°F)+ 460°F]						
Volume Flow (acfm) from CT		1,853,998		1,755,772		1,701,700
CT Temperature (°F)		1,194		1,200		1,200
HRSG Temperature (°F)		190		190		190
Volume Flow (acfm) from HRSG		728,597		687,501		666,328
Velocity (ft/sec)= Volume flow (acfm) from HRSG ÷ [((diameter)²÷ 4) x 3.14159] ÷ 60 sec/min						
Volume Flow (acfm) from HRSG		728,597		687,501		666,328
Diameter (ft)		18.0		18.0		18.0
Velocity (ft/sec)		47.7		45.0		43.6

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft²

Source: General Electric, 1992.

Table 2. Maximum Emissions for Criteria Pollutants for the Tiger Bay Cogeneration Facility- GE PG7221(FA), Dry Low NOx II Combustion System, Distillate Oil, 60 Percent Load

Pollutant		Gas Turbine Fuel Oil 27 °F	* Not Available * Gas Turbine Fuel Oil 64 °F	Gas Turbine Fuel Oil 72 °F	* Not Available * Gas Turbine Fuel Oil 79 °F	Gas Turbine Fuel Oil 97 °F
A	B	C	D	E	F	G
Hours of Operation		300		300		300
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer						
Basis, lb/hr (manufactur.) (1)		17.0		17.0		17.0
lb/hr		17.0		17.0		17.0
TPY		2.6		2.6		2.6
Sulfur Dioxide (lb/hr)= Fuel oil (lb/hr) x sulfur content(fraction) x (lb SO2/lb S) x fraction emitted as SO2						
Fuel Oil (lb/hr)		73,025.6		64,849.0		60,386.8
Sulfur content (%)		0.05		0.05		0.05
lb SO2/lb S (64/32)		2.0		2.0		2.0
SO2 Fraction emitted		1.00		1.00		1.00
lb/hr		73.03		64.85		60.39
TPY		11.0		9.7		9.1
Nitrogen Oxides (lb/hr)= NOx(ppm) x {[20.9 x (1 - Moisture(%)/100)] - Oxygen(%)} x 2116.8 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr + [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]						
Basis, ppm* (1)		42.0		42.0		42.0
Moisture (%)		11.84		12.09		12.18
Oxygen (%)		10.63		11.03		11.3
Volume Flow (acfm)		1,853,998		1,755,772		1,701,700
Temperature (°F)		1194		1200		1200
lb/hr		235.2		209.1		194.7
TPY		35.3		31.4		29.2
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt CO) x 60 min/hr + [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+ (1)		30.0		30.0		30.0
Moisture (%)		11.84		12.09		12.18
Volume Flow (acfm)		1,853,998		1,755,772		1,701,700
Temperature (°F)		1194		1200		1200
lb/hr		68.2		64.2		62.2
TPY		10.2		9.6		9.3
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 16 (mole. wgt as methane) x 60 min/hr + [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+ (1)		4.2		4.1		1.7
Moisture (%)		11.84		12.09		12.18
Volume Flow (acfm)		1,853,998		1,755,772		1,701,700
Temperature (°F)		1194		1200		1200
lb/hr		5.46		5.01		2.01
TPY		0.8		0.8		0.3
Lead (lb/hr)= Lead (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) + 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (2)		8.9		8.9		8.9
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		1.21E-02		1.07E-02		9.97E-03
TPY		1.81E-03		0.0		0.0

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

Source: (1) General Electric, 1992; (2) EPA, 1990

Table 3. Maximum Emissions of Other Regulated Pollutants for the Tiger Bay Cogeneration Facility
GE PG7221(FA), Dry Low NOx II Combustion System, Distillate Oil, 60 Percent Load

Pollutant	Units	Gas Turbine Fuel Oil 27 °F	* Not Available * Gas Turbine Fuel Oil 64 °F	Gas Turbine Fuel Oil 72 °F	* Not Available * Gas Turbine Fuel Oil 79 °F	Gas Turbine Fuel Oil 97 °F
A	B	C	D	E	F	G
Hours of Operation		300		300		300
Arsenic (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		4.2		4.2		4.2
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		5.69E-03		5.05E-03		4.70E-03
TPY		8.53E-04		7.58E-04		7.06E-04
Beryllium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		2.5		2.5		2.5
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		3.39E-03		3.01E-03		2.80E-03
TPY		5.08E-04		4.51E-04		4.20E-04
Mercury (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		3		3		3
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		4.06E-03		3.61E-03		3.36E-03
TPY		6.10E-04		5.41E-04		5.04E-04
Fluoride (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, pg/J (2)		14		14		14
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		4.41E-02		3.91E-02		3.64E-02
TPY		6.61E-03		5.87E-03		5.47E-03
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2						
Fraction SO2 (%)		8		8		8
SO2 (lb/hr)		73.0		64.8		60.4
lb H2SO4/lb SO2 (98/64)		1.53		1.53		1.53
lb/hr		8.95E+00		7.94E+00		7.40E+00
TPY		1.34E+00		1.19E+00		1.11E+00

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

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

Table 4. Maximum Emissions of Non-Regulated Pollutants for the Tiger Bay Cogeneration Facility-GE PG7221(FA), Dry Low NOx II Combustion System, Distillate Oil, 60 Percent Load

Pollutant	Units	Gas Turbine Fuel Oil 27 °F	* Not Available * Gas Turbine Fuel Oil 64 °F	Gas Turbine Fuel Oil 72 °F	* Not Available * Gas Turbine Fuel Oil 79 °F	Gas Turbine Fuel Oil 97 °F
A	B	C	D	E	F	G
Hours of Operation		300		300		300
Manganese (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		14		14		14
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		1.90E-02		1.68E-02		1.57E-02
TPY		2.84E-03		2.53E-03		2.35E-03
Nickel (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		170		170		170
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		2.30E-01		2.05E-01		1.90E-01
TPY		3.45E-02		3.07E-02		2.86E-02
Cadmium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		10.5		10.5		10.5
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		1.42E-02		1.26E-02		1.18E-02
TPY		2.13E-03		1.89E-03		1.76E-03
Chromium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		47.5		47.5		47.5
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		6.43E-02		5.71E-02		5.32E-02
TPY		9.65E-03		8.57E-03		7.98E-03
Copper (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		280		280		280
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		3.79E-01		3.37E-01		3.14E-01
TPY		5.69E-02		5.05E-02		4.70E-02
Vanadium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		69.5		69.5		69.5
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		9.41E-02		8.36E-02		7.79E-02
TPY		1.41E-02		1.25E-02		1.17E-02
Selenium (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		23.42		23.42		23.42
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		3.17E-02		2.82E-02		2.62E-02
TPY		4.76E-03		4.23E-03		3.94E-03
Polycyclic Organic Matter (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		0.278		0.278		0.278
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		3.77E-04		3.34E-04		3.11E-04
TPY		5.65E-05		5.02E-05		4.67E-05
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		405		405		405
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		5.49E-01		4.87E-01		4.54E-01
TPY		8.23E-02		7.31E-02		6.81E-02

Source: (1) EPA, 1990

Table 5. Maximum Emissions for Additional Non-Regulated Pollutant for the Tiger Bay Cogeneration Facility-GE PG7221(FA), Dry Low NOx II Combustion System, Distillate Oil, 60 Percent Load

Pollutant		Gas Turbine Fuel Oil 27 °F	* Not Available * Gas Turbine Fuel Oil 64 °F	Gas Turbine Fuel Oil 72 °F	* Not Available * Gas Turbine Fuel Oil 79 °F	Gas Turbine Fuel Oil 97 °F
A	B	C	D	E	F	G
Hours of Operation		300		300		300
Antimony (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, pg/J (1)		9.4		9.4		9.4
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		2.96E-02		2.63E-02		2.45E-02
TPY		4.44E-03		3.94E-03		3.67E-03
Barium (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, pg/J (1)		8.4		8.4		8.4
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		2.64E-02		2.35E-02		2.19E-02
TPY		3.97E-03		3.52E-03		3.28E-03
Cobalt (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, pg/J (1)		3.9		3.9		3.9
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		1.23E-02		1.09E-02		1.02E-02
TPY		1.84E-03		1.64E-03		1.52E-03
Zinc (lb/hr)= Basis (pg/J) x 2.324 x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, pg/J (1)		294		294		294
HIR (MMBtu/hr)		1,354.6		1,202.9		1,120.2
lb/hr		9.26E-01		8.22E-01		7.65E-01
TPY		1.39E-01		1.23E-01		1.15E-01
Chlorine (lb/hr)= Basis (ppm) x Fuel oil (lb/hr) ÷ 1,000,000 (adj. for ppm)						
Basis, ppm		0.5		0.5		0.5
Fuel Oil (lb/hr)		73,025.6		64,849.0		60,386.8
lb/hr		3.65E-02		3.24E-02		3.02E-02
TPY		5.48E-03		4.86E-03		4.53E-03

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

Source: (1) EPA, 1979

Table 6. Design Information and Stack Parameters for the Tiger Bay Cogeneration Facility- GE PG7221(FA), Dry Low NOx II Combustion System, Natural Gas, 60 Percent Load

Data		Gas Turbine Natural Gas 27 °F	Gas Turbine Natural Gas 64 °F	Gas Turbine Natural Gas 72 °F	Gas Turbine Natural Gas 79 °F	Gas Turbine Natural Gas 97 °F
A	B	C	D	E	F	G
General						
Power (kW)		102,100.0	91,000.0	89,200.0	86,400.0	80,200.0
Heat Rate (Btu/kwh)		11,570.0	11,970.0	12,050.0	12,206.0	12,520.0
CT Exhaust Flow						
Mass Flow (lb/hr)		2,526,000	2,453,000	2,403,000	2,375,000	2,319,000
Temperature (oF)		1,200	1,200	1,200	1,200	1,200
Moisture (% Vol.)		7.71	8.78	9.11	9.56	9.71
Oxygen (% Vol.)		12.55	12.58	12.58	12.55	12.68
Molecular Weight		28.47	28.34	28.30	28.25	28.22
Heat Input (MMBtu/hr)= Power (kW) x Heat Rate (Btu/kwh) + 1,000,000 Btu/MMBtu						
Power (kW)		102,100.0	91,000.0	89,200.0	86,400.0	80,200.0
Heat Rate (Btu/kwh)		11,570.0	11,970.0	12,050.0	12,206.0	12,520.0
Heat Input (MMBtu/hr)		1,181.3	1,089.3	1,074.9	1,054.6	1,004.1
Natural Gas Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu + Fuel Heat Content, LHV (Btu/lb)						
(cf/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu + Fuel Heat Content, LHV (Btu/cf)						
Heat Input (MMBtu/hr)		1,181.3	1,089.3	1,074.9	1,054.6	1,004.1
Heat Content,LHV (Btu/lb)		21,515	21,515	21,515	21,515	21,515
Natural Gas (lb/hr)		54,905.7	50,628.4	49,958.6	49,016.9	46,670.0
Heat Content,LHV (Btu/cf)		950	950	950	950	950
Natural Gas (cf/hr)		1,243,471	1,146,600	1,131,432	1,110,104	1,056,952
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] + [Molecular weight x 2116.8] + 60 min/hr						
Mass Flow (lb/hr)		2,526,000	2,423,000	2,403,000	2,375,000	2,319,000
Temperature (°F)		1,200	1,200	1,200	1,200	1,200
Molecular Weight		28.47	28.34	28.30	28.25	28.22
Volume Flow (acfm)		1,791,791	1,726,673	1,714,707	1,697,954	1,659,410
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F +460°F)] + [Molecular weight x 2116.8] + 60 min/hr						
Mass Flow (lb/hr)		2,526,000	2,453,000	2,403,000	2,375,000	2,319,000
Temperature (°F)		68	68	68	68	68
Molecular Weight		28.47	28.34	28.30	28.25	28.22
Volume Flow (scfm)		569,919	556,007	545,401	540,072	527,812
HRSG Stack Data						
Stack Height (ft)		180	180	180	180	180
Diameter (ft)		18.0	18.0	18.0	18.0	18.0
Volume Flow (acfm) from HRSG= [Volume flow (acfm) x (HRSG temp.(°F)+ 460°F)] + [CT temp.(°F)+ 460°F]						
Volume Flow (acfm) from CT		1,791,791	1,726,673	1,714,707	1,697,954	1,659,410
CT Temperature (°F)		1,200	1,200	1,200	1,200	1,200
HRSG Temperature (°F)		190	190	190	190	190
Volume Flow (acfm) from HRSG		701,605	676,107	671,421	664,861	649,769
Velocity (ft/sec)= Volume flow (acfm) from HRSG + [((diameter)²+ 4) x 3.14159] + 60 sec/min						
Volume Flow (acfm) from HRSG		701,605	676,107	671,421	664,861	649,769
Diameter (ft)		18.0	18.0	18.0	18.0	18.0
Velocity (ft/sec)		46.0	44.3	44.0	43.5	42.6

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft²

Source: General Electric, 1992.

Table 7. Maximum Emissions for Criteria Pollutants for the Tiger Bay Cogeneration Facility-GE PG7221(FA), Dry Low NOx II Combustion System, Natural Gas, 60 Percent Load

Pollutant		Gas Turbine Natural Gas 27 °F	Gas Turbine Natural Gas 64 °F	Gas Turbine Natural Gas 72 °F	Gas Turbine Natural Gas 79 °F	Gas Turbine Natural Gas 97 °F
A	B	C	D	E	F	G
Hours of Operation		8460	8460	8460	8460	8460
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer						
Basis, lb/hr (manufactur.) (1)		9.0	9.0	9.0	9.0	9.0
lb/hr		9.0	9.0	9.0	9.0	9.0
TPY		38.07	38.07	38.07	38.07	38.07
Sulfur Dioxide (lb/hr)= Natural gas (cf/hr) x sulfur content(gr/100 cf) x 1 lb/7000 gr x (lb SO2/lb S) + 100						
Natural Gas (cf/hr)		1,243,471	1,146,600	1,131,432	1,110,104	1,056,952
Basis, gr/100 cf		1.0	1.0	1.0	1.0	1.0
lb SO2/lb S (64/32)		2.0	2.0	2.0	2.0	2.0
lb/hr		3.55	3.28	3.23	3.17	3.02
TPY		15.03	13.86	13.67	13.42	12.77
Nitrogen Oxides (lb/hr)= NOx(ppm) x {[20.9 x (1 - Moisture(%)/100)] - Oxygen(%)} x 2116.8 x Volume flow (acfm) x 46 (mole. wgt NOx) x 60 min/hr + [1545 x (CT temp.(°F) + 460°F) x 5.9 x 1,000,000 (adj. for ppm)]						
Basis, ppm* (1)		25.0	25.0	25.0	25.0	25.0
Moisture (%)		7.71	8.78	9.11	9.56	9.71
Oxygen (%)		12.55	12.58	12.58	12.55	12.68
Volume Flow (acfm)		1,791,791	1,726,673	1,714,707	1,697,954	1,659,410
Temperature (°F)		1200	1200	1200	1200	1200
lb/hr		116.5	108.1	106.2	104.1	99.2
TPY		492.99	457.19	449.20	440.37	419.44
Carbon Monoxide (lb/hr)= CO(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 28 (mole. wgt CO) x 60 min/hr + [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+ (1)		15.0	15.0	15.0	15.0	15.0
Moisture (%)		7.71	8.78	9.11	9.56	9.71
Volume Flow (acfm)		1,791,791	1,726,673	1,714,707	1,697,954	1,659,410
Temperature (°F)		1200	1200	1200	1200	1200
lb/hr		34.4	32.8	32.4	31.9	31.2
TPY		145.49	138.57	137.12	135.10	131.82
VOCs (lb/hr)= VOC(ppm) x [1 - Moisture(%)/100] x 2116.8 lb/ft2 x Volume flow (acfm) x 16 (mole. wgt as methane) x 60 min/hr + [1545 x (CT temp.(°F) + 460°F) x 1,000,000 (adj. for ppm)]						
Basis, ppm+ (1)		1.7	1.6	1.6	1.6	1.7
Moisture (%)		7.71	8.78	9.11	9.56	9.71
Volume Flow (acfm)		1,791,791	1,726,673	1,714,707	1,697,954	1,659,410
Temperature (°F)		1200	1200	1200	1200	1200
lb/hr		2.23	2.00	1.98	1.95	2.02
TPY		9.42	8.45	8.36	8.23	8.54
Lead (lb/hr)= Negligible						
Basis, lb/10E+12 Btu		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA

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

Source: General Electric, 1992.

Table 8. Maximum Emissions of Other Regulated Pollutants for the Tiger Bay Cogeneration Facility
GE PG7221(FA), Dry Low NOx II Combustion System, Natural Gas, 60 Percent Load

Pollutant	Units	Gas Turbine Natural Gas 27 °F	Gas Turbine Natural Gas 64 °F	Gas Turbine Natural Gas 72 °F	Gas Turbine Natural Gas 79 °F	Gas Turbine Natural Gas 97 °F
A	B	C	D	E	F	G
Hours of Operation		8460	8460	8460	8460	8460
Arsenic (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Beryllium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Mercury (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Fluoride (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2						
Fraction SO2 (%)		8	8	8	8	8
SO2 (lb/hr)		3.55	3.28	3.23	3.17	3.02
lb H2SO4/lb SO2 (98/64)		1.53	1.53	1.53	1.53	1.53
lb/hr		4.35E-01	4.01E-01	3.96E-01	3.89E-01	3.70E-01
TPY		1.84E+00	1.70E+00	1.68E+00	1.64E+00	1.56E+00

Source: (1) EPA, 1990

Table 9. Maximum Emissions of Non-Regulated Pollutants for the Tiger Bay Cogeneration Facility-GE PG7221(FA), Dry Low NOx II Combustion System, Natural Gas, 60 Percent Load

Pollutant	Units	Gas Turbine Natural Gas 27 °F	Gas Turbine Natural Gas 64 °F	Gas Turbine Natural Gas 72 °F	Gas Turbine Natural Gas 79 °F	Gas Turbine Natural Gas 97 °F
A	B	C	D	E	F	G
Hours of Operation		8460	8460	8460	8460	8460
Manganese (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Nickel (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Cadmium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Chromium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Copper (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Vanadium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Selenium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Polycyclic Organic Matter (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		1.113	1.113	1.113	1.113	1.113
HIR (MMBtu/hr)		1,181.3	1,089.3	1,074.9	1,054.6	1,004.1
lb/hr		1.31E-03	1.21E-03	1.20E-03	1.17E-03	1.12E-03
TPY		5.56E-03	5.13E-03	5.06E-03	4.97E-03	4.73E-03
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		88.12	88.12	88.12	88.12	88.12
HIR (MMBtu/hr)		1,181.3	1,089.3	1,074.9	1,054.6	1,004.1
lb/hr		1.04E-01	9.60E-02	9.47E-02	9.29E-02	8.85E-02
TPY		4.40E-01	4.06E-01	4.01E-01	3.93E-01	3.74E-01

Source: (1) EPA, 1990

Table 10. Maximum Emissions for Additional Non-Regulated Pollutant for the Tiger Bay Cogeneration Facility-GE PG7221(FA), Dry Low NOx II Combustion System, Natural Gas, 60 Percent Load

Pollutant	Gas Turbine Natural Gas 27 °F	Gas Turbine Natural Gas 64 °F	Gas Turbine Natural Gas 72 °F	Gas Turbine Natural Gas 79 °F	Gas Turbine Natural Gas 97 °F
A B	C	D	E	F	G
Hours of Operation	8460		8460		8460
Antimony (lb/hr)= Negligible					
Basis, pg/J	NA	NA	NA	NA	NA
HIR (MMBtu/hr)	NA	NA	NA	NA	NA
lb/hr	NA	NA	NA	NA	NA
TPY	NA	NA	NA	NA	NA
Barium (lb/hr)= Negligible					
Basis, pg/J	NA	NA	NA	NA	NA
HIR (MMBtu/hr)	NA	NA	NA	NA	NA
lb/hr	NA	NA	NA	NA	NA
TPY	NA	NA	NA	NA	NA
Cobalt (lb/hr)= Negligible					
Basis, pg/J	NA	NA	NA	NA	NA
HIR (MMBtu/hr)	NA	NA	NA	NA	NA
lb/hr	NA	NA	NA	NA	NA
TPY	NA	NA	NA	NA	NA
Zinc (lb/hr)= Negligible					
Basis, pg/J	NA	NA	NA	NA	NA
HIR (MMBtu/hr)	NA	NA	NA	NA	NA
lb/hr	NA	NA	NA	NA	NA
TPY	NA	NA	NA	NA	NA
Chlorine (lb/hr)= Negligible					
Basis, ppm	NA	NA	NA	NA	NA
Natural gas (cf)	NA	NA	NA	NA	NA
lb/hr	NA	NA	NA	NA	NA
TPY	NA	NA	NA	NA	NA

Table 11. Design Information for the Tiger Bay Cogeneration Facility-
Duct Burner, Supplemental Firing, Natural Gas

Data		Natural Gas 27 °F	Natural Gas 64 °F	Natural Gas 72 °F	Natural Gas 79 °F	Natural Gas 97 °F
A	B	C	D	E	F	G
General						
	Power (kW)	NA	NA	NA	NA	NA
	Heat Rate (Btu/kwh)	NA	NA	NA	NA	NA
	DB Exhaust Flow					
	Mass Flow (lb/hr)	5,244	5,244	5,244	5,244	5,244
	Temperature (oF)	190	190	190	190	190
	Moisture (% Vol.)	NA	NA	NA	NA	NA
	Oxygen (% Vol.)	NA	NA	NA	NA	NA
	Molecular Weight	28.00	28.00	28.00	28.00	28.00
Heat Input (MMBtu/hr)= As given						
	Power (kW)	NA	NA	NA	NA	NA
	Heat Rate (Btu/kwh)	NA	NA	NA	NA	NA
	Heat Input (MMBtu/hr)	100.0	100.0	100.0	100.0	100.0
Natural Gas Consumption (lb/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/lb) (cf/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, LHV (Btu/cf)						
	Heat Input (MMBtu/hr)	100.0	100.0	100.0	100.0	100.0
	Heat Content,LHV (Btu/lb)	23,839	23,839	23,839	23,839	23,839
	Natural Gas (lb/hr)	4,194.8	4,194.8	4,194.8	4,194.8	4,194.8
	Heat Content,LHV (Btu/cf)	950	950	950	950	950
	Natural Gas (cf/hr)	105,263	105,263	105,263	105,263	105,263
Volume Flow (acfm)= [(Mass Flow (lb/hr) x 1,545 x (Temp. (°F)+ 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
	Mass Flow (lb/hr)	5,244	5,244	5,244	5,244	5,244
	Temperature (°F)	190	190	190	190	190
	Molecular Weight	28.00	28.00	28.00	28.00	28.00
	Volume Flow (acfm)	1,481	1,481	1,481	1,481	1,481
Volume Flow (scfm)= [(Mass Flow (lb/hr) x 1,545 x (68°F + 460°F)] ÷ [Molecular weight x 2116.8] ÷ 60 min/hr						
	Mass Flow (lb/hr)	5,244	5,244	5,244	5,244	5,244
	Temperature (°F)	68	68	68	68	68
	Molecular Weight	28.00	28.00	28.00	28.00	28.00
	Volume Flow (scfm)	1,203	1,203	1,203	1,203	1,203
HRSG Stack Data						
	Stack Height (ft)	180	180	180	180	180
	Diameter (ft)	18.0	18.0	18.0	18.0	18.0
	Volume Flow (acfm) from DB= [Volume flow (acfm) x (HRSG temp.(°F)+ 460°F)] ÷ [CT temp.(°F)+ 460°F]					
	Volume Flow (acfm) from DB	1,481	1,481	1,481	1,481	1,481
	Assumed DB Exhaust Temp.(°F)	190	190	190	190	190
	HRSG Temperature (°F)	190	190	190	190	190
	Volume Flow (acfm) from DB	1,481	1,481	1,481	1,481	1,481
	Velocity (ft/sec)= Volume flow (acfm) from DB ÷ [((diameter)²÷ 4) x 3.14159] ÷ 60 sec/min					
	Volume Flow (acfm) from DB	1,481	1,481	1,481	1,481	1,481
	Diameter (ft)	18.0	18.0	18.0	18.0	18.0
	Velocity (ft/sec)	0.1	0.1	0.1	0.1	0.1

Note: Universal gas constant= 1,545 ft-lb(force)/°R; atmospheric pressure= 2,116.8 lb(force)/ft²

Source: Destec Engineering, Inc., 1992

Table 12. Maximum Emissions for Criteria Pollutants for the Tiger Bay Cogeneration Facility-Duct Burner, Supplemental Firing, Natural Gas

Pollutant	Natural Gas 27 °F	Natural Gas 64 °F	Natural Gas 72 °F	Natural Gas 79 °F	Natural Gas 97 °F
A B	C	D	E	F	G
Hours of Operation	8760	8760	8760	8760	8760
Particulate (lb/hr)= Basis (lb/MMBtu) x HIR (MMBtu/hr)					
Basis, lb/MMBtu	0.01	0.01	0.01	0.01	0.01
HIR, MMBtu/hr	100.0	100.0	100.0	100.0	100.0
lb/hr	1.00	1.00	1.00	1.00	1.00
TPY	4.38	4.38	4.38	4.38	4.38
Sulfur Dioxide (lb/hr)= Natural gas (cf/hr) x sulfur content(gr/100 cf) x 1 lb/7000 gr x (lb SO2/lb S) ÷ 100					
Natural Gas (cf/hr)	105,263	105,263	105,263	105,263	105,263
Basis, gr/100 cf	1.0	1.0	1.0	1.0	1.0
lb SO2/lb S (64/32)	2.0	2.0	2.0	2.0	2.0
lb/hr	0.30	0.30	0.30	0.30	0.30
TPY	1.32	1.32	1.32	1.32	1.32
Nitrogen Oxides (lb/hr)= Basis (lb/MMBtu/hr) x HIR (MMBtu/hr)					
Basis, lb/MMBtu	0.10	0.10	0.10	0.10	0.10
HIR, MMBtu/hr	100.0	100.0	100.0	100.0	100.0
lb/hr	10.00	10.00	10.00	10.00	10.00
TPY	43.80	43.80	43.80	43.80	43.80
Carbon Monoxide (lb/hr)= Basis (lb/MMBtu) x HIR (MMBtu/hr)					
Basis, lb/MMBtu	0.10	0.10	0.10	0.10	0.10
HIR, MMBtu/hr	100.0	100.0	100.0	100.0	100.0
lb/hr	10.00	10.00	10.00	10.00	10.00
TPY	43.80	43.80	43.80	43.80	43.80
VOCs (lb/hr)= Basis (lb/MMBtu) x HIR (MMBtu/hr)					
Basis, lb/MMBtu	0.029	0.029	0.029	0.029	0.029
HIR, MMBtu/hr	100.0	100.0	100.0	100.0	100.0
lb/hr	2.90	2.90	2.90	2.90	2.90
TPY	12.70	12.70	12.70	12.70	12.70
Lead (lb/hr)= Negligible					
Basis, lb/MMBtu	NA	NA	NA	NA	NA
HIR (MMBtu/hr)	NA	NA	NA	NA	NA
lb/hr	NA	NA	NA	NA	NA
TPY	NA	NA	NA	NA	NA

Table 13. Maximum Emissions of Other Regulated Pollutants for the Tiger Bay Cogeneration Facility
Duct Burner, Supplemental Firing, Natural Gas

Pollutant	Units	Natural Gas 27 °F	Natural Gas 64 °F	Natural Gas 72 °F	Natural Gas 79 °F	Natural Gas 97 °F
A	B	C	D	E	F	G
Hours of Operation		8760	8760	8760	8760	8760
Arsenic (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Beryllium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Mercury (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Fluoride (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Sulfuric Acid Mist (lb/hr) = Fraction of SO2 Emission Rate x SO2 Emission Rate x lb H2SO4/lb SO2						
Fraction SO2 (%)		8	8	8	8	8
SO2 (lb/hr)		0.30	0.30	0.30	0.30	0.30
lb H2SO4/lb SO2 (98/64)		1.53	1.53	1.53	1.53	1.53
lb/hr		3.68E-02	3.68E-02	3.68E-02	3.68E-02	3.68E-02
TPY		1.61E-01	1.61E-01	1.61E-01	1.61E-01	1.61E-01

Source: EPA, 1990

Table 14. Maximum Emissions of Non-Regulated Pollutants for the Tiger Bay Cogeneration Facility-Duct Burner, Supplemental Firing, Natural Gas

Pollutant	Units	Natural Gas 27 °F	Natural Gas 64 °F	Natural Gas 72 °F	Natural Gas 79 °F	Natural Gas 97 °F
A	B	C	D	E	F	G
Hours of Operation		8760	8760	8760	8760	8760
Manganese (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Nickel (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Cadmium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Chromium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Copper (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Vanadium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Selenium (lb/hr)= Negligible						
Basis, lb/10E+12 Btu (1)		NA	NA	NA	NA	NA
HIR (MMBtu/hr)		NA	NA	NA	NA	NA
lb/hr		NA	NA	NA	NA	NA
TPY		NA	NA	NA	NA	NA
Polycyclic Organic Matter (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		1.113	1.113	1.113	1.113	1.113
HIR (MMBtu/hr)		100.0	100.0	100.0	100.0	100.0
lb/hr		1.11E-04	1.11E-04	1.11E-04	1.11E-04	1.11E-04
TPY		4.87E-04	4.87E-04	4.87E-04	4.87E-04	4.87E-04
Formaldehyde (lb/hr)= Basis (lb/10E+12 Btu) x Heat Input Rate (MMBtu/hr) ÷ 1,000,000 MMBtu/10E+12 Btu						
Basis, lb/10E+12 Btu (1)		88.12	88.12	88.12	88.12	88.12
HIR (MMBtu/hr)		100.0	100.0	100.0	100.0	100.0
lb/hr		8.81E-03	8.81E-03	8.81E-03	8.81E-03	8.81E-03
TPY		3.86E-02	3.86E-02	3.86E-02	3.86E-02	3.86E-02

Source: (1) EPA, 1990

Table 15. Maximum Emissions for Criteria Pollutants for the Tiger Bay Cogeneration Facility- GE PG7221(FA), Dry Low NOx II Combustion System, 60 Percent Load, and Duct Burner

Pollutant	Gas Turbine- Distillate Oil			Gas Turbine- Natural Gas			Duct Burner- Natural Gas			Maximum Emissions		
	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a
A		C			C			C				
Particulate:												
lb/hr	17.00	17.00	17.00	9.00	9.00	9.00	1.00	1.00	1.00	18.00	18.00	18.00
TPY	2.55	2.55	2.60	38.07	38.07	39.40	4.38	4.38	4.38	45.00	45.00	46.38
Sulfur Dioxide:												
lb/hr	73.03	60.39	99.70	3.55	3.02	4.86	0.30	0.30	0.30	73.33	60.69	100.00
TPY	10.95	9.06	15.00	15.03	12.77	21.30	1.32	1.32	1.32	27.30	23.15	37.62
Nitrogen Oxides:												
lb/hr	235.22	194.67	326.00	116.55	99.16	161.90	10.00	10.00	10.00	245.22	204.67	336.00
TPY	35.28	29.20	48.90	492.99	419.44	709.10	43.80	43.80	43.80	572.07	492.44	801.80
Carbon Monoxide:												
lb/hr	68.24	62.17	98.40	34.39	31.16	48.80	10.00	10.00	10.00	78.24	72.17	108.40
TPY	10.24	9.32	14.80	145.49	131.82	213.70	43.80	43.80	43.80	199.52	184.94	272.30
VOCs (as methane):												
lb/hr	5.46	2.01	7.50	2.23	2.02	2.80	2.90	2.90	2.90	8.36	4.91	10.40
TPY	0.82	0.30	1.10	9.42	8.54	12.30	12.70	12.70	12.70	22.94	21.54	26.10
Lead:												
lb/hr	1.21E-02	9.97E-03	1.65E-02	NA	NA	NA	NA	NA	NA	1.21E-02	9.97E-03	1.65E-02
TPY	1.81E-03	1.50E-03	2.47E-03	NA	NA	NA	NA	NA	NA	1.81E-03	1.50E-03	2.47E-03

^a Permitted emission rate at 100 percent load.

Table 16. Maximum Emissions of Other Regulated Pollutants for the Tiger Bay Cogeneration Facility
GE PG7221(FA), Dry Low NOx II Combustion System, 60 Percent Load, and Duct Burner

Pollutant		Gas Turbine- Distillate Oil			Gas Turbine- Natural Gas			Duct Burner- Natural Gas			Maximum Emissions		
		27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a
Arsenic	lb/hr	5.69E-03	4.70E-03	7.77E-03	NA	NA	NA	NA	NA	NA	5.69E-03	4.70E-03	7.77E-03
	TPY	8.53E-04	7.06E-04	1.17E-03	NA	NA	NA	NA	NA	NA	8.53E-04	7.06E-04	1.17E-03
Beryllium	lb/hr	3.39E-03	2.80E-03	4.62E-03	NA	NA	NA	NA	NA	NA	3.39E-03	2.80E-03	4.62E-03
	TPY	5.08E-04	4.20E-04	6.94E-04	NA	NA	NA	NA	NA	NA	5.08E-04	4.20E-04	6.94E-04
Mercury	lb/hr	4.06E-03	3.36E-03	5.55E-03	NA	NA	NA	NA	NA	NA	4.06E-03	3.36E-03	5.55E-03
	TPY	6.10E-04	5.04E-04	8.32E-04	NA	NA	NA	NA	NA	NA	6.10E-04	5.04E-04	8.32E-04
Fluoride	lb/hr	4.41E-02	3.64E-02	NA	NA	NA	NA	NA	NA	NA	4.41E-02	3.64E-02	NA
	TPY	6.61E-03	5.47E-03	NA	NA	NA	NA	NA	NA	NA	6.61E-03	5.47E-03	NA
Sulfuric Acid Mist	lb/hr	8.95E+00	7.40E+00	1.22E+00	4.35E-01	3.70E-01	5.95E-01	3.68E-02	3.68E-02	3.70E-02	8.98E+00	7.43E+00	1.22E+00
	TPY	1.34E+00	1.11E+00	1.83E-01	1.84E+00	1.56E+00	2.60E+00	1.61E-01	1.61E-01	1.61E-01	3.34E+00	2.84E+00	2.78E+00

^a Permitted emission rate at 100 percent load.

Table 17. Maximum Emissions of Non-Regulated Pollutants for the Tiger Bay Cogeneration Facility- GE PG7221(FA), Dry Low NOx II Combustion System, 60 Percent Load, and Duct Burner

Pollutant		Gas Turbine- Distillate Oil			Gas Turbine- Natural Gas			Duct Burner- Natural Gas			Maximum Emissions		
		27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a
Manganese	lb/hr	1.90E-02	1.57E-02	NA	NA	NA	NA	NA	NA	NA	1.90E-02	1.57E-02	NA
	TPY	2.84E-03	2.35E-03	NA	NA	NA	NA	NA	NA	NA	2.84E-03	2.35E-03	NA
Nickel	lb/hr	2.30E-01	1.90E-01	NA	NA	NA	NA	NA	NA	NA	2.30E-01	1.90E-01	NA
	TPY	3.45E-02	2.86E-02	NA	NA	NA	NA	NA	NA	NA	3.45E-02	2.86E-02	NA
Cadmium	lb/hr	1.42E-02	1.18E-02	NA	NA	NA	NA	NA	NA	NA	1.42E-02	1.18E-02	NA
	TPY	2.13E-03	1.76E-03	NA	NA	NA	NA	NA	NA	NA	2.13E-03	1.76E-03	NA
Chromium	lb/hr	6.43E-02	5.32E-02	NA	NA	NA	NA	NA	NA	NA	6.43E-02	5.32E-02	NA
	TPY	9.65E-03	7.98E-03	NA	NA	NA	NA	NA	NA	NA	9.65E-03	7.98E-03	NA
Copper	lb/hr	3.79E-01	3.14E-01	NA	NA	NA	NA	NA	NA	NA	3.79E-01	3.14E-01	NA
	TPY	5.69E-02	4.70E-02	NA	NA	NA	NA	NA	NA	NA	5.69E-02	4.70E-02	NA
Vanadium	lb/hr	9.41E-02	7.79E-02	NA	NA	NA	NA	NA	NA	NA	9.41E-02	7.79E-02	NA
	TPY	1.41E-02	1.17E-02	NA	NA	NA	NA	NA	NA	NA	1.41E-02	1.17E-02	NA
Selenium	lb/hr	3.17E-02	2.62E-02	NA	NA	NA	NA	NA	NA	NA	3.17E-02	2.62E-02	NA
	TPY	4.76E-03	3.94E-03	NA	NA	NA	NA	NA	NA	NA	4.76E-03	3.94E-03	NA
Polycyclic Organic Matter	lb/hr	3.77E-04	3.11E-04	NA	1.31E-03	1.12E-03	NA	1.11E-04	1.11E-04	NA	1.43E-03	1.12E-03	NA
	TPY	5.65E-05	4.67E-05	NA	5.56E-03	4.73E-03	NA	4.87E-04	4.87E-04	NA	6.11E-03	4.77E-03	NA
Formaldehyde	lb/hr	5.49E-01	4.54E-01	NA	1.04E-01	8.85E-02	NA	8.81E-03	8.81E-03	NA	5.57E-01	4.54E-01	NA
	TPY	8.23E-02	6.81E-02	NA	4.40E-01	3.74E-01	NA	3.86E-02	3.86E-02	NA	5.61E-01	4.42E-01	NA

^a Permitted emission rate not applicable for this pollutant.

Table 18. Maximum Emissions for Additional Non-Regulated Pollutant for the Tiger Bay Cogeneration Facility- GE PG7221(FA), Dry Low NOx II Combustion System, 60 Percent Load, and Duct Burner

Pollutant		Gas Turbine- Distillate Oil			Gas Turbine- Natural Gas			Duct Burner- Natural Gas			Maximum Emissions		
		27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a	27 °F	97 °F	Permitted^a
Antimony													
	lb/hr	2.96E-02	2.45E-02	NA	NA	NA	NA	NA	NA	NA	2.96E-02	2.45E-02	NA
	TPY	4.44E-03	3.67E-03	NA	NA	NA	NA	NA	NA	NA	4.44E-03	3.67E-03	NA
Barium													
	lb/hr	2.64E-02	2.19E-02	NA	NA	NA	NA	NA	NA	NA	2.64E-02	2.19E-02	NA
	TPY	3.97E-03	3.28E-03	NA	NA	NA	NA	NA	NA	NA	3.97E-03	3.28E-03	NA
Cobalt													
	lb/hr	1.23E-02	1.02E-02	NA	NA	NA	NA	NA	NA	NA	1.23E-02	1.02E-02	NA
	TPY	1.84E-03	1.52E-03	NA	NA	NA	NA	NA	NA	NA	1.84E-03	1.52E-03	NA
Zinc													
	lb/hr	9.26E-01	7.65E-01	NA	NA	NA	NA	NA	NA	NA	9.26E-01	7.65E-01	NA
	TPY	1.39E-01	1.15E-01	NA	NA	NA	NA	NA	NA	NA	1.39E-01	1.15E-01	NA
Chlorine													
	lb/hr	3.65E-02	3.02E-02	NA	NA	NA	NA	NA	NA	NA	3.65E-02	3.02E-02	NA
	TPY	5.48E-03	4.53E-03	NA	NA	NA	NA	NA	NA	NA	5.48E-03	4.53E-03	NA

^a Permitted emission rate not applicable for this pollutant.

ATTACHMENT 2

EMISSION RATE BASES AND ESTIMATES FOR THE STRAY DRYER AND EVAPORATOR UNITS

Table 1. Design Information and Stack Parameters for Tiger Bay Cogeneration Facility- Zero Liquid Discharge System- Spray Dryer/ Evaporator

Data	Average Operating Conditions	Design Operating Conditions
General		
Heat Input Rate (MMBtu/hr)	1.35	3.066
Hours of Operation	8560	200
Exhaust Flow Conditions		
Flow rate (acfm)	2,120	5,050
Temperature (°F)	340	340
Moisture Content (% Vol.)	20.00	20.00
Natural Gas Consumption (cf/hr)= Heat Input (MMBtu/hr) x 1,000,000 Btu/MMBtu ÷ Fuel Heat Content, HHV (Btu/cf)		
Heat Content, HHV (Btu/cf)	1,022	1,022
Natural Gas Consumption (cf/hr)	1,321	3,000
Natural Gas Consumption (MMcf/hr)	0.001321	0.003000
Volume Flow (dscfm)= Volume flow (acfm) x [(68°F + 460°F)÷(Exhaust Temperature(°F) + 460°F)] x [(100-(Moisture Content(%)) ÷ 100]		
Volume Flow (acfm)	2,120	5,050
Exhaust Temperature (°F)	340	340
Moisture Content (%)	20.00	20.00
Volume Flow (dscfm)	1,119	2,666
Stack Data		
Stack Height (ft)	73	73
Diameter (ft)	1.3	1.3
Operating Data		
Velocity (ft/sec)= Volume flow (acfm) ÷ [((diameter)²÷ 4) x 3.14159] ÷ 60 sec/min		
Volume Flow (acfm)	2,120	5,050
Diameter (ft)	1.3	1.3
Velocity (ft/sec)	26.6	63.4

Table 2. Maximum Emissions of Criteria Pollutants for the Tiger Bay Cogeneration Facility- Zero Liquid Discharge System- Spray Dryer/ Evaporator

Pollutant	Average Operating Conditions	Design Operating Conditions	Total Emissions (Maximum)
Hours of Operation	8560	200	
Particulate (lb/hr)= Emission rate (lb/hr) from manufacturer			
Basis, lb/hr (vendor guarantee)	0.009	0.021	
lb/hr	0.009	0.021	0.021
TPY	0.039	0.0021	0.041
Sulfur Dioxide (lb/hr)= Sulfur Content (gr/100 cf) x Fuel Consumption (cf/hr) x 1 lb/7000 gr x (lb SO2/lb S) ÷ 100			
Sulfur content basis, gr/100 cf	1.0	1.0	
Fuel Consumption (cf/hr)	1,321	3,000	
lb SO2/lb S (64/32)	2.0	2.0	
lb/hr	0.0038	0.0086	0.0086
TPY	0.016	0.001	0.017
Nitrogen Oxides (lb/hr)= Emission Factor (lb/MMBtu) x Heat Input Rate (MMBtu/hr)			
Emission Factor (lb/MMBtu) [vendor guarantee]	0.105	0.105	
Heat Input Rate (MMBtu/hr)	1.35	3.066	
lb/hr	0.142	0.322	0.322
TPY	0.607	0.032	0.639
Carbon Monoxide (lb/hr)= Emission Factor (lb/MMBtu) x Heat Input Rate (MMBtu/hr)			
Emission Factor (lb/MMBtu) [vendor guarantee]	0.020	0.020	
Heat Input Rate (MMBtu/hr)	1.35	3.066	
lb/hr	0.027	0.061	0.061
TPY	0.116	0.006	0.122
Volatile Organic Compounds (lb/hr)= Emission Factor (lb/MMBtu) x Heat Input Rate (MMBtu/hr)			
Emission Factor (lb/MMBtu) [vendor guarantee]	0.006	0.006	
Heat Input Rate (MMBtu/hr)	1.35	3.066	
lb/hr	0.008	0.018	0.018
TPY	0.035	0.002	0.037