NRG Texas Power LLC
910 Louisiana Street
Houston, Tx 77002

Via Hand Delivery

March 17, 2020

MAR 18 2020
APIRT

Mr. Samual Short
Director, Air Permits Division, MC-163
Texas Commission on Environmental Quality

c/o Permits Administrative Review Section
Registration, Review and Reporting Division, MC-161
12100 Park 35 Circle
Building F, First Floor, Room 1206
Austin, Texas 78753

RE: NRG Texas Power LLC
Cedar Bayou Electric Generating Station
New Air Permit Application
NRG Cedar Bayou 5 LLC
CN603207218; RN100825371

Dear Mr. Short:

NRG Texas Power LLC (NRG Texas) on behalf of NRG Cedar Bayou 5 LLC, has prepared the enclosed Form PI-1 General Application and supporting documents for a new air permit at the Cedar Bayou Electric Generating Station located in Baytown, Chambers County, Texas. This air permit application is being submitted to authorize construction of an additional natural gas fired electric generating unit. The project will be a major modification for Prevention of Significant Deterioration (PSD) purposes but does not trigger Nonattainment New Source Review.

The Form PI-1 General Application and the Emissions Modeling Evaluation Workbook are being submitted electronically via email to the Air Permits Division and printed copies are included as attachments to this application. A PSD Modeling Protocol and State NSR Initial Modeling Summary is also being submitted with this application.

We believe that our application is technically complete and we respectfully request that TCEQ staff proceed with its review. Please contact Ms. Colleen Krenek of my staff at (713) 537-5742 or colleen.krenek@nrg.com or me at craig.eckberg@nrg.com with any questions or requests for more information.

Sincerely,

C.R.E.

Craig Eckberg
Sr. Director, Environmental Services

Attachments

cc: Mr. Joseph Doby, Air Section Manager, TCEQ Region 12, w/attachments
EPA Region 6, Dallas, Texas (via email to R6AirPermitsTX@epa.gov)
Mr. Larry A. Moon, P.E., POWER Engineers, Inc.

MAR 18 2020
APIRT

March 2020

AIR PERMIT APPLICATION

NRG Cedar Bayou 5 LLC
Cedar Bayou Electric Generating Station
Chambers County, Texas

Submitted To:
Texas Commission on Environmental Quality
Air Permits Division
12100 Park 35 Circle
Austin, Texas 78753

03-18-2020

STATE OF TEXAS
LARRY A. MOON
69515
LICENSED
PROFESSIONAL ENGINEER
F-988

Larry A. Moon

PROJECT NUMBER:
160060

POWER ENGINEERS

TABLE OF CONTENTS

APPENDICES:

INTRODUCTION

NRG Texas Power LLC (NRG Texas) owns and operates the Cedar Bayou Electric Generating Station in Baytown, Chambers County, Texas. This air permit application is being submitted to authorize construction of an additional electric generating unit at the Cedar Bayou Station. The new facility will operate under the name NRG Cedar Bayou 5 LLC (CB5). The new facility will be either be a simple cycle turbine generating unit or a combined cycle generating unit in a 1x1x1 configuration (one combustion turbine, with supplemental fired (duct burners) heat recovery steam generator (HRSG), and one steam turbine). The gas turbine that will be installed is the Mitsubishi Hitachi Power Systems, Ltd., hereinafter referred to as “Mitsubishi,” model MHI 501JAC. The project generation capacity of the new simple cycle electric generating unit will be approximately 415 MW. The project net baseload generation capacity of the new combined cycle unit will be approximately 689 MW. The proposed turbines and duct burners will be fired exclusively with pipeline quality natural gas.

The TCEQ issued Permit Nos. 105810 and PSDTX1308 in August 29, 2014 authorizing NRG Texas to construct two additional natural gas fired combustion turbines to operate in either simple or combined cycle mode at the Cedar Bayou Station. Extension for start of construction of that project was authorized and the new date by which construction had to commence was extended to April 15, 2020. NRG Texas does not anticipate the previously permitted project will be built. The application being submitted by CB5 to construct a much more efficient simple or combined cycle gas turbine will supplant the previously permitted project. CB5 anticipates the TCEQ will issue a permit for the new project after April 15, 2020, after authorization to construct the previously authorized project has lapsed. For this reason, the previous project has not been represented in contemporaneous netting.

The Cedar Bayou Station is located in Chambers County, which is classified as a serious nonattainment county for ozone under the federal 8-hour standard. Further, the station is an existing major source with respect to the nonattainment new source review (NNSR) and the prevention of significant deterioration (PSD) programs. Although CB5 is seeking a new permit, the project is considered a modification to an existing facility for purposes of PSD and nonattainment permitting, since the site is an existing major source. The site operates under a plantwide applicability limit (PAL) for NOx. NRG Texas will maintain NOx, emissions at or below the established PAL9; therefore, PSD and NNSR will not apply to the proposed facilities for NOx. Emissions increases of SO_2 from the project alone will not exceed the applicable significant emission rate level; therefore, PSD review will not apply to SO_2. After netting, CO, $PM/PM_{10}/PM_{2.5}$, and H_2SO_4 increases exceed the PSD significance level; therefore, PSD review is required for these pollutants. The project increases of VOC will not exceed the NNSR significance level; therefore, NNSR review is not required for VOC. The project emissions increase of greenhouse gases (GHG) also exceeds the 75,000 tpy significance level; therefore, a PSD permit must also be obtained for GHG emissions.

The remainder of the application presents all information required for an air quality construction permit according to the TCEQ guidance, with information presented in the order that it is addressed on the PI-1 Form. An air dispersion modeling protocol will be submitted with this application. A final modeling report will be submitted after consultation with the TCEQ.

PI-1 GENERAL APPLICATION

I. Applicant Information	
I acknowledge that I am submitting an authorized TCEQ application workbook and any necessary attachments. Except for inputting the requested data and adjusting row height and column width, I have not changed the TCEQ application workbook in any way, including but not limited to changing formulas, formatting, content, or protections.	I agree
A. Company Information	
Company or Legal Name:	NRG Cedar Bayou 5, LLC
Permits are issued to either the facility owner or operator, commonly referred to as the applicant or permit holder. List the legal name of the company, corporation, partnership, or person who is applying for the permit. We will verify the legal name with the Texas Secretary of State at (512) 463-5555 or at:	
https://www.sos.state.tx.us	
Texas Secretary of State Charter/Registration Number (if given):	
B. Company Official Contact Information: must not be a consultant	
Prefix (Mr., Ms., Dr., etc.):	Mr.
First Name:	Craig
Last Name:	Eckberg
Title:	Director, South Region, Regulatory & Environmental Services
Mailing Address:	910 Louisana Street
Address Line 2:	
City:	Houston
State:	Texas
ZIP Code:	77002
Telephone Number:	(713) 537-2776
Fax Number:	
Email Address:	craig.eckberg@nrg.com
C. Technical Contact Information: This person must have the authority to make binding agreements and representations on behalf of the applicant and may be a consultant. **Additional technical contact(s) can be provided in a cover letter.**	
Prefix (Mr., Ms., Dr., etc.):	Ms.
First Name:	Colleen
Last Name:	Krenek
Title:	Environmental Specialist
Company or Legal Name:	NRG Cedar Bayou 5 LLC
Mailing Address:	910 Louisana Street
Address Line 2:	
City:	Houston
State:	Texas
ZIP Code:	77002
Telephone Number:	(713) 537-5742
Fax Number:	
Email Address:	colleen.krenek@nrg.com
D. Assigned Numbers The CN and RN below are assigned when a Core Data Form is initially submitted to the Central Registry. The RN is also assigned if the agency has conducted an investigation or if the agency has issued an enforcement action. If these numbers have not yet been assigned, leave these questions blank and include a Core Data Form with your application submittal. See Section VI.B. below for additional information.	
Enter the CN. The CN is a unique number given to each business, governmental body, association, individual, or other entity that owns, operates, is responsible for, or is affiliated with a regulated entity.	

Enter the RN. The RN is a unique agency assigned number given to each person, organization, place, or thing that is of environmental interest to us and where regulated activities will occur. The RN replaces existing air account numbers. The RN for portable units is assigned to the unit itself, and that same RN should be used when applying for authorization at a different location.	RN100825371

II. Delinquent Fees and Penalties

Does the applicant have unpaid delinquent fees and/or penalties owed to the TCEQ? This form will not be processed until all delinquent fees and/or penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ are paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ Web site at:	No

https://www.tceq.texas.gov/agency/financial/fees/delin

III. Permit Information

A. Permit and Action Type **(multiple may be selected, leave no blanks)**

Additional information regarding the different NSR authorizations can be found at:
https://www.tceq.texas.gov/permitting/air/guidance/authorize.html

Select from the drop-down the type of action being requested for each permit type. **If that permit type does not apply, you MUST select "Not applicable".**

Provide all assigned permit numbers relevant for the project. Leave blank if the permit number has not yet been assigned.

Permit Type	**Action Type Requested** **(do not leave blank)**	**Permit Number (if assigned)**
Minor NSR (can be a Title V major source): *Not applicable, Initial, Amendment, Renewal, Renewal Certification, Renewal/Amendment, Relocation/Alteration, Change of Location, Alteration, Extension to Start of Construction*	Initial	
Special Permit: *Not applicable, Amendment, Renewal, Renewal Certification, Renewal/Amendment, Alteration, Extension to Start of Construction*	Not applicable	
De Minimis: *Not applicable, Initial*	Not applicable	
Flexible: *Not applicable, Initial, Amendment, Renewal, Renewal Certification, Renewal/Amendment, Alteration, Extension to Start of Construction*	Not applicable	
PSD: *Not applicable, Initial, Major Modification*	Major Modification	
Nonattainment: *Not applicable, Initial, Major Modification*	Not applicable	
HAP Major Source [FCAA § 112(g)]: *Not applicable, Initial, Major Modification*	Not applicable	
PAL: *Not applicable, Initial, Amendment, Renewal, Renewal/Amendment, Alteration*	Not applicable	
GHG PSD: *Not applicable, Initial, Major Modification, Voluntary Update*	Initial	

GHG projects: List the non-GHG applications (pending or being submitted) that are associated with the project. Note: All preconstruction authorizations (including authorization for emissions of greenhouse gases, if applicable) must be obtained prior to start of construction.	

B. MSS Activities

How are/will MSS activities for sources associated with this project be authorized?	This permit

C. Consolidating NSR Permits

Will this permit be consolidated into another NSR permit with this action?	No
Will NSR permits be consolidated into this permit with this action?	No

D. Incorporation of Standard Permits, Standard Exemptions, and/or Permits By Rule (PBR)

To ensure protectiveness, previously issued authorizations (standard permits, standard exemptions, or PBRs) including those for MSS, are incorporated into a permit either by consolidation or by reference. At the time of renewal and/or amendment, consolidation (in some cases) may be voluntary and referencing is mandatory. More guidance regarding incorporation can be found in 30 TAC § 116.116(d)(2), 30 TAC § 116.615(3) and in this memo:

https://www.tceq.texas.gov/assets/public/permitting/air/memos/pbr_spc06.pdf

Are there any standard permits, standard exemptions, or PBRs to be incorporated by reference?	No
Are there any PBR, standard exemptions, or standard permits associated to be incorporated by consolidation? **Note:** Emission calculations, a BACT analysis, and an impacts analysis must be attached to this application at the time of submittal for any authorization to be incorporated by consolidation.	No

E. Associated Federal Operating Permits

Is this facility located at a site required to obtain a **site operating permit (SOP)** or **general operating permit (GOP)?**		Yes
Is a **SOP** or **GOP** review pending for this source, area, or site?		No
If required to obtain a **SOP** or **GOP**, list all associated permit number(s). If no associated permit number has been assigned yet, enter "TBD":	TBD	

IV. Facility Location and General Information		
A. Location		
County: Enter the county where the facility is physically located.	Chambers	
TCEQ Region	Region 12	
County attainment status as of Sept. 23, 2019	Serious Ozone nonattainment	
Street Address:	7705 West Bay Road	
City: If the address is not located in a city, then enter the city or town closest to the facility, even if it is not in the same county as the facility.	Baytown	
ZIP Code: Include the ZIP Code of the physical facility site, not the ZIP Code of the applicant's mailing address.	77523	
Site Location Description: If there is no street address, provide written driving directions to the site. Identify the location by distance and direction from well-known landmarks such as major highway intersections.		
Use USGS maps, county maps prepared by the Texas Department of Transportation, or an online software application such as Google Earth to find the latitude and longitude.		
Latitude (in degrees, minutes, and nearest second (DDD:MM:SS)) for the street address or the destination point of the driving directions. Latitude is the angular distance of a location north of the equator and will always be between 25 and 37 degrees north (N) in Texas.	29° 44' 54"	
Longitude (in degrees, minutes, and nearest second (DDD:MM:SS)) for the street address or the destination point of the driving directions. Longitude is the angular distance of a location west of the prime meridian and will always be between 93 and 107 degrees west (W) in Texas.	-94° 55' 38"	
Is this a project for a lead smelter, concrete crushing facility, and/or a hazardous waste management facility?		No
B. General Information		
Site Name:	Cedar Bayou Electric Generating Station	
Area Name: Must indicate the general type of operation, process, equipment or facility. Include numerical designations, if appropriate. Examples are Sulfuric Acid Plant and No. 5 Steam Boiler. Vague names such as Chemical Plant are not acceptable.	Electric Generating Unit 5	
Are there any schools located within 3,000 feet of the site boundary?	No	

C. Portable Facility	
Permanent or portable facility?	Permanent
D. Industry Type	
Principal Company Product/Business:	Electric Services
A list of SIC codes can be found at: https://www.naics.com/sic-codes-industry-drilldown/	
Principal SIC code:	4911
NAICS codes and conversions between NAICS and SIC Codes are available at: https://www.census.gov/eos/www/naics/	
Principal NAICS code:	221112
E. State Senator and Representative for this site	
This information can be found at (note, the website is not compatible to Internet Explorer): https://wrm.capitol.texas.gov/	
State Senator:	Brandon Creighton
District:	4
State Representative:	Mayes Middleton
District:	23

V. Project Information	
A. Description	
Provide a brief description of the project that is requested. (Limited to 500 characters).	Construction of new gas turbine electric generating unit at existing Cedar Bayou site.
B. Project Timing	
Authorization must be obtained for many projects before beginning construction. Construction is broadly interpreted as anything other than site clearance or site preparation. Enter the date as "Month Date, Year" (e.g. July 4, 1776).	
Projected Start of Construction:	December 31, 2020
Projected Start of Operation:	June 1, 2022
C. Enforcement Projects	
Is this application in response to, or related to, an agency investigation, notice of violation, or enforcement action?	No
D. Operating Schedule	
Will sources in this project be authorized to operate 8760 hours per year?	Yes

VI. Application Materials	
All representations regarding construction plans and operation procedures contained in the permit application shall be conditions upon which the permit is issued. (30 TAC § 116.116)	
A. Confidential Application Materials	
Is confidential information submitted with this application?	No

B. Is the Core Data Form (Form 10400) attached?	Yes
https://www.tceq.texas.gov/assets/public/permitting/centralregistry/10400.docx	
C. Is a current area map attached?	Yes
Is the area map a current map with a true north arrow, an accurate scale, the entire plant property, the location of the property relative to prominent geographical features including, but not limited to, highways, roads, streams, and significant landmarks such as buildings, residences, schools, parks, hospitals, day care centers, and churches?	Yes
Does the map show a 3,000-foot radius from the property boundary?	Yes
D. Is a plot plan attached?	Yes
Does your plot plan clearly show a north arrow, an accurate scale, all property lines, all emission points, buildings, tanks, process vessels, other process equipment, and two bench mark locations?	Yes
Does your plot plan identify all emission points on the affected property, including all emission points authorized by other air authorizations, construction permits, PBRs, special permits, and standard permits?	Yes
Did you include a table of emission points indicating the authorization type and authorization identifier, such as a permit number, registration number, or rule citation under which each emission point is currently authorized?	Yes
E. Is a process flow diagram attached?	Yes
Is the process flow diagram sufficiently descriptive so the permit reviewer can determine the raw materials to be used in the process; all major processing steps and major equipment items; individual emission points associated with each process step; the location and identification of all emission abatement devices; and the location and identification of all waste streams (including wastewater streams that may have associated air emissions)?	Yes
F. Is a process description attached?	Yes
Does the process description emphasize where the emissions are generated, why the emissions must be generated, what air pollution controls are used (including process design features that minimize emissions), and where the emissions enter the atmosphere?	Yes
Does the process description also explain how the facility or facilities will be operating when the maximum possible emissions are produced?	Yes
G. Are detailed calculations attached? Calculations must be provided for each source with new or changing emission rates. For example, a new source, changing emission factors, decreasing emissions, consolidated sources, etc. You do not need to submit calculations for sources which are not changing emission rates with this project. Please note: the preferred format is an electronic workbook (such as Excel) with all formulas viewable for review. It can be emailed with the submittal of this application workbook.	Yes
Are emission rates and associated calculations for planned MSS facilities and related activities attached?	Yes
H. Is a material balance (Table 2, Form 10155) attached?	N/A

I. Is a list of MSS activities attached?	Yes
Are the MSS activities listed and discussed separately, each complete with the authorization mechanism or emission rates, frequency, duration, and supporting information if authorized by this permit?	Yes
J. Is a discussion of state regulatory requirements attached, addressing 30 TAC Chapters 101, 111, 112, 113, 115, and 117?	Yes
For all applicable chapters, does the discussion include how the facility will comply with the requirements of the chapter?	Yes
For all not applicable chapters, does the discussion include why the chapter is not applicable?	Yes
K. Are all other required tables, calculations, and descriptions attached?	Yes

VII. Signature

The owner or operator of the facility must apply for authority to construct. The appropriate company official (owner, plant manager, president, vice president, or environmental director) must sign all copies of the application. The applicant's consultant cannot sign the application. **Important Note: Signatures must be original in ink, not reproduced by photocopy, fax, or other means, and must be received before any permit is issued.**

The signature below confirms that I have knowledge of the facts included in this application and that these facts are true and correct to the best of my knowledge and belief. I further state that to the best of my knowledge and belief, the project for which application is made will not in any way violate any provision of the Texas Water Code (TWC), Chapter 7; the Texas Health and Safety Code, Chapter 382; the Texas Clean Air Act (TCAA); the air quality rules of the Texas Commission on Environmental Quality; or any local governmental ordinance or resolution enacted pursuant to the TCAA. I further state that I understand my signature indicates that this application meets all applicable nonattainment, prevention of significant deterioration, or major source of hazardous air pollutant permitting requirements. The signature further signifies awareness that intentionally or knowingly making or causing to be made false material statements or representations in the application is a criminal offense subject to criminal penalties.

Name:	Craig Eckberg
Signature:	C.R.Eckberg
	Original signature is required.
Date:	17 March 2020

V. PROJECT INFORMATION

V.A. Description

CB5 proposes to construct an additional electric generating unit at the Cedar Bayou Station. The new facility will be either be a simple cycle turbine generating unit or a combined cycle generating unit in a 1x1x1 configuration (one combustion turbine, with supplemental fired (duct burner) HRSG, and one steam turbine). The application contains manufacturer specific emission data for the combined and simple cycle turbine configurations. The application also identifies and quantifies emissions from ancillary equipment that will be constructed as part of the project. Below is a summary of all air emission sources and air quality control systems that are a part of this project.

- One natural gas-fired combustion turbine generator (CTG) equipped with lean pre-mix, low NOx emissions combustion technology.
- One natural gas-fired duct burner systems serving the HRSG for the gas turbine in combined cycle configuration.
- One selective catalytic reduction (SCR) system for additional NO_x emissions control.
- One oxidation catalyst for additional CO and VOC emissions control.
- Aqueous ammonia piping and handling and metering equipment
- Lube oil vents for the turbine lube oil recirculation systems
- One natural gas-fired auxiliary boiler supporting the combined cycle configuration.
- One natural gas-fired fuel gas heater.
- A diesel fuel-fired emergency engine and associated diesel storage tank.
- Natural gas piping handling, and metering equipment.
- A cooling tower to support the combined cycle configuration.
- Electrical equipment with sulfur hexafluoride (SF_6).

Details regarding the proposed equipment follow. A process flow diagram for the combined cycle option and a process flow diagram for the simple cycle option are included in Section VI.E and a TCEQ Material Balance Table 2 is included in Section VI.H.

VI. APPLICATION MATERIALS

VI.C. AREA MAP

The attached area map illustrates the location surrounding the Cedar Bayou Station and includes a 3,000-foot radius around the facility with property boundary indicated.

Legend

Plant Boundary

3000 Foot Radius

0 1,000 2,000

Feet

NRG CEDAR BAYOU 5 LLC

AREA MAP

CHAMBERS COUNTY, TEXAS

POWER ENGINEERS

Date: 03/02/2020

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VI. APPLICATION MATERIALS

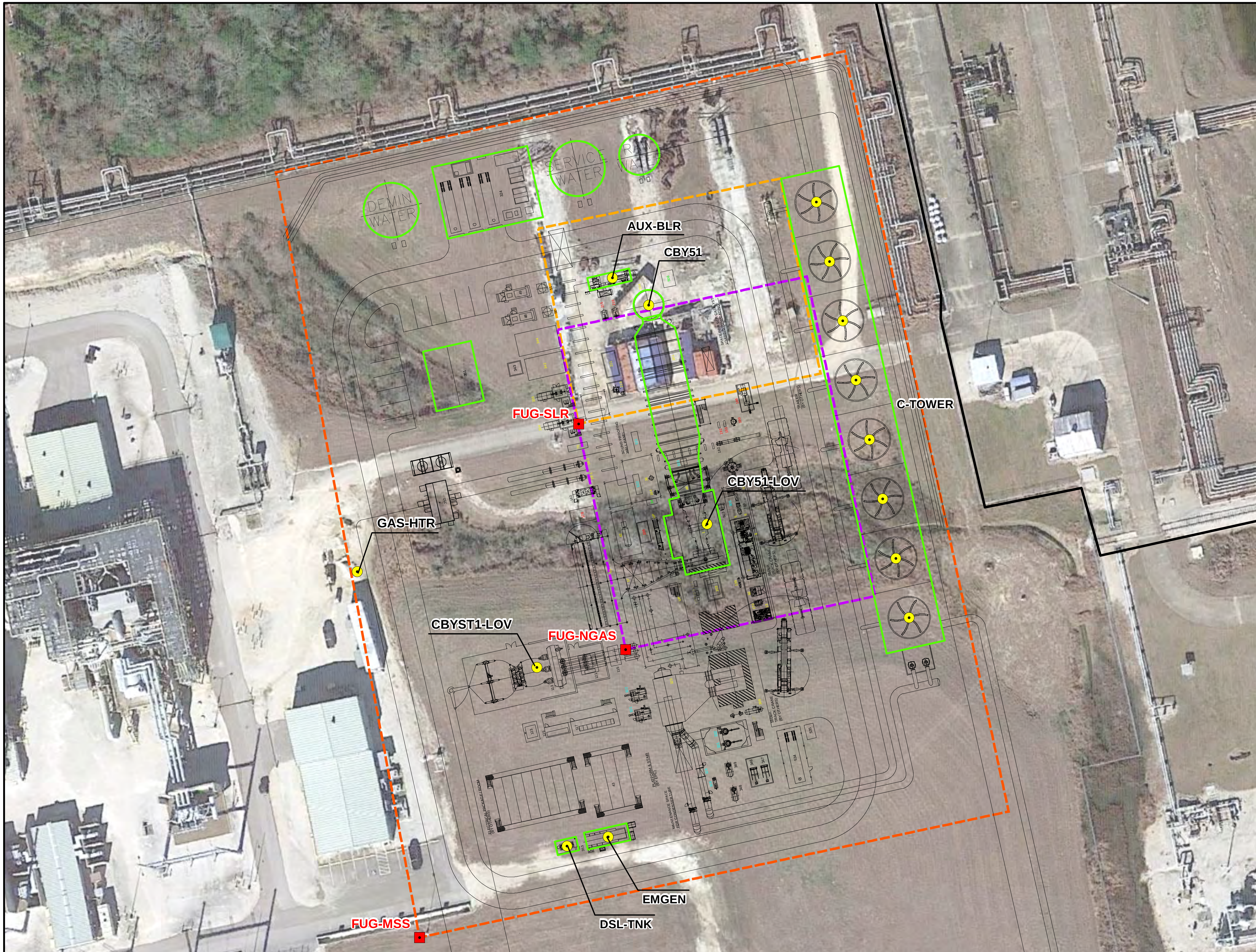
VI.D. PLOT PLAN

Attached is a detailed plot plan showing the site arrangement for the combined cycle project option and an overview plot plan showing the combined cycle site arrangement and the entire property line. Following those plot plans are a detailed plot plan showing the site arrangement for the simple cycle project option and an overview plot plan showing the simple cycle arrangement and the entire property line. Each attached plot plan shows the scale, a north arrow, and two benchmarks.

NRG CEDAR BAYOU 5 LLC

PLOT PLAN COMBINED-CYCLE

Chambers County, Texas



Legend

- Area Source Location
- EPN Location
- Modeling Structure
- FUG-MSS
- FUG-NGAS
- FUG-SLR
- Property Boundary

Imagery Source:
Google Earth Image dated 01/02/2018

0 50 100
Feet

POWER ENGINEERS

Date: 03/02/2020

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NRG CEDAR BAYOU 5 LLC

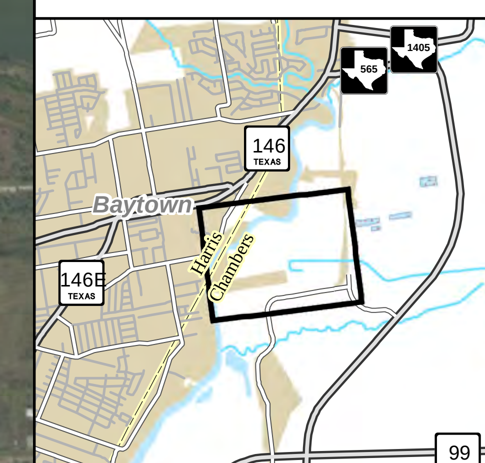
PLOT PLAN (OVERVIEW) COMBINED-CYCLE

Chambers County, Texas

Legend

- Area Source Location
- EPN Location
- Modeling Structure
- FUG-MSS
- FUG-NGAS
- FUG-SLR
- Property Boundary

Imagery Source:
Google Earth Image dated 01/02/2018



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POWER ENGINEERS

Date: 03/02/2020

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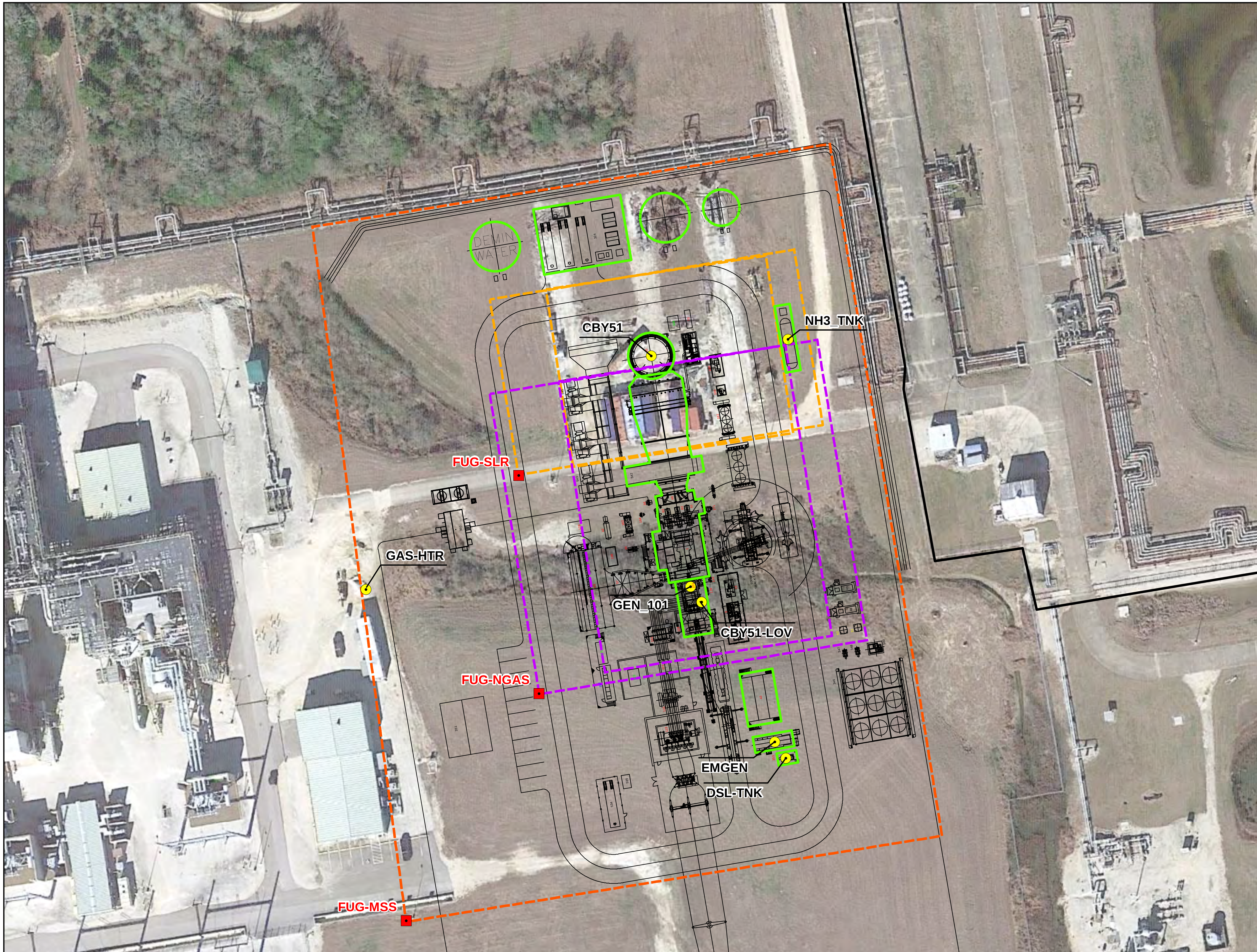
NRG CEDAR BAYOU 5 LLC

PLOT PLAN SIMPLE-CYCLE

Chambers County, Texas



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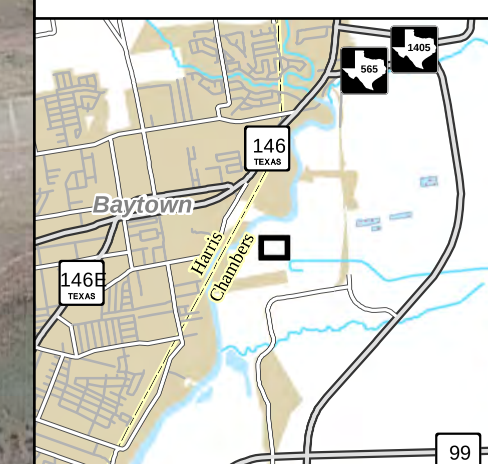
- Area Source Location
- EPN Location
- Modeling Structure
- FUG-MSS
- FUG-NGAS
- FUG-SLR
- Property Boundary

Imagery Source:
Google Earth Image dated 01/02/2018



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POWER ENGINEERS

Date: 03/02/2020

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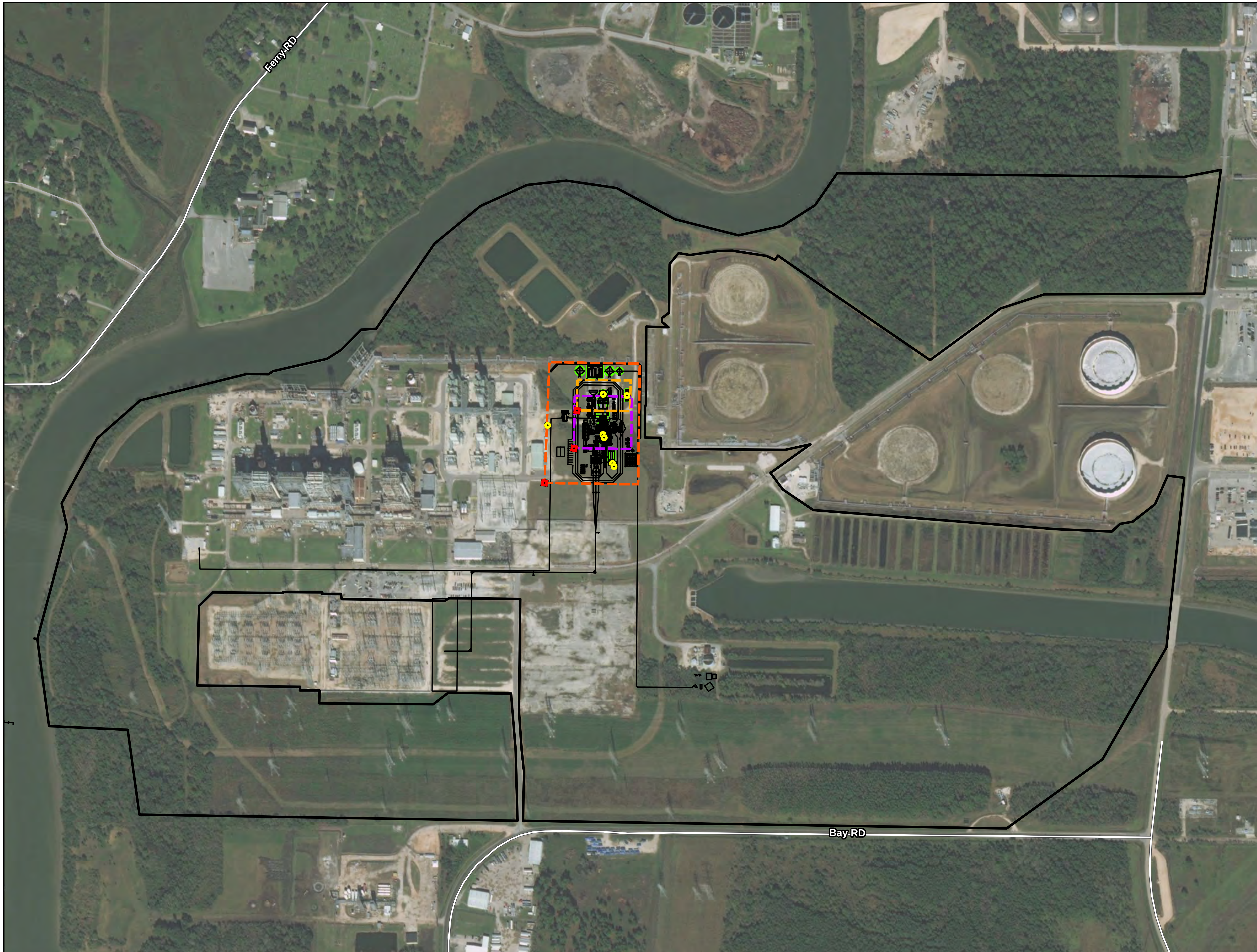
NRG CEDAR
BAYOU 5 LLC

PLOT PLAN (OVERVIEW)
SIMPLE-CYCLE

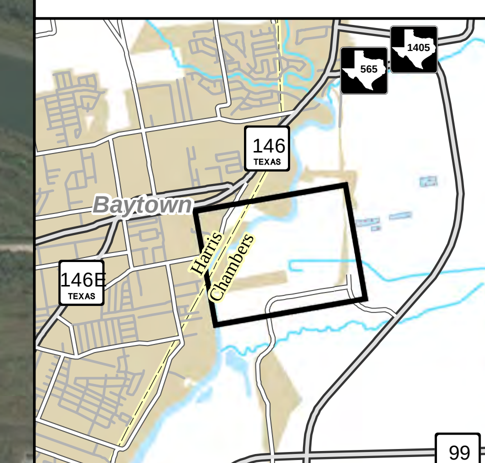
Chambers County, Texas



Legend

- Area Source Location
- EPN Location
- FUG-MSS
- FUG-NGAS
- FUG-SLR
- Modeling Structure
- Property Boundary

Imagery Source:
Google Earth Image dated 01/02/2018



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POWER ENGINEERS

Date: 03/02/2020

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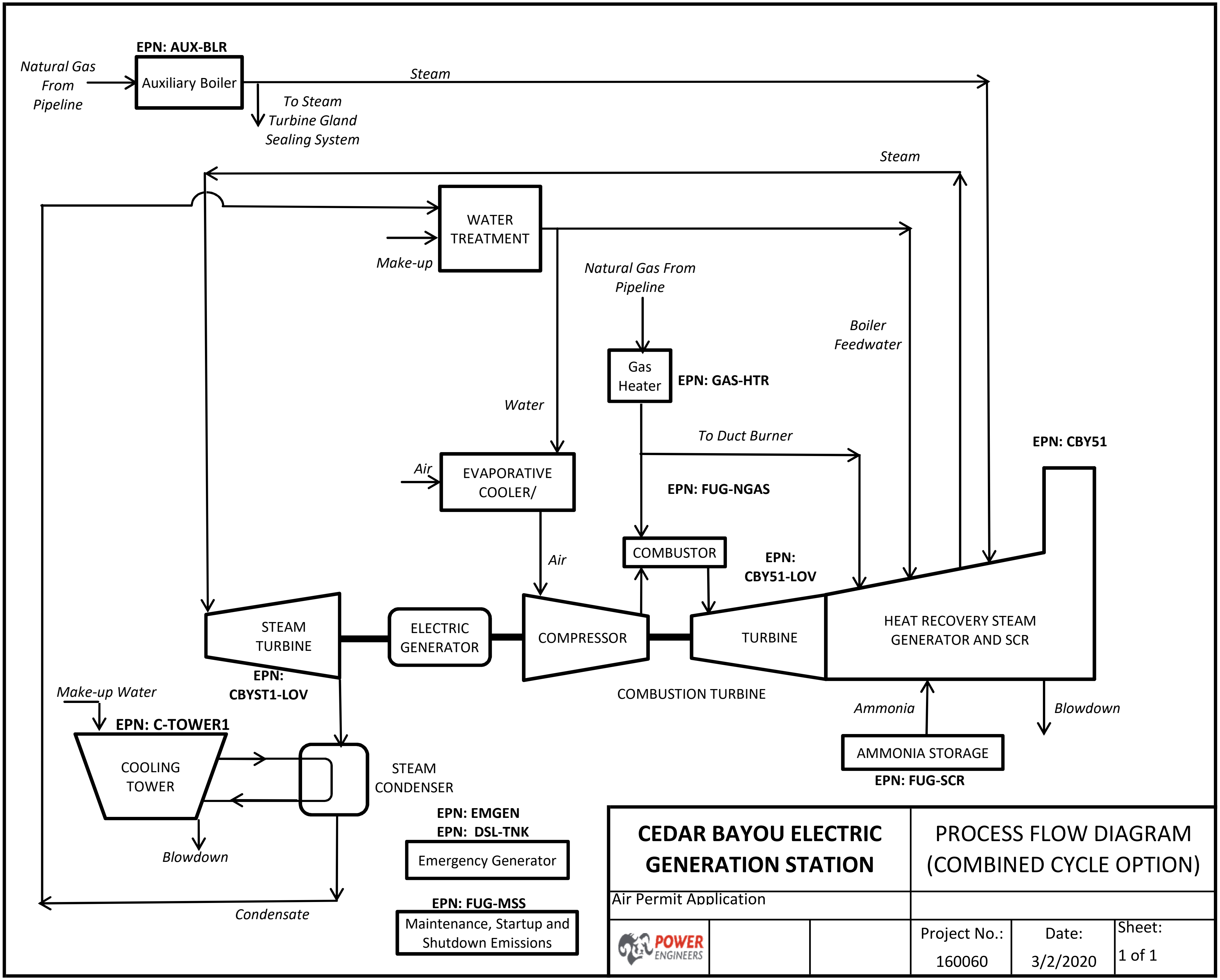
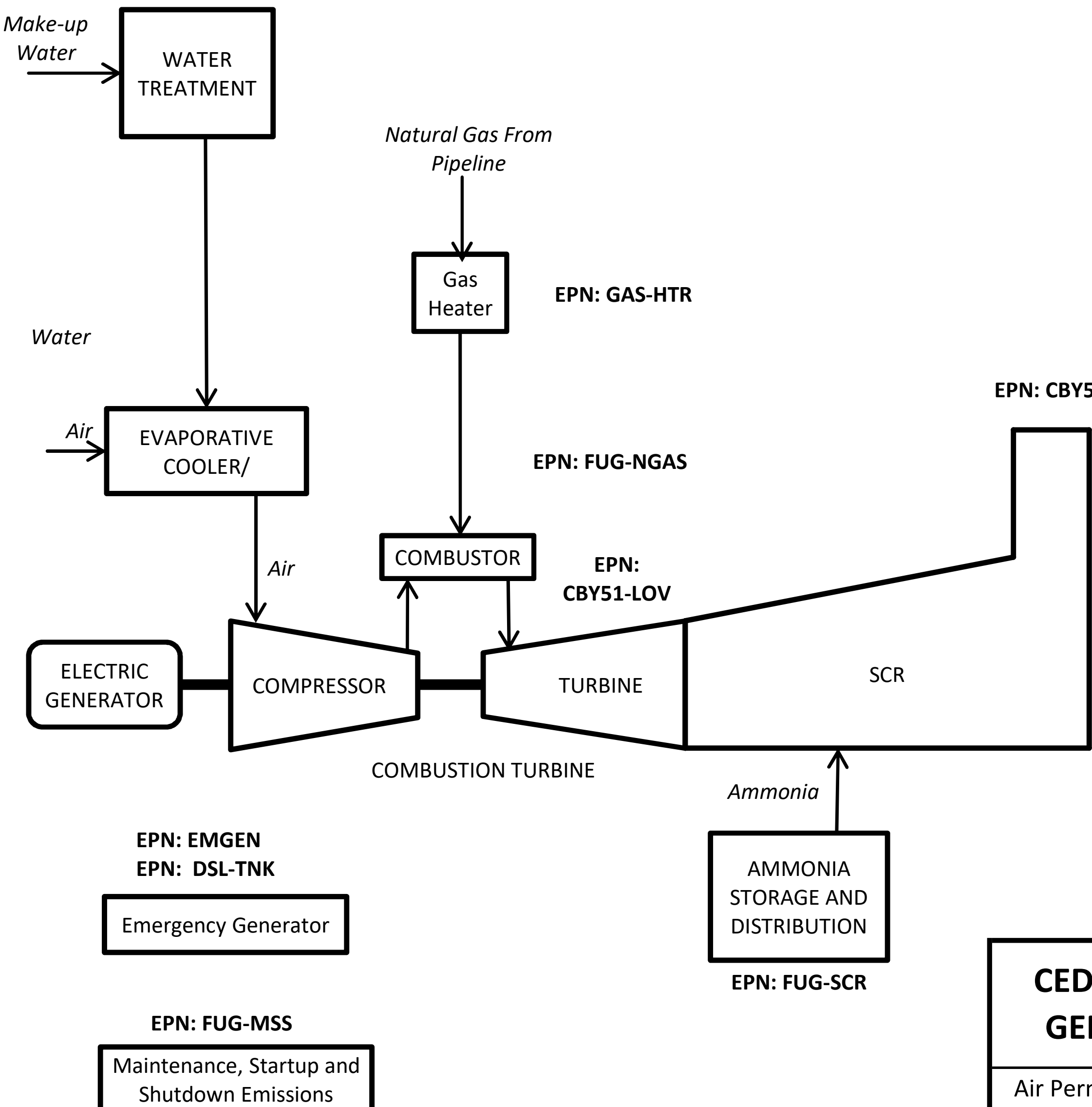
VI. APPLICATION MATERIALS

VI.E. PROCESS FLOW DIAGRAMS

Attached is a process flow diagram showing the combined cycle option and a process flow diagram showing the simple cycle option for this project.


EPN: AUX-BLR
Natural Gas From Pipeline
Auxiliary Boiler
Steam
To Steam Turbine Gland Sealing System
Steam
WATER TREATMENT
Make-up
Natural Gas From Pipeline
Boiler Feedwater
Gas Heater
EPN: GAS-HTR
Water
To Duct Burner
EPN: CBY51
Air
EVAPORATIVE COOLER/
EPN: FUG-NGAS
Air
COMBUSTOR
EPN: CBY51-LOV
STEAM TURBINE
ELECTRIC GENERATOR
COMPRESSOR
TURBINE
HEAT RECOVERY STEAM GENERATOR AND SCR
EPN: CBYST1-LOV
COMBUSTION TURBINE
Make-up Water
Ammonia
Blowdown
EPN: C-TOWER1
COOLING TOWER
STEAM CONDENSER
AMMONIA STORAGE
EPN: FUG-SCR
EPN: EMGEN
EPN: DSL-TNK
Emergency Generator
Blowdown
Condensate
EPN: FUG-MSS
Maintenance, Startup and Shutdown Emissions
CEDAR BAYOU ELECTRIC GENERATION STATION
PROCESS FLOW DIAGRAM (COMBINED CYCLE OPTION)
Air Permit Application
POWER ENGINEERS
Project No.: 160060
Date: 3/2/2020
Sheet: 1 of 1



CEDAR BAYOU ELECTRIC GENERATION STATION		PROCESS FLOW DIAGRAM (SIMPLE CYCLE OPTION)		
Air Permit Application				
POWER ENGINEERS		Project No.: 160060	Date: 3/2/2020	Sheet: 1 of 1

VI. APPLICATION MATERIALS (PROCESS DESCRIPTION; EMISSION CALCULATIONS; BACT)

EMISSION POINT INFORMATION

EPN CBY51 Combustion Turbine Generator and Heat Recovery Steam Generator (Combined Cycle Option)

EPN CBY51 Process Description

CB5 is seeking authorization to construct and operate either a simple cycle turbine electric generating unit or a combined cycle turbine electric generating unit. CB5 has selected the Mitsubishi MHI 501JAC turbine with a nominal base-load electric power output of approximately 415 MW at ISO conditions in the simple cycle configuration. In the combined cycle configuration, the unit will produce approximately 689 MW.

The main components of the CTG unit consist of a compressor, combustor, turbine, and generator. Filtered ambient air is drawn into the compressor section of the CTG. Natural gas is mixed with the compressed inlet air and combusted in the combustor section of the CTG. Lean premix combustors are used to reduce the NO_x emissions generated in the combustion process. Hot exhaust gases then enter the expansion turbine where the gases expand across the turbine, which generates torque that causes rotation of the turbine shaft. The shaft drives the compressor section of the unit and spins a dedicated electric generator, producing electricity. The temperature of the inlet air to the CTG proposed for the project may occasionally be lowered using evaporative cooling to increase the mass air flow through the turbines and achieve maximum turbine power output on days of most urgent ERCOT needs.

In the combined cycle configuration, exhaust from the combustion turbine then passes through a HRSG where boiler feed water is converted into high pressure steam. Natural gas-fired duct burners increase the temperature of the exhaust as the exhaust passes through the HRSG. The duct burners will have a maximum heat input capacity of 780 million British thermal units per hour (MMBtu/hr) higher heating value (HHV). Emissions from the turbine are further controlled using a SCR unit and an oxidation catalyst that is installed within the HRSG at a location where the exhaust gas is at the optimum temperature for the catalyst. The SCR process includes injection of ammonia into the exhaust gas stream within the HRSG and exposure of the exhaust to a catalyst bed where a series of reactions between the NO_x in the exhaust and the added ammonia converts most of the NO_x to nitrogen and oxygen. The exhaust stream is then released to the atmosphere through the unit’s stack (EPN: CBY51).

A steam turbine generator receives the steam from the HRSG. The expansion of the high-pressure steam across the steam turbine transfers kinetic energy from the flowing steam, impelling upon curved turbine blades mounted on a central rotating spindle that causes rotation of the steam turbine shaft, producing approximately an additional 274 MW of electricity. Electricity produced at the Plant is exported to the Texas wholesale electric market.

A conventional SCR system, using a 19-percent solution of aqueous ammonia as the reagent, will be used to control NOx emissions from the proposed combined cycle turbine configurations. The systems will be comprised of aqueous ammonia storage and handling equipment, ammonia injection grids, and catalyst beds. In the combined cycle configuration, the ammonia injection grids and the SCR catalyst beds will be installed downstream of the turbine and downstream of the duct burners at a location in the HRSG housings where the flue gas temperature will allow for SCR NOx reduction reactions.

The combined cycle turbine configuration will be equipped with an oxidation catalyst system to minimize CO and VOC emissions. Each oxidation catalyst system will be comprised of catalyst bed modules and will be installed at the location where exhaust temperatures will optimize CO and VOC reduction reactions.

Planned startup and shutdown (SUSD) of the proposed combined cycle configuration will be part of the routine operations at the facility. A planned startup when in combined cycle configuration is defined as the period beginning when the combustion turbine receives a “turbine start” signal and an initial flame detection signal is recorded in the plant’s control system and ending when the combustion turbine output achieves steady operation in the low NO_x operating mode and the SCR and OC have achieved steady state operation, thereby achieving emissions compliance. A planned shutdown period when in combined cycle mode will begin when a combustion turbine receives a shutdown command and the combustion turbine operating level drops below its minimum sustainable load. A combustion turbine planned shutdown will end when a flame detection signal is no longer recorded in the plant’s control system.

CB5 intends to operate the combined cycle combustion turbines in an efficient manner by limiting the duration of SUSD periods. CB5 proposes to limit the duration of a startup in combined cycle mode to no more than 120 minutes and the duration of a shutdown to 60 minutes.

CB5 may also perform the following planned maintenance activities that release emissions from the HRSG stacks.

- Combustion turbine tuning and optimization
- Diagnostic Load reduction Activities
- On-line turbine washing
- Boiler tube cleaning
- Refractory repair/replacement

In addition to combustion turbine optimization during the commissioning period, the combustion turbine fuel systems require periodic tuning, including after major overhauls, to maintain compliance with manufacturer’s specifications for emissions and combustion dynamics. The turbine tuning is conducted across the combustor’s load range and according to manufacturer recommendations in order to minimize NO_x and CO production while ensuring combustor stability. Additionally, CB5 anticipates that the new turbine will perform Diagnostic Load Reduction Activities (runbacks) not exceeding 20 hours per year associated with: initiation of steam turbine operation, low load steam turbine operation, variability in water or fuel supply, electric generator protection, and variation in turbine operations (including but not limited to, combustor flashback, primary combustion zone re-ignition, or combustion exhaust blade path spread).. During these low-load tuning operations, the gas turbine CO and NO_x emissions will be limited to the same levels as SUSD periods.

EPN CBY51 Criteria Pollutant Emission Methodology

The combined cycle CTG will be fired exclusively with pipeline-quality natural gas. Products of combustion from the CTG will include NOx, CO, VOC, SO_2, particulate matter (PM) - which includes particulate matter with diameters less than 10 microns (PM_{10}) and particulate matter with diameters less than 2.5 microns ($PM_{2.5}$), and sulfuric acid mist (H_2SO_4). The HRSG will also emit ammonia (NH_3) as a result of the SCR technology used to control NOx emissions to meet Best Available Control Technology (BACT) requirements. NH3 from the SCR system will react with H_2SO_4 to form ammonium sulfate [$(NH_4)_2SO_4$] particulate matter. $(NH_4)_2SO_4$ is expected to be emitted in place of H_2SO_4. The CTG and HRSG duct firing combustion emissions will vent to the atmosphere via the HRSG exhaust stack (EPN: CBY51).

Maximum short-term emissions during periods other than SUSD (including during periods of full and reduced load operations) were calculated at various ambient conditions. Additionally, maximum annual emissions due to the combined contributions from all modes of operation were calculated based on maximum emission rates estimated for normal and SUSD operations and the frequencies of SUSD operations.

Emission calculations were based, primarily, on data supplied by Mitsubishi and on the application of BACT. Maximum hourly emissions during normal operations are projected to occur at an ambient temperature of 10 ºF, at base load, and with maximum duct burner firing (Case 20).
Following is a summary of emissions performance assumptions used in calculating the maximum mass emission rates associated with normal operation of the turbines in when operating in combined cycle mode:

- NOx emissions during combined cycle operation were calculated using a base emission factor of 2 parts per million by volume, dry basis, corrected to 15 percent oxygen (ppmvd @ 15% O_2).
- CO emissions during combined cycle operation were calculated using a stack exhaust concentration of 4 ppmvd @ 15% O_2.
- SO_2 emissions were calculated using a maximum natural gas sulfur content of 0.5 grain per 100 standard cubic feet (gr/100 scf) on an annual basis and 1 gr/100 scf on a maximum hourly basis. The sulfur content in the fuel was multiplied by the volumetric rate of fuel consumed to determine the total flow of sulfur. One hundred percent of the sulfur in the fuel was assumed to convert (stoichiometrically) to SO_2.
- H_2SO_4 emissions during combined cycle operation were calculated by conservatively assuming that 5 percent by weight of SO_2 emissions oxidizes to sulfur trioxide (SO_3) in the combustion turbine; 10% conversion of SO_2 oxidizes to SO_3 in the duct burner; and 40% conversion of SO_2 oxidizes to SO_3 across the catalyst beds. The calculation assumes that 100 percent of SO_3 converts to H_2SO_4.
- PM (including PM_{10}/$PM_{2.5}$) emissions during combined cycle operation were based on data provided by the turbine vendor. The calculated $(NH_4)_2SO_4$ contribution to the condensable fraction of the PM emissions was added to the vendor provided PM emission rates to estimate the total PM emission rates.
- VOC emissions during combined cycle operation were calculated using a base emission factor of 1 ppmvd.
- Hazardous air pollutant (HAP) emissions test data show that formaldehyde is the HAP emitted in the greatest quantities from CTGs. Formaldehyde emissions are calculated based on an outlet stack concentration of 91 parts per billion by volume @ 15% O_2 (ppbvd at 15% O_2).
- In the process of reducing nitrogen oxide emissions to nitrogen in the SCR, unreacted ammonia ("ammonia slip") will be emitted from each respective HRSG stack serving the proposed combined cycle units. The projected SCR ammonia slip emission rates were calculated based on an exhaust concentration of 7 ppmvd ammonia slip corrected to 15 percent O_2 combined cycle combustion turbine.

- Ammonium sulfate particulate matter will be formed in the SCR unit as H_2SO_4 mist in the exhaust stream reacts with the ammonia. For emissions calculations purposes, it was conservatively assumed that all of the H_2SO_4 mist will convert to $(NH_4)_2SO_4$. However, in order to develop conservative H_2SO_4 mist estimates, the H_2SO_4 emission rate estimates are based on the assumption that none of the H_2SO_4 reacts with the ammonia to form $(NH_4)_2SO_4$.
- During planned SUSD periods, emissions may be released from the combustion turbine at higher rates than during normal operations. In particular, during startup, higher NOx emissions may be produced during the transition of the combustors to low NOx operating mode. Also, higher CO and VOC emissions during SUSD may result due to less complete combustion as the CTGs transition to their normal operating modes. The calculation of planned SUSD emissions from the CTG during combined cycle operation and during simple cycle operation was based on data supplied by Mitsubishi which is shown on Table A-8.

EPN CBY51 Greenhouse Gas Emission Calculation Methodology

GHG emissions from the combustion turbine and the HRSG are calculated in accordance with the procedures in the Mandatory Greenhouse Reporting Rules (40 CFR 98), Subpart D – Electric Generation. Annual CO_2 emissions are calculated using the methodology in equation G-4 of the Acid Rain Rules.

$$W_{CO_2} = \left(\frac{F_C \times H \times U_f \times MW_{CO_2}}{2000} \right) \qquad (Eq.\ G\text{–}4)$$

Where:

W_{CO2} = CO_2 emitted from combustion, tons/yr

MW $_{CO2}$ = Molecular weight of carbon dioxide, 44.0 lb/lb-mole

F_c = Carbon based F-factor, 1,040 scf/MMBtu for natural gas

H = Annual heat input in MMBtu

U_f = 1/385 scf CO_2/lb-mole at 14.7 psia and 68 °F.

Annual methane (CH_4) and nitrous oxide (N_2O) emissions are calculated using the emission factors (kg/MMBtu) for natural gas combustion from Table C-2 of the Mandatory Greenhouse Gas Reporting Rules. A summary of the project total GHG emissions is provided in Table B-1. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules.

Calculations of GHG emissions from the combined cycle turbine are presented on Table B-2 and GHG emissions from the simple cycle turbine are presented on Table B-3 of Appendix B of this application.

The emissions of CO_2, CH_4, and N_2O from the combustion turbine/HRSG will be directly proportional to the firing rate of natural gas. During a typical startup, there will be no duct burner firing and the firing rate of natural gas to the combustion turbine will be less than the firing rate at baseload. Therefore, GHG emissions during startup will be less than GHG emissions at baseload conditions.

Table A-2
Emission Calculations - Maximum Hourly Turbine
Normal Operating Conditions
M501JAC Combined Cycle - Single Unit
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

OPERATING CONDITIONS:		Case 1	Case 13	Case 14	Case 16	Case 18	Case 24	Case 25	Case 26	Case 28
		Fired	Fired			MECL	Fired			MECL
		Base	Base	Base	75% Load	35% Load	Base	Base	75% Load	41.9% Load
		Evap On	Evap On	Evap On	Evap Off	Evap Off	Evap Off	Evap Off	Evap Off	Evap Off
		Input	Input	Input	Input	Input				
Ambient Dry Bulb Temperature	ºF	97	59	59	59	59	10	10	10	10
Ambient Relative Humidity	%	45	60	60	60	60	75	75	75	75
Ambient Pressure	psia	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431
NATURAL GAS FUEL PROPERTIES:										
Natural Gas Fuel	BTU/lb - HHV	23,643	23,643	23,643	23,643	23,643	23,643	23,643	23,643	23,643
Heating Value, Natural Gas	BTU/scf - HHV	1022	1022	1022	1022	1022	1022	1022	1022	1022
Natural Gas MW	lb/lbmole	16.41	16.41	16.41	16.41	16.41	16.41	16.41	16.41	16.41
Sulfur Content, Natural Gas 1-Hr	grains S/100 scf	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulfur Content, Natural Gas Annual	grains S/100 scf	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CTG EFFECTS:										
Evaporative cooler On/Off		On	On	On	Off	Off	Off	Off	Off	Off
Evaporative cooler effectiveness	%	90	90	90	0	0	0	0	0	0
GT output power	kW	687,485	710,427	630,237	488,077	290,662	724,203	642,646	520,656	346,229
Heat Input	MMBTU/hr - HHV	3,657.0	3,794.8	3,797.1	3,003.5	2,044.4	3,885.5	3,889.0	3,238.9	2,395.9
DUCT BURNER EFFECTS:										
Duct Burner Heat Rate	MMBTU/hr - HHV	674	628	0	0	0	643	0	0	0
DB Fuel Flow	lb/hr	28,508	26,568	0	0	0	27,186	0	0	0
DB Fuel Flow	scf/hr	659,596	614,716	0	0	0	628,997	0	0	0
DB Fuel Flow	mol/hr	1,737	1,619	0	0	0	1,657	0	0	0
CTG & DUCT BURNER COMBINED EXHAUST:										
HRSG stack exhaust gas mass flow	lb_m/hr	5,810,888	5,997,649	5,971,080	4,854,180	3,919,860	6,016,626	5,989,440	5,220,360	4,303,380
HRSG stack gas temperature	°F	171.9	169.0	178.0	171.7	165.3	162.7	176.2	174.4	169.3
HRSG stack gas N2 volume percentage	%	71.50	72.98	73.54	73.80	74.29	73.67	74.25	74.43	74.74
HRSG stack gas O2 volume percentage	%	8.58	9.01	10.63	10.95	12.38	8.87	10.53	11.00	11.95
HRSG stack gas CO2 volume percentage	%	5.35	5.35	4.61	4.49	3.84	5.51	4.75	4.53	4.10
HRSG stack gas H2O volume percentage	%	13.66	11.74	10.29	9.83	8.55	11.03	9.54	9.10	8.27
HRSG stack gas Ar volume percentage	%	0.90	0.92	0.93	0.93	0.94	0.92	0.93	0.94	0.94
HRSG stack gas O2 volume percentage - Dry Basis	%	9.94	10.21	11.85	12.14	13.54	9.97	11.64	12.10	13.03
HRSG stack gas molecular weight		27.95	28.17	28.26	28.30	28.38	28.26	28.35	28.38	28.43
HRSG stack PM	lb/hr	23.71	23.77	14.30	11.48	8.47	24.23	14.48	12.39	6.43
Exit Flow Rate	lb_{mol}/hr	207,867	212,942	211,305	171,540	138,121	212,932	211,257	183,944	151,356
Exit Flow Rate	lb_{mol}/hr - dry	179,469	187,937	189,562	154,678	126,312	189,440	191,103	167,205	138,838
Exit Flow Rate	scf/hr	80,132,804	82,089,297	81,458,239	66,128,787	53,245,820	82,085,250	81,439,525	70,910,348	58,347,569
Exit Flow Rate	scf/hr - dry	69,185,250	72,449,745	73,076,186	59,628,327	48,693,302	73,029,205	73,670,195	64,457,506	53,522,225
CTG & DUCT BURNER COMBINED EXHAUST:										
NO_X	ppmvd@15%O_2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NO_X	ppmvd	3.71631	3.62492	3.06804	2.96823	2.49578	3.70473	3.13881	2.98264	2.66869
NO_X as NO_2	lb/hr	30.68	31.34	26.76	21.12	14.50	32.29	27.60	22.94	17.05
CO	ppmvd@15%O_2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
CO	ppmvd	6.50	6.34	5.37	5.19	4.37	6.48	5.49	5.22	4.67
CO	lb/hr	32.69	33.39	28.51	22.51	15.45	34.40	29.40	24.45	18.16
VOC, as CH_4	ppmvd@15%O_2	1	1	0.9	0.9	0.9	1	0.9	0.9	0.9
VOC, as CH_4	ppmvd	1.86	1.81	1.38	1.34	1.12	1.85	1.41	1.34	1.20
VOC, as CH_4	lb/hr	5.35	5.46	4.20	3.31	2.28	5.63	4.33	3.60	2.67
H_2CO	ppmvd@15%O_2	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
H_2CO	ppmvd	169.09	164.93	139.60	135.05	113.56	168.57	142.82	135.71	121.43
H_2CO	lb/hr	0.91	0.93	0.79	0.63	0.43	0.96	0.82	0.68	0.51
NH_3	ppmvd@15%O_2	7	7	7	7	7	7	7	7	7
NH_3	ppmvd	13.01	12.69	10.74	10.39	8.74	12.97	10.99	10.44	9.34
NH_3	lb/hr	39.75	40.61	34.67	27.37	18.79	41.83	35.75	29.73	22.08
SO_2, Maximum Hourly	lb/hr	12.10	12.36	10.61	8.39	5.71	12.65	10.86	9.05	6.69
SO_2, Annual Average	lb/hr	6.05	6.18	5.30	4.19	2.86	6.32	5.43	4.52	3.35
SO_2 to SO_3 Conversion in Turbine	%	5	5	5	5	5	5	5	5	5
SO_2 to SO_3 Conversion in Duct Burner	%	10	10	0	0	0	10	0	0	0
SO_2 to SO_3 Conversion in Catalyst Beds	%	40	40	40	40	40	40	40	40	40
H_2SO_4, Maximum Hourly (100% converted SO_3)	lb/hr	8.74	8.94	6.98	5.52	3.76	9.16	7.15	5.96	4.41
H_2SO_4, Annual Average (100% converted SO_3)	lb/hr	4.37	4.47	3.49	2.76	1.88	4.58	3.58	2.98	2.20
$(NH_4)_2SO_4$, Maximum Hourly (100% converted SO_3)	lb/hr	11.77	12.05	9.41	7.44	5.07	12.34	9.63	8.02	5.94
$(NH_4)_2SO_4$, Annual Average (100% converted SO_3)	lb/hr	5.89	6.03	4.70	3.72	2.53	6.17	4.82	4.01	2.97
PM FH+BH, Maximum Hourly (including Sulfates)	lb/hr	35.49	35.83	23.70	18.92	13.53	36.57	24.12	20.41	12.37
PM FH+BH, Annual Average (including Sulfates)	lb/hr	29.60	29.80	19.00	15.20	11.00	30.40	19.30	16.40	9.40

Table A-3
Sample Emission Calculations
M501JAC Combined Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Case 24		
Exhaust Flow Rate	6,016,626	lb/hr
Exhaust Flow MW	28.26	lb/lbmole
CTG Heat Input	3,886	MMBtu / hr, HHV
DB Heat Input.	643	MMBtu / hr, HHV
Natural Gas	1,021.9	Btu / scf, HHV
Exhaust Content	8.87	% O2 wet
Exhaust Content	11.03	% H2O

Exhaust Flow = $\frac{6{,}016{,}626 \text{ lb exhaust}}{\text{hr}} \Big| \frac{\text{lbmole}}{28.26 \text{ lb}} \Big| 1 - (11.03\%\ H2O)/100)$ = 189,440.2 lbmole/hr (dry)

Convert Oxygen Concentration to Dry Basis

$O_2 = \frac{8.87\ \%\ O2\ \text{wet}}{(1 - (11.03\ \%\ H20)\ /100))}$ = 9.97 % dry

Natural Gas Usage

CTG NG Flow = $\frac{3{,}886 \text{ MMBtu HHV}}{\text{hr}} \Big| \frac{1{,}000{,}000 \text{ Btu}}{\text{MMBtu}} \Big| \frac{\text{scf}}{1{,}021.9 \text{ MMBtu HHV}}$ = 3,802,397.2 scfh

DB NG Flow = $\frac{643 \text{ MMBtu HHV}}{\text{hr}} \Big| \frac{1{,}000{,}000 \text{ Btu}}{\text{MMBtu}} \Big| \frac{\text{scf}}{1{,}021.9 \text{ MMBtu HHV}}$ = 628,997.3 scfh

Total NG Flow = 3,802,397.2 scfh + 628,997.3 scfh = 4,431,394.5 scfh

Gaseous Pollutant Sample Calculation - Oxides of Nitrogen (NOx)

Emission Factor	2.0	ppmvd NOx @ 15% O_2
NO_2 MW	46.01	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Oxides of Nitrogen

Emission Factor = $\frac{2.0 \text{ ppmd @ 15\%}}{} \Big| \frac{(20.9 - 9.97\ O2\%\ \text{dry})}{(20.9 - 15)}$ = 3.7 ppmvd NOx

Emission Rate Calculation - Oxides of Nitrogen

ST Emissions = $\frac{3.7 \text{ lbmole NOx}}{1{,}000{,}000 \text{ lbmole exhaust}} \Big| \frac{189{,}440 \text{ lbmole exhaust}}{\text{hr}} \Big| \frac{46.01 \text{ lb NOx/lb mole}}{\text{lbmole NOx}}$ = 32.29 lb/hr NOx as NO2

Gaseous Pollutant Sample Calculation - Carbon Monoxide (CO)

Emission Factor	3.5	ppmvd CO @ 15% O_2
CO MW	28.01	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Carbon Monixide

Emission Factor = $\frac{3.5 \text{ ppmd @ 15\%}}{} \Big| \frac{(20.9 - 9.97\ O2\%\ \text{dry})}{(20.9 - 15)}$ = 6.48 ppmvd CO

Emission Rate Calculation - Carbon Monoxide

ST Emissions = $\frac{6.48 \text{ lbmole CO}}{1{,}000{,}000 \text{ lbmole exhaust}} \Big| \frac{189{,}440 \text{ lbmole exhaust}}{\text{hr}} \Big| \frac{28.01 \text{ lb CO/lb mole}}{\text{lbmole CO}}$ = 34.4 lb/hr CO

Gaseous Pollutant Sample Calculation - Volatile Organic Compound (VOC)

Emission Factor	1.0	ppmvd VOC @ 15% O_2
VOC MW	16.04	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - VOC

Emission Factor = $\frac{1.0 \text{ ppmd @ 15\%}}{} \Big| \frac{(20.9 - 9.97\ O2\%\ \text{dry})}{(20.9 - 15)}$ = 1.85 ppmvd VOC

Emission Rate Calculation - VOC

ST Emissions = $\frac{1.85 \text{ lbmole VOC}}{1{,}000{,}000 \text{ lbmole exhaust}} \Big| \frac{189{,}440 \text{ lbmole exhaust}}{\text{hr}} \Big| \frac{16.04 \text{ lb VOC/lb mole}}{\text{lbmole VOC}}$ = 5.63 lb/hr VOC

Table A-3
Sample Emission Calculations
M501JAC Combined Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Sample Calculation - Sulfur Dioxide (SO_2), Sulfuric Acid (H_2SO_4) and Ammonium Sulfate $(NH_4)_2SO_4$

Emission Factor	1	grain S / 100 scf, Natural Gas, Max Hourly
Emission Factor	0.5	grain S / 100 scf, Natural Gas, Annual Average
S MW	32.06	lb / lb_{mole}
SO_2 MW	64.06	lb / lb_{mole}
H_2SO_4 MW	98.07	lb / lb_{mole}
$(NH_4)_2SO_4$ MW	132.13	lb / lb_{mole}

Sample Calculation - Sulfur Dioxide (SO_2)

CTG/DB ST Emissions =	1 grain S	lb	4,431,395 Total NG scf	64.06 lbmole SO2	= 12.65 lb/hr SO2
	100 scf	7000 grain	hr	32.06 lbmole S	

Sample Calculation - Sulfuric Acid (H_2SO_4)

SO2 to SO3 Conversion in Turbine	5	%
SO2 to SO3 Conversion in Duct Burner	10	%
SO2 to SO3 Conversion in Catalyst Beds	40	%

Turbine Conversion =	1 grain S	lb S	3,802,397 scf NG to CGT	lbmole SO2	
	100 scf	7000 grain	hr	32.06 lb S	
	(5/100) lbmole SO3	lbmole H2SO4	98.07 lb H2SO4	= 0.8 lb/hr H2SO4	
	lbmole SO2	lbmole SO3	lbmole H2SO4		

Duct Burner Conversion =	1 - (5/100)	3,802,397 scf NG to CGT	1 grain S	lb S	lbmole SO2
		hr	100 scf	7000 grain	32.06 lb S
	(10/100) lbmole SO3	lbmole H2SO4	98.07 lb H2SO4	= 1.6 lb/hr H2SO4	
	lbmole SO2	lbmole SO3	lbmole H2SO4		

Catalyst Bed Conversion =	(1 - (5 + 10)/100)) * 3,802,397) scf NG to CGT + 628,997 scf NG to DB	1 grain S	lb S	
	hr	100 scf	7000 grain	

lbmole SO2	(40/100) lbmole SO3	lbmole H2SO4	98.07 lb H2SO4	= 6.7 lb/hr H2SO4
32.06 lb S	lbmole SO2	lbmole SO3	lbmole H2SO4	

Total H2SO4 = 0.8 lb/hr + 1.6 lb/hr +6.7 lb/hr = 9.2 lb/hr H2SO4

Sample Calculation - Ammonium Sulfate ($(NH_4)_2SO_4$)

Assume 100% of H_2SO_4.converts to $(NH_4)_2SO_4$.

ST Emissions =	9.2 lb H2SO4	lbmole H2SO4	lbmole (NH4)2SO4	132 lb (NH4)2SO4
	hr	98 lb H2SO4	lbmole H2SO4	lbmole (NH4)2SO4

= 12.34 lb/hr (NH4)2(SO4) lb/hr

Sample Calculation - Particulate Matter ($PM_{10}/PM_{2.5}$)

CTG Emission Rate =	24.23	lb/hr, front and back half, vendor supplied
(NH4)2SO4 Emissions =	12.34	lb/hr
Total PM =	36.57	lb/hr

Table A-6
Hourly Emission Summary
Normal Operating Conditions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

M501JAC Combined Cycle

Pollutant	Maximum For Averaging Period	Single Turbine (lb/hr)					
		Maximum Hourly	MSS Max Hourly (Cold Start)			Annual	Annual
		Case 24 Fired Base Evap Off 10 °F lb/hr	MSS Emissions lbs	MSS Duration minutes	First Hour Emissions MSS/Routine lb/hr	Case 13 Duct Fired Base Evap On 59 °F lb/hr	Case 14 No Duct Firing Base Evap On 59 °F lb/hr
NO_X	1-Hour	32.29	22	19	43.96		
	Annual					31.34	26.76
CO	1-Hour	34.40	510	19	533.39		
	Annual					33.39	28.51
VOC	1-Hour	5.630	73	19	76.83		
	Annual					5.46	4.20
SO_2	1-Hour	12.65					
	Annual					6.18	5.30
Particulates (FH&BH)	1-Hour	36.57					
	Annual					29.80	19.00
H_2SO_4	1-Hour	9.16					
	Annual					4.47	3.49
NH_3	1-Hour	41.83					
	Annual					40.61	34.67
$(NH_4)_2SO_4$	1-Hour	12.34					
	Annual					6.03	4.70

M501JAC Simple Cycle

Pollutant	Maximum For Averaging Period	Single Turbine				
		Maximum Hourly	MSS Max Hourly (Cold Start)			Annual
		Case 22 Base Load; 10 F lb/hr	MSS Emissions lbs	MSS Duration minutes	First Hour Emissions MSS/Routine lb/hr	Case 13 Base Load; 59 F lb/hr
NO_X	1-Hour	34.65	15	20	38.10	
	Annual					33.56
CO	1-Hour	29.54	237	20	256.69	
	Annual					28.60
VOC	1-Hour	7.250	58	20	62.83	
	Annual					7.02
SO_2	1-Hour	10.81				
	Annual					5.28
Particulates (FH&BH)	1-Hour	19.28				
	Annual					14.28
H_2SO_4	1-Hour	7.12				
	Annual					3.48
NH_3	1-Hour	51.31				
	Annual					49.69
$(NH_4)_2SO_4$	1-Hour	9.59				
	Annual					4.68

Notes:
1. VOCs are non-methane, non-ethane as CH_4.
2. Particulates are front and back half by EPA Method 5/202 and include condensables.

Table A-7
Gas Turbine Annual Emission Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Annual Emissions for M501JAC Combined Cycle

Annual Operating Hours with Duct Firing: 1910.0
Annual Operating Hours without Duct Firing 6819.9
Annual SS Operating Hours: 30.1

Pollutant	Annual Emissions Based on 1,910.0 hrs/yr of Normal Operations with Duct Firing tons/yr	Annual Emissions Based on 6,819.9 hrs/yr of Normal Operations without Duct Firing tons/yr	Estimated Annual Emissions From SS Operations tons/yr	Estimated SS Annual Operating Hours[1] hrs/yr
NO_X	29.93	91.24	1.69	30.1
CO	31.89	97.21	21.19	30.1
VOC	5.22	14.32	4.75	30.1
SO_2	5.90	18.08	---	---
$PM/PM_{10}/PM_{2.5}$	28.46	64.79	---	---
H_2SO_4	4.27	11.90	---	---
$(NH_4)_2SO_4$	5.75	16.04	---	---
NH_3	38.78	118.21	---	---

Notes:
1. Only emissions of NOx, CO, and VOC are shown in the startup/shutdown columns as emissions of other pollutants are expected to be less than during normal operation.

Annual Emissions for M501JAC Simple Cycle

Annual Operating Hours: 3850

Pollutant	Annual Emissions Based on 3,850 hrs/yr of Normal Operations tons/yr	Estimated Annual Emissions From SS Operations tons/yr	Estimated SS Annual Operating Hours[1] hrs/yr	Combined Routine/MSS Annual Emissions tons/yr
NO_X	64.59	1.84	77	65.14
CO	55.06	59.57	77	113.53
VOC	13.52	11.09	77	24.33
SO_2	10.16	---	---	10.16
$PM/PM_{10}/PM_{2.5}$	27.49	---	---	27.49
H_2SO_4	6.69	---	---	6.69
$(NH_4)_2SO_4$	9.01	---	---	9.01
NH_3	95.64	---	---	95.64

Notes:
1. Only emissions of NOx, CO, and VOC are shown in the startup/shutdown columns as emissions pollutants are expected to be less than during normal operation.

Table A-8
Hourly Emission Summary - Turbine Startup/Shutdown
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Startup/Shutdown Emissions for Mitsubishi M501JAC Combined Cycle Turbine

Type	Each Turbine Unit								
	Duration (min)	Events/yr(1)	MSS hr/yr	NOx		CO		VOC	
				lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr
Startup-Cold, Maximum (lb/event)	19.2	55	17.6	22	0.6	510	14.0	73	2.0
Startup-Warm, Maximum (lb/event)	19.2	5	1.6	22	0.1	403	1.0	73	0.2
Startup-Hot, Maximum (lb/event)	19.2	5	1.6	22	0.1	148	0.4	73	0.2
Shutdown, Maximum (lb/event)	8.6	65	9.3	30	1.0	178	5.8	73	2.4
			30.1		1.7		21.2		4.7

Notes:

1. This is an estimate for purposes of calculating annual emissions. It is not a representation of total number of annual MSS events.

Startup/Shutdown Emissions for Mitsubishi M501JAC Simple Cycle Turbine

Type	Each Turbine Unit								
	Duration (min)	Events/Yr(1)	MSS hr/yr	NOx		CO		VOC	
				lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr
Startup (Normal - to 100% Load) (lb/event)	20	175	58.3	15	1.3	237	20.7	58	5.1
Start-up (10 min start)	10	18	3.0	5	0.0	230	2.1	57	0.5
Shutdown, Maximum (lb/event)	5	193	16.1	5	0.5	381	36.8	57	5.5
	--		77.4		1.8		59.6		11.1

Notes:

1. This is an estimate for purposes of calculating annual emissions. It is not a representation of total number of annual MSS events.

Table B-2
GHG Annual Emission Calculations - M501JAC Combined Cycle Combustion Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Average Heat Input MMBtu/hr	Hours Per Year	Annual Heat Input MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[4]	GHG Mass Emissions[5] ton/yr	Global Warming Potential[6]	CO_2e ton/yr
CBY51[1] (Duct Burner Firing)	4,423	1,910	8,447,872	CO_2	118.86	502,045.0	1	502,045.0
				CH_4	2.2E-03	9.3	25	232.8
				N_2O	2.2E-04	0.9	298	277.5
CBY51[2] (No Duct Burner Firing)	3797.1	6,819.9	25,895,837	CO_2	118.86	1,538,952.6	1	1,538,952.6
				CH_4	2.2E-03	28.5	25	713.6
				N_2O	2.2E-04	2.9	298	850.6
CBY51[3] (Startup/Shutdown)	2274.1	30.1	68,489	CO_2	118.86	4,070.2	1	4,070.2
				CH_4	2.2E-03	0.1	25	1.9
				N_2O	2.2E-04	0.01	298	2.2
CBY51 Total		8,760	34,412,198	CO_2		2,045,067.8	1	2,045,067.8
				CH_4		37.9	25	948.3
				N_2O		3.8	298	1,130.4
					TOTAL	**2,045,109.5**		**2,047,146.5**

Notes:
1. The average heat input for the M501JAC duct burner firing scenario is based on the HHV heat input at 100% load, with duct burner firing, at 59°F ambient temperature (Operating Case 13).
2. The average heat input for the M501JAC non-duct burner firing scenario is based on the HHV heat input at 100% load, with no duct burner firing, at 59°F ambient temperature (Operating Case 14).
3. The average heat input for the M501JAC startup-shutdown scenario is based on the HHV heat input at 50% load, with no duct burner firing, at 59°F ambient temperature (Operating Case 17).
4. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
5. CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4

W_{CO2} = (F_c x H x U_f X MW_{CO2})/2000

W_{CO2} = CO_2 emitted from combustion, tons/yr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/yr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68°F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

6. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

EPN CBY51 Combined Cycle Combustion Turbine BACT for Criteria Pollutants

The TCAA and 30 TAC §116.111(a)(2)(C) require that new and modified facilities use BACT. BACT is determined through a 3-tier process and on a case-by-case basis for proposed facilities. The BACT analysis for the proposed project has been prepared consistent with this 3-tier approach as well as guidance provided in the TCEQ's April 2001 document, *Evaluating Best Available Control Technology (BACT) in Air Permit Applications* (Draft RG-383)

According to TCEQ guidance, the BACT process begins at the first tier (i.e., emission performance levels accepted as BACT in recent permit reviews for the same process and/or industry) and continues sequentially through the second and third tiers only if BACT cannot be established through a Tier I analysis.

As stated in the TCEQ's RG-383 BACT guidance, "Tier I of the BACT evaluation involves a comparison of the applicant's BACT proposal to emission reduction performance levels accepted as BACT in recent permit reviews". RG-383 further indicates that the BACT review is complete if the Air Permits Division has not identified emission reduction options with better performance that should be evaluated. As will be presented in the following sections, BACT for the facilities associated with the proposed project is established at the Tier I level.

The BACT determinations for the operation of the proposed combustion turbines and duct burners are based on the latest information available from the TCEQ and the EPA concerning the evaluation of BACT in permit applications for combined cycle combustion turbine units. Additional relevant documentation that provided technical background information for the BACT assessment of the proposed units included the following:

- *TCEQ Combustion Sources – Current BACT Spreadsheet for Turbines* (June 4, 2019);
- The TCEQ "gas turbine permit list" (updated November 05, 2019); and
- U.S. EPA RACT/BACT/LAER Clearinghouse (RBLC) listings for the "process type" or source category representative of the proposed project emission sources.

Copies of these references are included in Appendix C to this application.

As discussed in the Process Description section (VII.A.5.) of this application, the proposed generating equipment will consist of one additional combustion turbine that will be built and operated as either a simple cycle or combined cycle configuration. The combined cycle configuration will include an HRSG equipped with duct burners, and a steam turbine/generator. The BACT-based emission rates proposed for the combined and simple cycle operations are consistent with the published TCEQ recommendations.

NOx Emissions

Emissions of NO_x from proposed combustion turbines will be generated through the oxidation of nitrogen in the high-temperature combustion zones. As a review of recently issued permits demonstrates, a combination of combustion and post-combustion controls are typically used to limit the emissions of NO_x.

TCEQ's recent BACT determinations and BACT guidance for combined cycle gas turbines (with or without duct burner firing) reflect that dry low-NO_X (DLN) combustors in combination with selective catalytic reduction (SCR) constitute BACT for NO_x. DLN combustors are considered a combustion control as they are designed to minimize combustion temperatures by providing a lean pre-mixed air-fuel mixture prior to fuel combustion. This design minimizes fuel-rich pockets and allows the excess air to act as a heat sink. The lower temperatures inhibit NO_x formation. SCR is a post-combustion technology that uses ammonia as a reagent to reduce oxides of nitrogen to molecular nitrogen and water in the presence of a catalyst. SCR systems must be operated in the HRSG within the temperature window at which the catalyst is effective; typically, between 500°F and 750°F.

A search of the RBLC returned 55 projects for which natural gas-fired combined cycle units were permitted between 2014 and 2019, with reported NO_x emission limit (see Appendix B). The RBLC determinations show NO_x emission limits ranging from 2.0 to 25 ppmvd @15% O_2. Fifty of the 55 projects utilized dry low-NO_X (DLN) combustors in combination with selective catalytic reduction (SCR). Forty-eight of 55 projects (87%) were permitted at 2 pmvd, which is CB5's proposed NOx concentration. Seven projects were permitted slightly higher.

According to the *TCEQ Current BACT Spreadsheet for Turbines – Current Best Available Control Technology (BACT) Requirements* for gas-fired combined cycle turbines (November 5, 2019), BACT for NO_x emissions is 2 ppmvd @ 15% O_2 with or without duct burner firing, which is consistent with the RBLC findings. Equipment vendors can now ensure NO_x emission levels of 2 ppmvd @ 15% O_2 on a rolling 24-hour average basis (excluding emissions during maintenance, startup, and shutdown periods) with the use of DLN combustors in conjunction with SCR. CB5 has corroborated this conclusion through discussions with its potential vendors.

CB5 proposes to satisfy BACT for NO_x emissions during the proposed combined cycle operations through use of DLN combustors and an aqueous ammonia-based SCR system. With these emissions controls, NO_x emissions while operating in combined cycle mode will not exceed 2 ppmvd @ 15% O_2 for either turbine model configuration, with or without duct burner firing. Compliance with this emissions limit would be demonstrated on a rolling 24-hour average basis and would exclude periods of SUSD. This proposed limit is equivalent to the lowest BACT-based emission rate permitted for recent combined cycle projects both inside and outside Texas; therefore, the proposed emission rate satisfies BACT.

CB5 will demonstrate that BACT for NO_x is achieved through the initial stack testing of the combined cycle trains and through the continuous monitoring of NO_x emissions from the HRSG stack.

NH3 Emissions

CB5 will operate the SCR systems in a manner that ammonia slip (i.e., the emission of unreacted ammonia to the atmosphere) is minimized while ensuring that the NO_x emissions limits are met. Control of the ammonia injection system and operating parameters will be maintained to control ammonia slip in the HRSG exhaust stream to levels not exceeding 7 ppmvd @ 15% O_2, on a rolling 24-hour average basis, excluding SUSD periods, and 7 ppmvd @ 15% O_2, on an annual average basis, excluding SUSD periods. This level of emissions control meets the *TCEQ Combustion Sources – Current BACT Spreadsheet for Turbines* requirements for ammonia slip from turbines (7 to 10 ppmvd @ 15% O_2). CB5 will demonstrate that BACT for NH_3 is achieved through the initial stack testing and through a monitoring method acceptable to the TCEQ.

CO Emissions

Combustion is a thermal oxidation process in which carbon and hydrogen in the fuel combine with oxygen to primarily form carbon dioxide and water vapor. Emissions of CO are the result of incomplete combustion of the carbon in a fuel. The primary factors influencing the generation of CO emissions are temperature and residence time within the combustion zone.

A search of the RBLC showed 88 projects listed between 2014 and 2019 with CO emission limits for natural gas-fired combined cycle projects (see Appendix C). The RBLC determinations show CO emission limits ranging from 0.9 to 25 ppmvd @15% O_2. Eighty-two of the 88 projects were equipped with oxidation catalyst to control CO, while only six projects were not equipped with oxidation catalyst. Forty-eight of the 88 projects listed (54%) 2 ppmvd as BACT. Nine projects (10%) listed CO concentration less than ppmvd as BACT. Thirty-one projects (35%) listed CO emission concentration higher than 2 ppmvd. CB5's proposed CO BACT is clearly consistent with the projects identified in the RBLC.

As shown in the TCEQ gas turbine permit list, there are no pending permit applications and no recently-issued permits for natural gas-fired combined cycle projects anywhere in Texas with a proposed emission rate or stipulated emission limit lower than 2 ppmvd @ 15% O_2. This finding is consistent with the TCEQ's current Tier 1 BACT guidance for CO emissions from gas-fired combined cycle turbines (with or without duct burner firing), which specifies a limit of 2 to 4 ppmvd @ 15% O_2 for units using an oxidation catalyst (see *TCEQ Combustion Sources – Current BACT Spreadsheet for Turbines*).

Based on the findings summarized above, CB5 proposes to satisfy BACT for CO emissions from the proposed combined cycle unit through use of an oxidation catalyst and operating procedures directed at the most efficient levels of operation, i.e., good combustion practices – controlled fuel/air mixing and sufficient temperature and gas residence time. With an oxidation catalyst and good combustion practices, CO emissions associated with the turbine will not exceed 4 ppmvd @15% O_2, with or without duct burner firing. Compliance with this emissions limit would be demonstrated on a rolling 24-hour average basis and would exclude periods of planned maintenance, startup, and shutdown. CB5's proposed CO emission rates are at the low end of the range of limits reported in the RBLC and satisfy TCEQ's Tier 1 BACT requirements.

CB5 will achieve BACT for CO through the use of an oxidation catalyst and through good combustion practices and will demonstrate that BACT has been achieved through the initial stack testing and through the continuous monitoring of CO emissions from the HRSG stack.

VOC Emissions

Similar to CO emissions generation, VOC emissions will result from the incomplete combustion of the natural gas. The primary factors influencing the generation of VOC emissions are temperature and residence time within the combustion zone.

A search of the RBLC showed 86 projects listed between 2014 and 2019 with VOC emission limits for natural gas-fired simple cycle units (see Appendix C). There were 28 listed projects in this time period that underwent LAER reviews. The RBLC show the LAER determinations for VOC emission limits ranging from 0.7 to 2.4 ppmvd @15% O_2. All the LAER projects identified oxidation catalyst as the method of control. Many of the combined cycle units that had the lowest emission rates did not have duct burner firing. Typically, the emissions limit of 1.0 ppmvd @ 15% O_2 applies for operation with no duct burner firing; alternate emission limits that apply for operation with duct burner firing range between 1.5 and 2.4 ppmvd @ 15% O_2. Seven of the 28 projects were listed at 2 ppmvd. The variability in the range of VOC concentration reflected different turbine models and the influence of duct burner to the overall concentration. Most of the combined cycle projects listed in the RBLC do not have permitted duct burners that were as large as CB5's. CB5 is proposing a VOC concentration that has not only been accepted as BACT but has also been accepted as LAER in the last five years.

TCEQ's current Tier 1 BACT guidance for VOC emissions from gas-fired combined cycle turbines specifies a limit of 2 ppmvd @ 15% O_2 for units with no duct burner firing and 4 ppmvd @ 15% O_2 for units with duct burner firing.

Based on the findings in the RBLC, CB5 is proposing the use of an oxidation catalyst and good combustion practices as BACT for VOC emissions. With these controls, VOC emissions will not exceed 1 ppmvd @ 15% O_2, with or without duct burner firing. The proposed emission limit is consistent with the limits stipulated for other similar projects recently permitted in ozone attainment areas in Texas and complies with TCEQ BACT guidance for VOC emissions from natural gas-fired combined cycle combustion turbines (see *TCEQ Combustion Sources – Current BACT Spreadsheet for Turbines)*; therefore, the proposed emission rate satisfies BACT.

CB5 will demonstrate that BACT for VOC is achieved through the initial stack testing, with use of an oxidation catalyst, and with the proper operation of the combustion turbine and duct burners.

PM/PM10/PM2.5 Emissions

In general, PM is emitted from combustion processes as a result of inorganic constituents contained in the fuel, particulate matter in the inlet air, and incomplete combustion of the organic constituents in the fuel. Because the combustion turbine and duct burners will fire only natural gas, $PM/PM_{10}/PM_{2.5}$ emissions are anticipated to be relatively low. In addition, turbines are designed and operated to combust fuel as completely as possible in order to attain the highest possible thermal efficiencies. These good combustion techniques inherently control the PM emissions from turbines. Consistent with recent combined cycle combustion turbine permits for which the TCEQ has determined that good combustion practices and firing pipeline quality natural gas is BACT for PM. CB5 will fire pipeline-quality natural gas and apply good combustion practices to minimize emissions of $PM/PM_{10}/PM_{2.5}$ from the proposed units. The most stringent particulate control method demonstrated for gas turbines and duct burners is the use of low ash fuel (such as natural gas). No add-on control technologies are listed in the TCEQ guidelines or EPA RBLC database for BACT for natural gas combustion turbines or duct burners. Therefore, the proposed use of pipeline-quality natural gas and the application of good combustion practices for the CB5 units satisfy TCEQ's Tier 1 BACT requirements and constitute BACT for $PM/PM_{10}/PM_{2.5}$.

CB5 will demonstrate that BACT for $PM/PM_{10}/PM_{2.5}$ is achieved through the initial stack testing and proper operation of the combustion turbine and duct burners.

Sulfur Compound Emissions

Emissions of SO_2 will occur as a result of oxidation of sulfur in the natural gas-fired in the combustion turbines and duct burners, with the majority of the sulfur converted to SO_2 and a portion to H_2SO_4 and $(NH_4)_2SO_4$ (the latter being a conversion contribution due to operation of the SCR system). A review of the EPA RBLC database identifies low sulfur fuel as the only available SO_2 control method for gas combustion turbines. No add-on control technologies are listed in the TCEQ guidelines or EPA RBLC database for BACT for natural gas combustion turbines or duct burners. Consistent with recent combined cycle combustion turbine permits for which the TCEQ has determined that firing pipeline quality natural gas is BACT for sulfur compounds, the CB5 project will minimize the formation and emissions of SO_2 and other sulfur oxide compounds by using pipeline-quality natural gas. The sulfur content of this natural gas will not exceed 1 grain per 100 standard cubic feet (gr/100 scf) on a short-term basis and 0.5 gr/100 scf on an annual average basis. CB5's proposed use of low sulfur fuel reflects the BACT determination identified previously for combined cycle combustion turbines and satisfies TCEQ's Tier 1 BACT requirements.

CB5 will demonstrate that BACT for SO_x compounds is achieved through the maintenance of records of contractual limits on sulfur content; valid purchase contracts, tariff sheets, or transportation contracts showing the sulfur content of the fuel.

Maintenance, Startup, and Shutdown Emissions

Periodic SUSD of the proposed combustion turbines will be part of the routine operations at the facility. The combined cycle trains will be started up and shut down in a manner that minimizes the emissions during these events. BACT will be achieved by 1) limiting the duration of each SUSD; and 2) engaging the pollution control equipment (e.g., the SCR and oxidation catalyst systems) as soon as practicable, based on vendor recommendations. The Process Description, Section VII.A.5. of this application, describes typical durations of planned startups and shutdowns of the units.

EPN CBY51 Combined Cycle Combustion Turbine BACT for Greenhouse Gas Emissions

CO_2 is a product of combustion of fuel containing carbon, which is inherent in any power generation technology using fossil fuel. It is not possible to reduce the amount of CO_2 generated from combustion, as CO_2 is the essential product of the chemical reaction between the fuel and the oxygen in which it burns, not a byproduct caused by imperfect combustion. As such, there is no technology available that can effectively reduce CO_2 generation by adjusting the conditions in which combustion takes place.

The only effective means to reduce the amount of CO_2 generated by a fuel-burning power plant is to generate as much electric power as possible per unit of fuel combusted, thereby reducing the amount of fuel needed to meet the project's required power output. This result is obtained by using the most efficient generating technologies available, so that as much of the energy content of the fuel as possible goes into generating power.

The most efficient way to generate electricity from a natural gas fuel source is the use of a combined cycle design. For fossil fuel technologies, efficiency ranges from approximately 30-50% (higher heating value (HHV)). A typical Rankine cycle power plant has a baseload efficiency of approximately 30% (HHV), while a modern large frame natural gas-fired combined cycle unit operating under optimal conditions has a baseload efficiency of approximately 50% (HHV).

Combined cycle units operate based on a combination of two thermodynamic cycles: the Brayton and the Rankine cycles. A combustion turbine operates on the Brayton cycle and the HRSG and steam turbine operate on the Rankine cycle. The combination of the two thermodynamic cycles allows for the high efficiency associated with combined cycle plants.

A search of the RBLC returned 65 natural gas-fired combined cycle projects with GHG emission limits permitted within the last 5 years. 39 of the RBLC entries had lb CO_2e/MWh limits; 3 of the entries had Btu/KWh limits; and the remaining 23 entries had only annual mass limits. The RBLC entries with lb CO_2e/MWh limits ranged from 775 – 1,800 lb CO_2e/MWh. NSPS Subpart TTTT, Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units, has a limit of 1,000 lb CO_2/MWh (gross energy output), 12-operating month rolling average, that applies to combustion turbines that commence construction after January 8, 2014. CB5 proposes to meet BACT for GHG emissions from the combined cycle turbine by meeting the NSPS Subpart TTTT limit of 1,000 lb CO_2/MWh (gross energy output), 12-operating month rolling average.

EPN CBY51: Combustion Turbine Generator (Simple Cycle Option)

EPN CBY51 Process Description for Simple Cycle Option

CB5 is seeking authorization to construct and operate either a simple cycle turbine electric generating unit or a combined cycle turbine electric generating unit. CB5 has selected the Mitsubishi MHI 501JAC turbine with a nominal base-load electric power output of approximately 415 MW at ISO conditions in the simple cycle configuration. In the combined cycle configuration, the unit will produce approximately 689 MW.

The main components of the CTG unit consist of a compressor, combustor, turbine, and generator. Filtered ambient air is drawn into the compressor section of the CTG. Natural gas is mixed with the compressed inlet air and combusted in the combustor section of the CTG. Lean premix combustors are used to reduce the NO_x emissions generated in the combustion process. Hot exhaust gases then enter the expansion turbine where the gases expand transferring kinetic energy, impelling upon curved turbine blades mounted on a central rotating spindle that causes rotation of the turbine shaft. The shaft drives the compressor section of the unit and spins a dedicated electric generator, producing electricity. The temperature of the inlet air to the CTG proposed for CB5 may occasionally be lowered using evaporative cooling to increase the mass air flow through the turbines and achieve maximum turbine power output on days of most urgent ERCOT needs.

In the simple cycle configuration, exhaust from the combustion turbine is cooled with ambient air to maintain desired temperature as it passes through a transition section containing the oxidation catalyst and the SCR catalyst prior to being released to the atmosphere through a stack (EPN: CBY51). The simple cycle operating hours will be limited to less than 3,850 hours per year.

The simple cycle configuration will utilize a high temperature SCR catalyst and 19-percent solution of ammonia as the reagent to control NOx emissions. The systems will be comprised of aqueous ammonia storage and handling equipment, ammonia injection grids, and catalyst beds. In the simple cycle configuration, the ammonia injection grids and the SCR catalyst beds will be installed in a transition section between the turbine and the exhaust stack.

The simple cycle turbine configuration will be equipped with an oxidation catalyst system to minimize CO and VOC emissions. Each oxidation catalyst system will be comprised of catalyst bed modules and will be installed at the location where exhaust temperatures will optimize CO and VOC reduction reactions.

Startup and shutdown of the proposed combustion turbines will be part of the routine operations at the facility. For the combustion turbine, startup in simple cycle configuration is defined as the period beginning when the gas turbine receives a “turbine start” signal and an initial flame detection signal is recorded in the plant’s control system and ending when the combustion turbine output reaches minimum sustainable load or MECL, which can vary based upon ambient conditions. The shutdown period is defined as the period beginning when the gas turbine receives a “turbine stop” command and the generator output drops below the minimum stable load and ending when a flame detection signal is no longer recorded in the plant’s control system. Startups and shutdowns in simple cycle mode will not exceed 60 minutes.

In addition to combustion turbine optimization during the commissioning period, the combustion turbine fuel systems require periodic tuning, including after major overhauls, to maintain compliance with manufacturer’s specifications for emissions and combustion dynamics. The turbine tuning is conducted across the combustor's load range and according to manufacturer recommendations in order to minimize NO_x and CO production while ensuring combustor stability. Additionally, CB5 anticipates that the new turbine will perform Diagnostic Load Reduction Activities (runbacks) not exceeding 20 hours per year associated with: initiation of steam turbine operation, low load steam turbine operation, variability in water or fuel supply, electric generator protection, and variation in turbine operations (including but not limited to, combustor flashback, primary combustion zone re-ignition, or combustion exhaust blade path spread).. During these low-load tuning operations, the gas turbine CO and NO_x emissions will be limited to the same levels as SUSD periods.

EPN CBY51 Simple Cycle Combustion Turbine Emission Methodology

The Simple Cycle CTG will be fired exclusively with pipeline-quality natural gas. Products of combustion from the CTG when in simple cycle mode will include NO_x, CO, VOC, SO_2, PM, PM_{10}, $PM_{2.5}$, NH_3, and H_2SO_4. NH_3 from the SCR system will react with H_2SO_4 to form $(NH_4)_2SO_4$ particulate matter. $(NH_4)_2SO_4$ is expected to be emitted in place of H_2SO_4. The products of combustion will vent to the atmosphere via the exhaust stack (EPN: CBY51).

Maximum short-term emissions during periods other than SUSD (including during periods of full and reduced load operations) were calculated at various ambient conditions. Additionally, maximum annual emissions due to the combined contributions from all modes of operation were calculated based on maximum emission rates estimated for normal and SUSD operations and the frequencies of SUSD operations.

Emission calculations were based, primarily, on data supplied by Mitsubishi and on the application of BACT. Maximum emissions during normal operations are projected to occur at an ambient temperature of 10ºF and at base load (Case 22).

Following is a summary of emissions performance assumptions used in calculating normal operations emissions from the turbines in simple cycle mode:

- NO_x emissions were calculated using a base emission factor of 2.5 ppmvd @ 15% O_2.
- CO emissions were calculated using a base emission factor of 3.5 ppmvd @ 15% O_2.
- SO_2 emissions during simple cycle operation were calculated using a maximum natural gas sulfur content of 0.5 gr/100 scf on an annual basis and 1 gr/100 scf on a maximum hourly and daily basis. The sulfur content in the fuel was multiplied by the volumetric rate of fuel consumed to determine the total flow of sulfur. One hundred percent of the sulfur in the fuel was assumed to convert (stoichiometrically) to SO_2.
- H_2SO_4 emissions during combined cycle operation were calculated by conservatively assuming that 5% of SO_2 emissions oxidizes to sulfur trioxide (SO_3) in the combustion turbine and 40% conversion of SO_2 oxidizes to SO_3 across the catalyst beds. The calculation assumes that 100 percent of SO_3 converts to H_2SO_4.
- PM (including PM_{10}/$PM_{2.5}$) emissions were based on data provided by the turbine vendors. The calculated H_2SO_4 contribution to the condensable fraction of the PM emissions was added to the vendor provided PM emission rates to estimate the total PM emission rates.
- VOC emissions were calculated using a base emission factor of 1.5 ppmvd @ 15% O_2.
- Formaldehyde emissions are calculated based on an outlet stack concentration of 91 parts per billion by volume @ 15% O_2 (ppbvd at 15% O_2).

- The projected SCR ammonia slip emission rates were calculated based on an exhaust concentration of 10 ppmvd ammonia slip corrected to 15 percent O_2 the simple cycle combustion turbine.
- Ammonium sulfate particulate matter will be formed in the SCR unit as H_2SO_4 mist in the exhaust stream reacts with the ammonia. For emissions calculations purposes, it was conservatively assumed that all of the H_2SO_4 mist will convert to $(NH_4)_2SO_4$. However, in order to develop conservative H_2SO_4 mist estimates, the H_2SO_4 emission rate estimates are based on the assumption that none of the H_2SO_4 reacts with the ammonia to form $(NH_4)_2SO_4$.

EPN CBY51 Simple Cycle Combustion Turbine Greenhouse Gas Emission Calculation Methodology

GHG emissions from the combustion turbine are calculated in accordance with the procedures in the Mandatory Greenhouse Reporting Rules (40 CFR 98), Subpart D – Electric Generation. Annual CO_2 emissions are calculated using the methodology in equation G-4 of the Acid Rain Rules.

$$W_{CO_2} = \left(\frac{F_C \times H \times U_f \times MW_{CO_2}}{2000} \right) \qquad (Eq.\ G\text{-}4)$$

Where:

W_{CO2} = CO_2 emitted from combustion, tons/yr

MW $_{CO2}$ = Molecular weight of carbon dioxide, 44.0 lb/lb-mole

F_c = Carbon based F-factor, 1,040 scf/MMBtu for natural gas

H = Annual heat input in MMBtu

U_f = 1/385 scf CO_2/lb-mole at 14.7 psia and 68 °F.

Annual CH_4 and N_2O emissions are calculated using the emission factors (kg/MMBtu) for natural gas combustion from Table C-2 of the Mandatory Greenhouse Gas Reporting Rules. A summary of the project total GHG emissions is provided in Table B-1. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules.

Table A-4
Emission Calculations - Maximum Hourly Turbine
Normal Operating Conditions
M501JAC Simple Cycle - Single Unit
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

ERATING CONDITIONS:		1	13	15	17	22	23	25
		WC			MECL			MECL
		Base	Base	80% Load	35.1% Load	Base	80% Load	43.9% Load
		Evap On	Evap On	Evap Off	Evap Off	Evap Off	Evap Off	Evap Off
Ambient Dry Bulb Temperature	ºF	97	59	59	59	10	10	10
Ambient Relative Humidity	%	45	60	60	60	75	75	75
Ambient Pressure	psia	14.69	14.69	14.69	14.69	14.69	14.69	14.69
TURAL GAS FUEL PROPERTIES:								
Natural Gas Fuel	BTU/lb - HHV	23,643	23,643	23,643	23,643	23,643	23,643	23,643
Heating Value, Natural Gas	BTU/scf - HHV	1022	1022	1022	1022	1022	1022	1022
Natural Gas MW	lb/lbmole	16.41	16.41	16.41	16.41	16.41	16.41	16.41
Sulfur Content, Natural Gas 1-Hr	grains S/100 scf	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulfur Content, Natural Gas Annual	grains S/100 scf	0.5	0.5	0.5	0.5	0.5	0.5	0.5
G EFFECTS:								
Evaporative cooler On/Off		On	On	Off	Off	Off	Off	Off
Evaporative cooler effectiveness	%	90	90	0	0	0	0	0
GT output power	kW	410,868	419,568	333,707	146,243	432,929	362,293	189,950
Heat Input	MMBTU/hr - LHV	3,397	3,409	2,822	1,859	3,490	3,048	2,144
Heat Input	MMBTU/hr - HHV	3,767	3,780	3,130	2,062	3,871	3,380	2,378
G & DUCT BURNER COMBINED EXHAUST:								
HRSG stack exhaust gas mass flow	lb_m/hr	9,516,171	9,399,447	8,088,635	6,558,693	9,176,365	8,262,762	6,956,166
HRSG stack gas temperature	°F	825.0	825.0	825.0	825.0	825.0	825.0	825.0
HRSG stack gas N2 volume percentage	%	73.22	74.88	75.08	75.5	75.5	75.57	75.95
HRSG stack gas O2 volume percentage	%	13.98	14.23	14.49	15.66	14.04	14.26	15.31
HRSG stack gas CO2 volume percentage	%	2.872	2.98	2.869	2.331	3.159	3.058	2.573
HRSG stack gas H2O volume percentage	%	9.023	6.986	6.625	5.582	6.37	6.175	5.226
HRSG stack gas Ar volume percentage	%	0.9059	0.9303	0.9303	0.9303	0.933	0.9396	0.9396
HRSG stack gas O2 volume percentage - Dry Basis	%	15.3647	15.2944	15.5228	16.5863	14.9926	15.1984	16.1568
HRSG stack gas molecular weight		28.24	28.47	28.5	28.56	28.55	28.57	28.63
HRSG stack PM	lb/hr	9.30	9.60	8.12	6.03	9.69	8.85	6.68
Exit Flow Rate	lb_{mol}/hr	337,006	330,142	283,811	229,608	321,369	289,241	242,999
Exit Flow Rate	lb_{mol}/hr - dry	306,599	307,078	265,009	216,792	300,898	271,380	230,301
Exit Flow Rate	scf/hr	129,915,860	127,269,562	109,408,959	88,513,716	123,887,667	111,502,277	93,676,131
Exit Flow Rate	scf/hr - dry	118,193,952	118,378,542	102,160,928	83,573,283	115,996,014	104,616,957	88,780,899
G & DUCT BURNER COMBINED EXHAUST:								
NO_X	ppmvd@15%O2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
NO_X	ppmvd	2.34545	2.37524	2.27847	1.82784	2.50312	2.41593	2.00981
NO_X as NO_2	lb/hr	33.08	33.56	27.78	18.23	34.65	30.16	21.29
CO	ppmvd@15%O2	3.5	3.5	3.5	3.5	3.5	3.5	3.5
CO	ppmvd	3.28	3.33	3.19	2.56	3.50	3.38	2.81
CO	lb/hr	28.20	28.60	23.68	15.54	29.54	25.71	18.15
VOC, as CH_4	ppmvd@15%O2	1.5	1.5	1.5	1.5	1.5	1.5	1.5
VOC, as CH_4	ppmvd	1.41	1.43	1.37	1.10	1.50	1.45	1.21
VOC, as CH_4	lb/hr	6.92	7.02	5.81	3.81	7.25	6.31	4.46
H_2CO	ppbvd@15%O2	91.0	91.0	91.0	91.0	91.0	91.0	91.0
H_2CO	ppmvd	85.37	86.46	82.94	66.53	91.11	87.94	73.16
H_2CO	lb/hr	0.79	0.80	0.66	0.43	0.82	0.72	0.51
NH_3	ppmvd@15%O2	10	10	10	10	10	10	10
NH_3	ppmvd	9.38	9.50	9.11	7.31	10.01	9.66	8.04
NH_3	lb/hr	48.99	49.69	41.13	26.99	51.31	44.66	31.53
SO_2, Maximum Hourly	lb/hr	10.52	10.56	8.74	5.76	10.81	9.44	6.64
SO_2, Annual Average	lb/hr	5.26	5.28	4.37	2.88	5.41	4.72	3.32
SO_2 to SO_3 Conversion in Turbine	%	5	5	5	5	5	5	5
SO_2 to SO_3 Conversion in Catalyst Beds	%	40	40	40	40	40	40	40
H_2SO_4, Maximum Hourly (100% converted SO_3)	lb/hr	6.93	6.95	5.75	3.79	7.12	6.22	4.37
H_2SO_4, Annual Average (100% converted SO_3)	lb/hr	3.46	3.48	2.88	1.90	3.56	3.11	2.19
$(NH_4)_2SO_4$, Maximum Hourly (100% converted SO_3)	lb/hr	9.33	9.36	7.75	5.11	9.59	8.37	5.89
$(NH_4)_2SO_4$, Annual Average (100% converted SO_3)	lb/hr	4.67	4.68	3.88	2.55	4.79	4.19	2.95
PM FH+BH, Maximum Hourly (including Sulfates and VOC)	lb/hr	18.63	18.96	15.88	11.14	19.28	17.22	12.57
PM FH+BH, Annual Average (including Sulfates and VOC)	lb/hr	13.97	14.28	12.00	8.59	14.49	13.04	9.63

Table A-5
Sample Emission Calculations
M501JAC Simple Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Case 22		
Exhaust Flow Rate	9,176,365	lb/hr
Exhaust Flow MW	28.55	lb/lbmole
CTG Heat Input	3,871	MMBtu / hr, HHV
Natural Gas	1,021.9	Btu / scf, HHV
Exhaust Content	14.04	% O2 wet
Exhaust Content	6.37	% H2O

Exhaust Flow = $\frac{\text{9,176,365 lb exhaust}}{\text{hr}} \Big| \frac{\text{lbmole}}{\text{28.55 lb}} \Big| \frac{\text{1 - (6.37\% H2O)/100)}}{}$ = 300,897.6 lbmole/hr (dry)

Convert Oxygen Concentration to Dry Basis

O_2 = $\frac{\text{14.04 \% O2 wet}}{\text{(1 - (6.37 \% H20) /100))}}$ = 14.99 % dry

Natural Gas Usage

CTG NG Flow = $\frac{\text{3,871 MMBtu HHV}}{\text{hr}} \Big| \frac{\text{1,000,000 Btu}}{\text{MMBtu}} \Big| \frac{\text{scf}}{\text{1,021.9 MMBtu HHV}}$ = 3,787,785.8 scfh

Gaseous Pollutant Sample Calculation - Oxides of Nitrogen (NOx)

Emission Factor	2.5	ppmvd NOx @ 15% O_2
NO_2 MW	46.01	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Oxides of Nitrogen

Emission Factor = $\frac{\text{2.5 ppmd @ 15\%}}{} \Big| \frac{\text{(20.9 - 14.99 O2\% dry)}}{\text{(20.9 - 15)}}$ = 2.5 ppmvd NOx

Emission Rate Calculation - Oxides of Nitrogen

ST Emissions = $\frac{\text{2.5 lbmole NOx}}{\text{1,000,000 lbmole exhaust}} \Big| \frac{\text{300,898 lbmole exhaust}}{\text{hr}} \Big| \frac{\text{46.01 lb NOx/lb mole}}{\text{lbmole NOx}}$ = 34.65 lb/hr NOx as NO2

Gaseous Pollutant Sample Calculation - Carbon Monoxide (CO)

Emission Factor	3.5	ppmvd CO @ 15% O2
CO MW	28.01	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Carbon Monoxide

Emission Factor = $\frac{\text{3.5 ppmd @ 15\%}}{} \Big| \frac{\text{(20.9 - 14.99 O2\% dry)}}{\text{(20.9 - 15)}}$ = 3.5 ppmvd CO

Emission Rate Calculation - Carbon Monoxide

ST Emissions = $\frac{\text{3.5 lbmole CO}}{\text{1,000,000 lbmole exhaust}} \Big| \frac{\text{300,898 lbmole exhaust}}{\text{hr}} \Big| \frac{\text{28.01 lb CO/lb mole}}{\text{lbmole CO}}$ = 29.54 lb/hr CO

Gaseous Pollutant Sample Calculation - Volatile Organic Compound (VOC)

Emission Factor	1.5	ppmvd VOC @ 15% O2
VOC MW	16.04	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Volatile Organic Compound

Emission Factor = $\frac{\text{1.5 ppmd @ 15\%}}{} \Big| \frac{\text{(20.9 - 14.99 O2\% dry)}}{\text{(20.9 - 15)}}$ = 1.5 ppmvd VOC

Emission Rate Calculation - Volatile Organic Compound

ST Emissions = $\frac{\text{1.5 lbmole VOC}}{\text{1,000,000 lbmole exhaust}} \Big| \frac{\text{300,898 lbmole exhaust}}{\text{hr}} \Big| \frac{\text{16.04 lb CO/lb mole}}{\text{lbmole CO}}$ = 7.25 lb/hr VOC

Table A-5
Sample Emission Calculations
M501JAC Simple Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Sample Calculation - Sulfur Dioxide (SO_2), Sulfuric Acid (H_2SO_4) and Ammonium Sulfate $(NH_4)_2SO_4$

Emission Factor	1	grain S / 100 scf, Natural Gas, Max Hourly
Emission Factor	0.5	grain S / 100 scf, Natural Gas, Annual Average
S MW	32.06	lb / lb_{mole}
SO_2 MW	64.06	lb / lb_{mole}
H_2SO_4 MW	98.07	lb / lb_{mole}
$(NH_4)_2SO_4$ MW	132.13	lb / lb_{mole}

Sample Calculation - Sulfur Dioxide (SO_2)

CTG/DB ST Emissions = $\frac{\text{1 grain S}}{\text{100 scf}} \times \frac{\text{lb}}{\text{7000 grain}} \times \frac{\text{3,787,786 Total NG scf}}{\text{hr}} \times \frac{\text{64.06 lbmole SO2}}{\text{32.06 lbmole S}}$ = 10.81 lb/hr SO2

Sample Calculation - Sulfuric Acid (H_2SO_4)

SO2 to SO3 Conversion in Turbine	5	%
SO2 to SO3 Conversion in Catalyst Beds	40	%

Turbine Conversion = $\frac{\text{1 grain S}}{\text{100 scf}} \times \frac{\text{lb S}}{\text{7000 grain}} \times \frac{\text{3,787,786 scf NG to CGT}}{\text{hr}} \times \frac{\text{lbmole SO2}}{\text{32.06 lb S}}$

$\times \frac{\text{(5/100) lbmole SO3}}{\text{lbmole SO2}} \times \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \times \frac{\text{98.07 lb H2SO4}}{\text{lbmole H2SO4}}$ = 0.8 lb/hr H2SO4

Catalyst Bed Conversion = $\frac{\text{(1 - 5/100)) * 3,787,786) scf NG to CGT}}{\text{hr}} \times \frac{\text{1 grain S}}{\text{100 scf}} \times \frac{\text{lb S}}{\text{7000 grain}}$

$\times \frac{\text{lbmole SO2}}{\text{32.06 lb S}} \times \frac{\text{(40/100) lbmole SO3}}{\text{lbmole SO2}} \times \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \times \frac{\text{98.07 lb H2SO4}}{\text{lbmole H2SO4}}$ = 6.3 lb/hr H2SO4

Total H2SO4 = 0.8 lb/hr + 6.3 lb/hr = 7.12 lb/hr H2SO4

Sample Calculation - Ammonium Sulfate ($(NH_4)_2SO_4$)

Assume 100% of H_2SO_4.converts to $(NH_4)_2SO_4$.

ST Emissions = $\frac{\text{7.1 lb H2SO4}}{\text{hr}} \times \frac{\text{lbmole H2SO4}}{\text{98 lb H2SO4}} \times \frac{\text{lbmole (NH4)2SO4}}{\text{lbmole H2SO4}} \times \frac{\text{132 lb (NH4)2SO4}}{\text{lbmole (NH4)2SO4}}$

= 9.59 lb/hr (NH4)2(SO4) lb/hr

Sample Calculation - Particulate Matter ($PM_{10}/PM_{2.5}$)

CTG Emission Rate =	9.69	lb/hr, front and back half, vendor supplied
(NH4)2SO4 Emissions =	9.59	lb/hr
Total PM =	19.28	lb/hr

Table A-6
Hourly Emission Summary
Normal Operating Conditions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

M501JAC Combined Cycle

Pollutant	Maximum For Averaging Period	Single Turbine (lb/hr)					
		Maximum Hourly	MSS Max Hourly (Cold Start)			Annual	Annual
		Case 24 Fired Base Evap Off 10 °F lb/hr	MSS Emissions lbs	MSS Duration minutes	First Hour Emissions MSS/Routine lb/hr	Case 13 Duct Fired Base Evap On 59 °F lb/hr	Case 14 No Duct Firing Base Evap On 59 °F lb/hr
NO_X	1-Hour	32.29	22	19	43.96		
	Annual					31.34	26.76
CO	1-Hour	34.40	510	19	533.39		
	Annual					33.39	28.51
VOC	1-Hour	5.630	73	19	76.83		
	Annual					5.46	4.20
SO_2	1-Hour	12.65					
	Annual					6.18	5.30
Particulates (FH&BH)	1-Hour	36.57					
	Annual					29.80	19.00
H_2SO_4	1-Hour	9.16					
	Annual					4.47	3.49
NH_3	1-Hour	41.83					
	Annual					40.61	34.67
$(NH_4)_2SO_4$	1-Hour	12.34					
	Annual					6.03	4.70

M501JAC Simple Cycle

Pollutant	Maximum For Averaging Period	Single Turbine				
		Maximum Hourly	MSS Max Hourly (Cold Start)			Annual
		Case 22 Base Load; 10 F lb/hr	MSS Emissions lbs	MSS Duration minutes	First Hour Emissions MSS/Routine lb/hr	Case 13 Base Load; 59 F lb/hr
NO_X	1-Hour	34.65	15	20	38.10	
	Annual					33.56
CO	1-Hour	29.54	237	20	256.69	
	Annual					28.60
VOC	1-Hour	7.250	58	20	62.83	
	Annual					7.02
SO_2	1-Hour	10.81				
	Annual					5.28
Particulates (FH&BH)	1-Hour	19.28				
	Annual					14.28
H_2SO_4	1-Hour	7.12				
	Annual					3.48
NH_3	1-Hour	51.31				
	Annual					49.69
$(NH_4)_2SO_4$	1-Hour	9.59				
	Annual					4.68

Notes:
1. VOCs are non-methane, non-ethane as CH_4.
2. Particulates are front and back half by EPA Method 5/202 and include condensables.

Table A-7
Gas Turbine Annual Emission Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Annual Emissions for M501JAC Combined Cycle

Annual Operating Hours with Duct Firing:	1910.0
Annual Operating Hours without Duct Firing	6819.9
Annual SS Operating Hours:	30.1

Pollutant	Annual Emissions Based on 1,910.0 hrs/yr of Normal Operations with Duct Firing tons/yr	Annual Emissions Based on 6,819.9 hrs/yr of Normal Operations without Duct Firing tons/yr	Estimated Annual Emissions From SS Operations tons/yr	Estimated SS Annual Operating Hours[1] hrs/yr
NO_X	29.93	91.24	1.69	30.1
CO	31.89	97.21	21.19	30.1
VOC	5.22	14.32	4.75	30.1
SO_2	5.90	18.08	---	---
$PM/PM_{10}/PM_{2.5}$	28.46	64.79	---	---
H_2SO_4	4.27	11.90	---	---
$(NH_4)_2SO_4$	5.75	16.04	---	---
NH_3	38.78	118.21	---	---

Notes:
1. Only emissions of NOx, CO, and VOC are shown in the startup/shutdown columns as emissions of other pollutants are expected to be less than during normal operation.

Annual Emissions for M501JAC Simple Cycle

Annual Operating Hours: 3850

Pollutant	Annual Emissions Based on 3,850 hrs/yr of Normal Operations tons/yr	Estimated Annual Emissions From SS Operations tons/yr	Estimated SS Annual Operating Hours[1] hrs/yr	Combined Routine/MSS Annual Emissions tons/yr
NO_X	64.59	1.84	77	65.14
CO	55.06	59.57	77	113.53
VOC	13.52	11.09	77	24.33
SO_2	10.16	---	---	10.16
$PM/PM_{10}/PM_{2.5}$	27.49	---	---	27.49
H_2SO_4	6.69	---	---	6.69
$(NH_4)_2SO_4$	9.01	---	---	9.01
NH_3	95.64	---	---	95.64

Notes:
1. Only emissions of NOx, CO, and VOC are shown in the startup/shutdown columns as emissions pollutants are expected to be less than during normal operation.

Table A-8
Hourly Emission Summary - Turbine Startup/Shutdown
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Startup/Shutdown Emissions for Mitsubishi M501JAC Combined Cycle Turbine

Type	Each Turbine Unit								
	Duration (min)	Events/yr[1]	MSS hr/yr	NOx		CO		VOC	
				lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr
Startup-Cold, Maximum (lb/event)	19.2	55	17.6	22	0.6	510	14.0	73	2.0
Startup-Warm, Maximum (lb/event)	19.2	5	1.6	22	0.1	403	1.0	73	0.2
Startup-Hot, Maximum (lb/event)	19.2	5	1.6	22	0.1	148	0.4	73	0.2
Shutdown, Maximum (lb/event)	8.6	65	9.3	30	1.0	178	5.8	73	2.4
			30.1		1.7		21.2		4.7

Notes:
1. This is an estimate for purposes of calculating annual emissions. It is not a representation of total number of annual MSS events.

Startup/Shutdown Emissions for Mitsubishi M501JAC Simple Cycle Turbine

Type	Each Turbine Unit								
	Duration (min)	Events/Yr[1]	MSS hr/yr	NOx		CO		VOC	
				lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr
Startup (Normal - to 100% Load) (lb/event)	20	175	58.3	15	1.3	237	20.7	58	5.1
Start-up (10 min start)	10	18	3.0	5	0.0	230	2.1	57	0.5
Shutdown, Maximum (lb/event)	5	193	16.1	5	0.5	381	36.8	57	5.5
	--		77.4		1.8		59.6		11.1

Notes:
1. This is an estimate for purposes of calculating annual emissions. It is not a representation of total number of annual MSS events.

Table B-3
GHG Annual Emission Calculations - M501JAC Simple Cycle Combustion Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Average Heat Input[1] MMBtu/hr	Annual Heat Input[2] MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[3]	GHG Mass Emissions[4] ton/yr	Global Warming Potential[5]	CO_2e ton/yr
CBY51	3,780	14,552,539	CO_2	118.86	864,836.6	1	864,836.6
			CH_4	2.2E-03	16.0	25	401.0
			N_2O	2.2E-04	1.6	298	478.0
				TOTAL	**864,854.2**		**865,715.7**

Notes:

1. The average heat input for the M501JAC scenario is based on the HHV heat input at 100% load, duct firing, evaporator on, at 59°F ambient temperature (Operating Case 13)
2. Annual heat input based on 3,850 hours per year
3. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
4. CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4

$W_{CO2} = (F_c \times H \times U_f \times MW_{CO2})/2000$

W_{CO2} = CO_2 emitted from combustion, tons/yr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/yr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68°F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

5. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

EPN CBY51 Simple Cycle Combustion Turbine BACT for Criteria Pollutants

NOx Emissions

Emissions of NO_x from combustion turbines are generated through the oxidation of nitrogen in the high-temperature combustion zones. For simple cycle combustion turbines, NO_x emissions can be reduced with dry low-NO_X (DLN) combustors. This method of NO_X control is considered a combustion control as it is designed to minimize combustion temperatures by providing a lean pre-mixed air-fuel mixture, where air and fuel are combined before entering the combustor. This design minimizes fuel-rich pockets and allows the excess air to act as a heat sink, thus lowering the combustion zone temperatures to minimize thermal NO_X formation. CB5 proposes to reduce NO_x emissions from the combustion turbine in the simple cycle configuration, through the use of this combustion technology.

A search of the RBLC returned 46 projects for which natural gas-fired simple cycle units were permitted between 2014 and 2019, with reported NO_x emission limit (see Appendix B). The RBLC determinations show NO_x emission limits ranging from 2.0 to 25 ppmvd @15% O_2. 41 of 46 projects (89%) were permitted at concentrations above 2.5 pmvd, which is CB5's proposed NOx concentration. A further review of the RBLC determinations shows that five simple cycle projects were permitted with a NO_x emission limit of 2.0 ppmvd and five were permitted at 2.5 ppmvd, based on the use of selective catalytic reduction (SCR) control technology. Eight of the ten projects permitted at or below 2.5 ppm had NO_x emission limits that were LAER-based limits and not BACT.

CB5 proposes to satisfy BACT for NO_x emissions for the proposed simple cycle configuration through use of DLN combustors and an aqueous ammonia-based high temperature SCR system. With these emissions controls, NO_x emissions while operating in combined cycle mode will not exceed 2.5 ppmvd @ 15% O_2. Compliance with this emissions limit would be demonstrated on a rolling 24-hour average basis and would exclude periods of maintenance, startup, and shutdown. This proposed limit is equivalent to the lowest BACT-based emission rate permitted for recent simple cycle projects both inside and outside Texas; therefore, the proposed emission rate satisfies BACT.

CB5 will demonstrate that BACT for NO_x is achieved through the initial stack testing of the turbine and through the continuous monitoring of NO_x emissions from the stack.

NH3 Emissions

CB5 will operate the SCR systems in a manner that ammonia slip (i.e., the emission of unreacted ammonia to the atmosphere) is minimized while ensuring that the NO_x emissions limits are met. Control of the ammonia injection system and operating parameters will be maintained to control ammonia slip in the simple cycle turbine exhaust stream to levels not exceeding 10 ppmvd @ 15% O_2, on a rolling 24-hour average basis, excluding SUSD periods, and 10 ppmvd @ 15% O_2, on an annual average basis, excluding SUSD periods. This level of emissions control meets the *TCEQ Combustion Sources – Current BACT Spreadsheet for Turbines* requirements for ammonia slip from turbines (7 to 10 ppmvd @ 15% O_2). CB5 will demonstrate that BACT for NH_3 is achieved through the initial stack testing and through a monitoring method acceptable to the TCEQ.

CO Emissions

Combustion is a thermal oxidation process in which carbon and hydrogen in the fuel combine with oxygen to primarily form carbon dioxide (CO_2) and water vapor. Emissions of CO are the result of incomplete combustion of the carbon in a fuel. The primary factors influencing the generation of CO emissions are temperature and fuel residence time within the combustion zone. CB5 proposes to minimize CO emissions from the proposed turbine in the simple cycle configuration with an oxidation catalyst and good combustion practices – controlled fuel/air mixing and sufficient temperature and gas residence time.

A search of the RBLC showed 45 projects listed between 2014 and 2019 with CO emission limits for natural gas-fired simple cycle units (see Appendix C). The RBLC determinations show CO emission limits ranging from 2.0 to 29 ppmvd @15% O_2. Thirty-four of the 45 projects were not equipped with oxidation catalyst and only used good combustion practices to control CO, while 11 projects were equipped with oxidation catalyst. Forty of the 45 projects listed (88%) had CO emission concentration higher than CB5's proposed BACT concentration.

According to the TCEQ's current combustion source BACT requirements, Tier I BACT for CO emissions from gas-fired simple cycle combustion turbines is 9 to 25 ppmvd @15% O_2. Also, TCEQ's recent BACT determinations, as shown in the agency's most recent "gas turbine permit list" for simple cycle gas turbines, demonstrate that CO emission limits for simple cycle units range from 8 to 29 ppmvd @15% O_2 (without the use of an add-on control technology, e.g., oxidation catalyst).

Based on the body of findings summarized above, CB5 proposes to satisfy BACT for CO emissions from the turbine in the simple cycle configuration, through use of an oxidation catalyst and good combustion practices – controlled fuel/air mixing and sufficient temperature and gas residence time. With an oxidation catalyst and good combustion practices, CO emissions associated with the turbine will not exceed 3.5 ppmvd @15% O_2. Compliance with this emissions limit would be demonstrated on a rolling 24-hour average basis and would exclude periods of planned maintenance, startup, and shutdown. CB5's proposed CO emission rate are at the low end of the range of limits reported in the RBLC and satisfy TCEQ's Tier 1 BACT requirements.

CB5 will achieve BACT for CO through the use of an oxidation catalyst and through good combustion practices and will demonstrate that BACT has been achieved through the initial stack testing and through the continuous monitoring of CO emissions from the stack.

VOC Emissions

Similar to CO emissions generation, VOC emissions will result from the incomplete combustion of the natural gas. The primary factors influencing the generation of VOC emissions are temperature and fuel residence time within the combustion zone. CB5 proposes to minimize VOC emissions from the proposed turbine with an oxidation catalyst and good combustion practices – controlled fuel/air mixing and sufficient temperature and gas residence time.

A search of the RBLC showed 31 projects listed between 2014 and 2019 with VOC emission limits for natural gas-fired simple cycle units (see Appendix C). There were 6 listed projects in this time period that underwent LAER reviews. The RBLC show the LAER determinations for VOC emission limits ranging from 0.7 to 2.0 ppmvd @15% O_2. The variability in the range of VOC concentration reflected different turbine models. The lowest permitted VOC limit 0.7 ppmvd @15% O_2, Dominion Cove Point LNG is an off-shore LNG terminal that utilizes much small turbines than proposed by CB5. The Cricket Valley Energy Center has not been constructed and has not demonstrated compliance with this permitted value. None of the simple cycle turbines that underwent a LAER review were J-Class turbines. CB5 is proposing a VOC concentration that has not only been accepted as BACT but has also been accepted as LAER in the last five years.

Based on the findings in the RBLC, CB5 is proposing the use of an oxidation catalyst and good combustion practices as BACT for VOC emissions. With these controls, VOC emissions will not exceed

1.5 ppmvd @ 15% O_2. The proposed emission limit is consistent with the limits stipulated for other similar projects recently permitted in ozone nonattainment areas in Texas and complies with TCEQ BACT guidance for VOC emissions from natural gas-fired combined cycle combustion turbines (see *TCEQ Combustion Sources – Current BACT Spreadsheet for Turbines)*; therefore, the proposed emission rate satisfies BACT.

CB5 will demonstrate that BACT for VOC is achieved through the initial stack testing, with use of an oxidation catalyst, and with the proper operation of the combustion turbine and duct burners.

PM/PM10/PM2.5 Emissions

In general, PM is emitted from combustion processes as a result of inorganic constituents contained in the fuel, particulate matter in the inlet air, and incomplete combustion of the organic constituents in the fuel. Because the combustion turbine will fire only natural gas, $PM/PM_{10}/PM_{2.5}$ emissions are anticipated to be relatively low. Consistent with recent permits for simple cycle turbines, for which the TCEQ has determined that firing pipeline quality natural gas is BACT for PM, CB5 will fire pipeline-quality natural gas and apply good combustion practices to minimize emissions of $PM/PM_{10}/PM_{2.5}$ from the proposed turbine in the simple cycle configuration.

CB5 will demonstrate that BACT for $PM/PM_{10}/PM_{2.5}$ is achieved through the initial stack testing and proper operation of the combustion turbines.

Sulfur Compound Emissions

Emissions of SO_2 will occur as a result of oxidation of sulfur in the natural gas-fired in the combustion turbine, with the majority of the sulfur converted to SO_2 and a small portion to H_2SO_4. Consistent with recent permits for simple cycle turbines, for which the TCEQ has determined that firing pipeline quality natural gas is BACT for sulfur compounds, CB5 will minimize the formation of SO_2 and H_2SO_4 by firing pipeline-quality natural gas with a sulfur content not exceeding 1 gr/100 scf on a short-term basis and 0.5 gr/100 scf on an annual average basis in the proposed units.

CB5 will demonstrate that BACT for SO_2, and H_2SO_4, is achieved through the maintenance of records of contractual limits on sulfur content, valid purchase contracts, tariff sheets, or transportation contracts for the fuel which show sulfur content.

Maintenance, Startup, and Shutdown Emissions

Operation of the combustion turbines will result in emissions from SUSD of the units. Each combustion turbine unit will be started up and shut down in a manner that minimizes the emissions during these events. BACT will be achieved by minimizing the duration of the SUSD events to 60 minutes.

EPN CBY51 Simple Cycle Combustion Turbine BACT for Greenhouse Gas Emissions

Simple cycle combustion turbines use a single combustion turbine to produce electricity (i.e., there is no heat recovery or steam cycle). Although the simple cycle combustion turbine has a lower energy efficiency than combined cycle turbines, the simple cycle units serve a different purpose than the combined cycle turbine. The simple cycle turbines are not intended to be used as a base load unit with full time operation. The power output from these simple cycle combustion turbines can be easily ramped up and down making them ideal for ‘‘peaking’’ operations that only operate during periods with the highest electricity demand.

The NSPS Subpart TTTT, Standards of Performance for Greenhouse Gas Emissions for Electric Generating Units, has a limit of 120 lb CO_2/MMBtu for turbines constructed after January 8, 2014 that supplies its design efficiency or 50 percent, whichever is less, times its potential electric output or less as net-electric sales on either a 12-operating month or a 3-year rolling average basis and combusts more than 90% natural gas on a heat input basis on a 12-operating-month rolling average basis. The 120 lb CO_2/MMBtu NSPS Subpart TTTT limit will apply to the proposed CB5 simple cycle turbine since the annual hours of operation will be limited to 3,850 hours per year.

A search of the RBLC returned 28 natural gas-fired simple cycle projects with GHG emission limits permitted within the last 5 years. The BACT limits either referenced the NSPS Subpart TTTT limit of 120 lb CO_2/MWh; listed a lb CO_2e/MWh ranging from 1,293 – 1,461; or only listed an annual mass limit of CO_2e. CB5 proposes to meet BACT for GHG emissions from the simple cycle by meeting the NSPS Subpart TTTT limit of 120 lb CO_2/MMBtu and by limiting hours of operation to 3,850 hours per year.

EMISSION POINT INFORMATION

EPN CBY51-LOV and CBYST1-LOV: Unit 1 Lube Oil Vent and Steam Turbine 1 Lube Oil Vent

EPN CBY51-LOC and CBYST1-LOV Process Description

The combustion turbine and the steam turbine will be equipped with lube oil recirculation systems to lubricate the moving parts. Emissions of condensed lube oil droplets from the lube oil systems will be exhausted through vapor extraction vents (EPNs: CBY51-LOV and CBYST1-LOV) serving the proposed unit, and these emissions will be controlled with mist eliminators.

EPN CBY51-LOC and CBYST1-LOV Criteria Pollutant Emission Calculation Methodology

The proposed new unit will be equipped with dedicated lubrication systems. Lubricating oil will be circulated through the turbine machinery from the oil sump, and the heating of recirculating lube oil in the turbine and generator housings will create oil vapor and oil condensate droplets in the oil reservoir compartments. Emissions of the condensed droplets will be controlled by a mist eliminator serving each reservoir. The calculation of emissions from the lube oil vents (EPNs: CBY51-LOV and CGYST1-LOV) was based on lube oil replacement rates for similar units equipped with mist eliminators and are presented as Table A-16 in Appendix A. The lube oil vent emissions are counted both as VOCs and PM for the four emission points.

When the gas turbine does not operate for a period of time and the lube oil temperature drops, lube oil mist is not being produced and the mist eliminators may be shut down. During this time, vapor breathing and filling losses may occur from each oil reservoir. However, these latter losses will be negligible compared to the emissions during the recirculation of the hot lube oil.

Table A-16
Lube Oil System Vents Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Notes:

1 - The heating of recirculating lube oil in the gas turbine and steam turbine housing generates oil vapor and oil condensate droplets in the oil reservoir compartments. Lube oil mist emissions in each reservoir are controlled by a mist eliminator.

2 - Unloading, storage, and heated recirculation of lube oil in gas and steam turbine reservoirs will emit less than 0.3 gallon per day of oil per turbine mist eliminator vent, based on oil consumption estimated by GE. The calculated hourly emissions are based on the daily emission rate divided by 24 hours per day.

3 - Lube oil mist will be generated and the corresponding mist eliminator fan will be operated concurrently with turbine operation, including during startup and shutdown, plus additional time after turbine operation. When the gas turbines or steam turbines do not operate for extended periods such that lube oil is cooled to near-ambient temperatures, mist eliminators may be shut down. During this time, vapor breathing and filling losses may occur from each oil reservoir. These latter losses are significantly less than the emission rates calculated on this sheet.

Sample Calculations:

Hourly ER (lb/hr) = daily volumetric emission rate (gal/day) x density (lb/gal) x (day/24 hr)

$$\text{lb/hr} = \frac{X\ \text{gal}}{\text{day}} \left| \frac{X\ \text{lb}}{\text{gal}} \right| \frac{\text{day}}{24\ \text{hr}}$$

Annual ER (tpy) = daily volumetric emission rate (gal/day) x density (lb/gal) x days of operation (days/yr) x (ton/2000 lb)

$$\text{tpy} = \frac{X\ \text{gal}}{\text{day}} \left| \frac{X\ \text{lb}}{\text{gal}} \right| \frac{X\ \text{day}}{\text{yr}} \left| \frac{\text{ton}}{2000\ \text{lb}} \right.$$

Calculation of Emissions:

EPN	Description	Pollutant	Maximum Annual No. of Days of Operation days/yr	Daily Volumetric Emission Rate Per Mist Eliminator Vent gal/day/vent	Approx. Density lb/gal	No. of Mist Eliminator Vents vents	Daily Emission Rate lb/day	Hourly Emission Rate lb/hr	Annual Emission Rate ton/yr
CBY51-LOV	Unit 1 Lube Oil Vent	VOC	365	0.01	7.26	1	0.07	0.003	0.01
		PM	365	0.01	7.26	1	0.07	0.003	0.01
CBYST1-LOV	Steam Turbine 1 Lube Oil Vent	VOC	365	0.01	7.26	1	0.07	0.003	0.01
		PM	365	0.01	7.26	1	0.07	0.003	0.01

EPN CBY51-LOV and CBYST1-LOV BACT for Criteria Pollutants

The heating of recirculating lubrication oil in the gas turbine and steam turbine housing generates oil vapor and oil condensate droplets in the oil reservoir compartments. The venting of turbine lubrication oil is a minor source of VOC and PM emissions. These emissions will be controlled with oil mist eliminators, which are BACT for emissions from these vents.

EMISSION POINT INFORMATION

EPN FUG-SCR: Ammonia Component Fugitives

EPN FUG-SCR Process Description

Aqueous ammonia will be delivered by tanker truck to pressurized tanks equipped with pressure relief valves. Ammonia vapors will be returned to the tanker truck as the storage tanks are filled. Piping and fittings associated with the tanks and other components of the system delivering ammonia to the SCR systems will be sources of fugitive emissions, identified as EPN: FUG-SCR.

EPN FUG-SCR Emission Calculation Methodology

Fugitive emissions will be generated from the components in ammonia service (EPNs: FUG-SCR). EPA emission factors for SOCMI facilities without ethylene were used to calculate emissions from NH_3 delivery systems.

Table A-14
SCR Delivery System - Plantwide Ammonia Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Equipment/Service		Equipment Counts[1]	Factor[2] lb/hr-component	NH_3 % weight	AVO Control Credit[3]	Emission Rate	
						lb/hr	ton/yr
Valves	Gas/Vapor	0	0.0089	100	97%	0.000	0.00
	Light Liquid	62.5	0.0035	100	97%	0.0066	0.029
	Heavy Liquid	0	0.0007	100	97%	0	0
Pumps	Light Liquid	0	0.0386	100	93%	0.0000	0.000
	Heavy Liquid	0	0.0161	100	93%	0	0
Flanges	Gas/Vapor	0	0.0029	100	97%	0.000	0.00
	Light Liquid	156.5	0.0005	100	97%	0.0023	0.0103
	Heavy Liquid	0	0.00007	100	97%	0	0
Compressors		0	0.5027	100	95%	0	0
Relief Valves		2	0.2293	100	97%	0.014	0.060
Open-Ended Lines		0	0.004	100	97%	0	0
Sampling Connections		0	0.033	100	97%	0	0
TOTAL						0.02	0.10

Notes:

1. Based on engineering judgment, all counts have been multiplied by a 1.2 safety factor.
2. EPA-453/R-93-026, June 1993, SOCMI w/o C2.
3. Air Permit Technical Guidance for Chemical Sources: Equipment Leak Fugitives, TNRCC, October 2000 Draft.

EPN FUG-SCR BACT

To ensure that fugitive emissions from the piping components in ammonia service are adequately controlled, CB5 will follow an audio, visual, and olfactory (AVO) inspection and maintenance program, performing an inspection once every 12 hours. This program will meet the requirements of the TCEQ's technical guidance package for chemical source equipment leak fugitives. Therefore, the proposed program will meet or exceed the requirements of BACT.

CB5 will demonstrate that BACT for fugitive NH_3 emissions is achieved through the keeping of records of the AVO inspections and maintenance activities.

EMISSION POINT INFORMATION

EPN FUG-NGAS: Natural Gas Component Fugitives

EPN FUG-NGAS Process Description

Natural gas will be delivered to the site via existing pipelines, where it will be metered and piped to the combustion turbine. Fugitive emissions from the natural gas piping components include emissions of methane (CH_4), VOC, and carbon dioxide, which are identified as EPN: FUG-NGAS.

EPN FUG-NGAS Criteria Pollutant Emission Calculation Methodology

Fugitive emissions will be generated from the natural gas feed system (EPN: FUG-NGAS). EPA's emission factors for oil and gas production operations published on Table 2-4 of its Protocol for Equipment Leak Emissions Estimates1 were applied to estimates of the number of equipment components (valves, flanges, relief valves etc.) in natural gas service to calculate fugitive emissions from the natural gas system.

EPN FUG-NGAS Greenhouse Gas Emission Calculation Methodology

GHG emission calculations for natural gas piping component fugitive emissions are based on emission factors from Table W-1A of Mandatory Greenhouse Gas Reporting Rules. The concentrations of CH_4 and CO_2 in the natural gas are based on a typical natural gas analysis. Since the CH_4 and CO_2 content of natural gas is variable, the concentrations of CH_4 and CO_2 from the typical natural gas analysis are used when determining the worst-case mass emission rate estimate. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules.

GHG emission calculations for releases of natural gas related to piping maintenance and turbine startup/shutdowns are calculated using the same CH_4 and CO_2 concentrations as natural gas piping fugitives.

[1] *EPA, Protocol for Equipment Leak Estimates (EPA-453/R-95-017), November 1995.*

Table A-15
Fuel Delivery System - VOC Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Equipment/Service	Equipment Counts[1]	Factor[2] lb/hr-component	C3+ Content % weight	Emission Rate	
				lb/hr	ton/yr
Valves	70	0.00992	0.25	0.0017	0.008
Pumps	0	0.00529	0.25	0	0
Flanges	175	0.00086	0.25	0.00038	0.0017
Compressors	0	0.0194	0.25	0	0
Relief Valves	5	0.0194	0.25	0.0002	0.0011
Open-Ended Lines	0	0.00441	0.25	0	0
TOTAL				0.0024	0.010

Notes:

1. Based on engineering judgment, all counts have been multiplied by a 1.2 safety factor.

2. EPA-453/R-95-017, November 1995, Table 2-4, Oil and Gas Operation Average Emission Factors.

Table B-6
GHG Emission Calculations - Natural Gas Piping Fugitives
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Source Type	Fluid State	Count	Emission Factor[1] scf/hr/comp	CO_2[2] ton/yr	Methane[3] ton/yr	Total ton/yr
FUG-NGAS	Valves	Gas/Vapor	70	0.121	0.003	1.507	
	Flanges	Gas/Vapor	175	0.017	0.001	0.529	
	Relief Valves	Gas/Vapor	5	0.193	0.000	0.172	
GHG Mass-Based Emissions					0.005	2.21	**2.2**
Global Warming Potential[4]					1	25	
CO_2e Emissions					0.005	55.21	**55.2**

Notes:

1. Emission factors from Table W-1A of 40 CFR 98 Mandatory Greenhouse Gas Reporting Rules
2. CO_2 emissions based on vol% of CO_2 in natural gas: 0.08% from natural gas analysis
3. CH_4 emissions based on vol% of CH_4 in natural gas: 97.51% from natural gas analysis
4. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

70 valves	0.121 scf gas	0.0008 scf CO2	lbmole	44 lb CO_2	8760 hr	ton =	0.003	ton/yr
	hr * valve	scf gas	385 scf	lbmole	yr	2000 lb		

Table B-7
Gaseous Fuel Venting During Turbine Shutdown/Maintenance and Small Equipment and Fugitive Component Repair/Replacement
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Location	Initial Conditions			Final Conditions			Annual Emissions		Total
	Volume[1] ft^3	Press. psig	Temp. °F	Press. psig	Temp. °F	Volume[2] scf	CO_2[3] ton/yr	CH_4[4] ton/yr	ton/yr
Turbine Fuel Line Shutdown/Maintenance	1,146	50	50	0	68	5,275	0.0002	0.11	
Small Equipment/Fugitive Component Repair/Replacement	6.7	50	50	0	68	31	0.00000	0.00062	
GHG Mass-Based Emissions							0.0002	0.1075	**0.11**
Global Warming Potential[5]							1	25	
CO_2e Emissions							0.0002	2.7	**2.7**

Notes:

1. Initial volume is calculated by multiplying the crossectional area by the length of pipe using the following formula:

$$V_i = pi * [(\text{diameter in inches}/12)/2]^2 * \text{length in feet} = ft^3$$

2. Final volume calculated using ideal gas law $[(PV/ZT)_i = (PV/ZT)_f]$. $V_f = V_i\ (P_i/P_f)\ (T_f/T_i)\ (Z_f/Z_i)$, where Z is estimated using the following equation: $Z = 0.9994 - 0.0002P + 3E\text{-}08P^2$.
3. CO_2 emissions based on vol% of CO_2 in natural gas: 0.08% from natural gas analysis
4. CH_4 emissions based on vol% of CH_4 in natural gas: 97.5% from natural gas analysis
5. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

5,275 scf Nat Gas	0.001 scf CO2	lbmole	44 lb CO_2	ton =	=	0.0002	ton/yr CO_2
yr	scf Nat Gas	385 scf	lbmole	2000 lb			

EPN FUG-NGAS BACT For Criteria Pollutants

Fugitive VOC emissions were estimated for metering, compression, and piping components in natural gas. These fugitive emissions were estimated using TCEQ recommended factors. VOC is the only criteria pollutant of concern found in natural gas; however, due to the relatively low concentration, the process fugitive emissions will not be a significant source of VOC. BACT for process fugitives typically consists of a leak detection and repair (LDAR) program intended to reduce VOC emissions. TCEQ guidance suggests that an LDAR program is not necessary to satisfy BACT when uncontrolled fugitive VOC emissions are less than 10 tpy. Because the fugitive VOC emissions from the proposed project will be less than 10 tpy, and in this instance, less than 1 tpy, an LDAR program will not result in a significant emission reduction and will not be implemented for BACT purposes. CB5 proposes that the proper design of the fuel and lube oil delivery and handling systems and the use of best operating practices satisfy the requirements of BACT for fugitive emissions from components in natural gas and lube oil service. CB5 will periodically inspect natural gas lines during routine plant operations. Any leaks will be repaired when detected for worker comfort and safety purposes.

EPN FUG-NGAS BACT For Greenhouse Gas Emissions

The proposed project will include natural gas piping components. These components are potential sources of methane and CO_2 emissions due to emissions from rotary shaft seals, connection interfaces, valve stems, and similar points. Maintenance activities include clearing of natural gas piping prior to maintenance activities.

The following technologies were identified as potential control options for piping fugitives:

- Implementation of leak detection and repair (LDAR) program using a handheld analyzer
- Implementation of audio/visual/olfactory (AVO) leak detection program.

Due to the very low volatile organic compound (VOC) content of natural gas, the project will not be subject to any VOC leak detection programs by way of its State/PSD air permit, TCEQ Chapter 115 – Control of Air Pollution from Volatile Organic Compounds, New Source Performance Standards (40 CFR Part 60), National Emission Standard for Hazardous Air Pollutants (40 CFR Part 61); or National Emission Standard for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). Therefore, any leak detection program implemented will be solely due to potential greenhouse emissions. Since the uncontrolled CO_2e emissions from the natural gas piping represent approximately 0.002% of the total project CO_2e emissions, any emission control techniques applied to the piping fugitives will provide minimal CO_2e emission reductions.

Since pipeline natural gas is odorized with a small amount of mercaptan, an AVO leak detection program for natural gas piping components is technically feasible. CB5 concludes that a daily AVO inspection program is BACT for piping components in natural gas service. BACT for maintenance activities will include minimizing the amount of natural gas released during maintenance activities. The estimated amount of CO_2e released during maintenance activities present approximately 0.00011% of the total project CO_2e emissions.

EMISSION POINT INFORMATION

EPN AUX-BLR: Auxiliary Boiler

EPN AUX-BLR Process Description

One natural gas-fired auxiliary boiler, rated at 89.1 MMBtu/hr, will be operated to support the combined cycle configuration by provide auxiliary steam; during brief periods of time between routine shutdowns/startups to allow for shorter startup duration, and during startups to provide steam to the steam turbine seals, the steam jet air ejector/hogging jets, the condenser deaerator spargers, and the HRSG steam spargers. In addition, the auxiliary boiler will provide auxiliary steam to prevent freezing of the sparging headers and the condenser deaerators if the HRSG is not operating for extended durations during cold weather conditions.

Emissions from the auxiliary boiler will be exhausted through the stack, EPN: AUX-BLR.

EPN AUX-BLR Criteria Pollutant Emission Calculation Methodology

The auxiliary boiler (EPN AUX-BLR) will fire natural gas and have a maximum heat input of 89.1 MMBtu/hr. NO_x, CO, and VOC emissions were calculated using emission specifications from the boiler vendor. PM emissions were calculated using EPA AP-42 emission factors for natural gas combustion. SO_2 emissions were based on a maximum fuel sulfur content of 1 gr/100 scf and an annual fuel sulfur content of 0.5 gr/100scf. The estimated emissions are calculated in Table A-10 for the auxiliary boiler in Appendix A.

EPN AUX-BLR Greenhouse Gas Emission Calculation Methodology

CO_2 emissions from the natural gas-fired auxiliary boiler are calculated using the emission factors (kg/MMBtu) for natural gas from Table C-1 of the Mandatory Greenhouse Gas Reporting Rules. CH_4 and N_2O emissions are calculated using the emission factors (kg/MMBtu) for natural gas from Table C-2 of the Mandatory Greenhouse Gas Reporting Rules. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules. Calculations of GHG emissions from the auxiliary boiler are presented on Table B-4.

Table A-10
Natural Gas Fired Auxiliary Boiler Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Maximum Natural Gas Firing Rate	89.1	MMBtu/hr
Maximum Natural Gas Firing Rate	87,087	scf/hr
Exhaust Gas	2,934	lbmol/hr-dry
Annual Operating Schedule	2,000	hours/year
Natural Gas Max Sulfur Content	1.0	gr/100scf
Natural Gas Annual Avg Sulfur Content	0.5	gr/100scf

Calculations:

Pollutant	Emission Factor[1]	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x[2]	0.01	lb/MMBtu	0.89	0.89
CO[2]	50	ppmvd at 3% O2	--	--
	0.037	lb/MMBtu	3.29	3.29
SO_2[3]	--	gr/100scf	0.25	0.12
$PM/PM_{10}/PM_{2.5}$[4]	7.6	lb/MMscf	0.66	0.66
VOC[4]	0.0054	lb/MMBtu	0.48	0.48

Notes:

1. These emission factors are used solely to calculate full load mass emission rates.
2. Proposed BACT limit.
3. Calculated based on fuel sulfur content and max fuel consumption.
4. EPA AP-42 Compilation of Air Pollution Emission Factors, Natural Gas Combustion Table 1.4-2 (7/98).

Sample Calculations:

NOx = (89 MMBtu/hr) * (0.01 lb/MMBtu) = 0.89 lb/hr NOx

SO2 = (87087 scf/hr) * (1 gr S/100scf) * (lb/ 7000 gr) * (lbmole S/32 lb S) * (1 lbmole SO2/ 1 lbmole S) * (64 lb SO2/lbmole SO2) = 0.25 lb/hr SO2

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
4.00	27,158.0	299	36.02

Table B-4
GHG Emission Calculations - Auxiliary Boiler
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Maximum Heat Input[1] MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[2]	GHG Mass Emissions ton/yr	Global Warming Potential[3]	CO_2e ton/yr
AUX-BLR	178,200	CO_2	116.89	10,414.7	1	10,414.7
		CH_4	2.2E-03	0.20	25	4.9
		N_2O	2.2E-04	0.020	298	5.9
		TOTAL		**10,414.9**		**10,425.5**

Notes:

1. Annual fuel use and heating value of natural gas from Table A-9 State/PSD air permit application.
2. Factors based on Table C-1 and C-2 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

EPN AUX-BLR Criteria Pollutant BACT

The proposed auxiliary boiler will have a heat input capacity of 89.1 MMBtu/hr and be fired on pipeline-quality natural gas. The boiler will be capable of full-year operation. CB5 is proposing a maximum NO_x emission rate of 0.01 lb/MMBtu based on the use of low-NO_x burners and proper operation and maintenance of the boiler. A review of the RBLC listing for natural gas-fired boilers with a heat input of between 10 and 100 MMBtu/hr and located in an ozone attainment area (see Appendix B) shows that the NO_x emission rate proposed by CB5 is consistent with the lowest permit limits. CB5 also is proposing a maximum CO emission rate of 0.037 lb/MMBtu (50 ppmvd @ 3% O_2) based the proper operation and maintenance of the boiler. A review of the RBLC listing for natural gas-fired boilers with a heat input of between 10 and 100 MMBtu/hr shows that the CO emission rate proposed by CB5 is consistent with the lowest permit limits, with one exception. The CO limit for the Interstate Power & Light Marshalltown project auxiliary boiler was significantly lower than the emission rate proposed by CB5; however, the Marshalltown unit will be equipped with an oxidation catalyst. The proposed maximum NO_x and CO emission rates for the project's auxiliary boiler comply with TCEQ BACT guidance for NO_x and CO emissions from natural gas-fired boilers (see *TCEQ Combustion Sources – Current Tier I BACT Required* Boilers [June 4, 2019]). Emissions of CO, VOC, particulate matter, and sulfur oxides will be reduced through good combustion practices and firing pipeline quality natural gas. CB5 proposes that the use of low-NO_x burners, firing of pipeline quality natural gas, and the proper operation and maintenance of the units constitute Tier 1 BACT for the auxiliary boilers.

CB5 will demonstrate that BACT is achieved through the keeping of records of the auxiliary boiler operations and maintenance and keeping records of valid purchase contracts tariff sheets or transportation contracts for the fuel that show its sulfur content.

EPN AUX-BLR Greenhouse Gas Emissions BACT

The following technologies were identified as potential control options for boilers:

- Use of low carbon fuels
- Use of good operating and maintenance practices
- Energy efficient design

The auxiliary boiler will utilize natural gas which is the lowest carbon fuel available at the Cedar Bayou Station. Therefore, formation of CO_2 from combustion of the fuel will be minimized. Good operating and maintenance practices for the boiler include following the manufacturer's recommended operating and maintenance procedures; maintaining good fuel mixing in the combustion zone; and maintaining the proper air/fuel ratio so that sufficient oxygen is provided to provide complete combustion of the fuel while at the same time preventing introduction of more air than is necessary into the boiler. The boilers' energy efficient design includes insulation to retain heat within the boiler and computerized process control systems that will optimize the fuel/air mixture and limit excess air in the boilers. CB5 concludes that the use of natural gas as a low carbon fuel; good operating and maintenance practices and the energy efficient design are selected as BACT for the auxiliary boiler.

EMISSION POINT INFORMATION

EPN GAS-HTR: Gas Heater

EPN GAS-HTR Process Description

One natural gas-fired auxiliary fuel gas heater, rated at 9.7 MMBtu/hr, will be operated to warm up the incoming natural gas fuel to prevent freezing of the gas regulating valves under certain gas operating conditions and to insure moisture does not form in the inlet gas lines. The heater will fire natural gas use ultra-low NOx burners to control NOx emissions. Emissions from the fuel gas heater will be exhausted through the stack, EPN: GAS-HTR.

EPN GAS-HTR Criteria Pollutant Emission Calculation Methodology

NO_x, CO, and VOC emissions were calculated using emission specifications from the heater vendor. PM emissions were calculated using EPA AP-42 emission factors for natural gas combustion. SO_2 emissions were based on a maximum fuel sulfur content of 1 gr/100 scf and an annual fuel sulfur content of 0.5 gr/100scf. The estimated emissions are calculated in Table A-11 for the natural gas heater in Appendix A.

EPN GAS-HTR Greenhouse Gas Emission Calculation Methodology

CO_2 emissions from the natural gas-fired heater are calculated using the emission factors (kg/MMBtu) for natural gas from Table C-1 of the Mandatory Greenhouse Gas Reporting Rules. CH_4 and N_2O emissions are calculated using the emission factors (kg/MMBtu) for natural gas from Table C-2 of the Mandatory Greenhouse Gas Reporting Rules. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules. Calculations of GHG emissions from the heater are presented in Table B-5.

Table A-11
Natural Gas Fired Dewpoint Heater Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Maximum Natural Gas Firing Rate	9.7	MMBtu/hr
Maximum Natural Gas Hourly Firing Rate	9,454	scf/hr
Maximum Natural Gas Annual Firing Rate	82,818,713	scf/yr
Hours of Operation	8,760	hours/yr
Natural Gas Max Sulfur Content	1.0	gr/100scf
Natural Gas Annual Average Sulfur Content	0.5	gr/100scf

Calculations:

Pollutant	Emission Factor[1]	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x[1]	0.012	lb/MMBtu	0.12	0.51
CO[1]	0.037	lb/MMBtu	0.35890	1.57
VOC[1]	0.003	lb/MMBtu	0.03298	0.14
$PM/PM_{10}/PM_{2.5}$[1]	0.005	lb/MMBtu	0.04850	0.21
SO_2[2]			0.027	0.06

Notes:
1. Gas Heater Performance Data.
2. Calculated based on fuel sulfur content and max fuel consumption.

Sample Calculations:

NOx = (9.7 MMBtu/hr) * (0.012 lb/MMBtu) = 0.12 lb/hr NOx

SO2 = (9454 scf/hr)*(1 gr S/100scf)*(lb/7000 gr)*(lbmole S/32.065 lb S)*(1 lbmole SO2/1 lbmole S)*(64.064 lb SO2/lbmole SO2) = 0.03 lb/hr SO2

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
2.00	4,423.0	250	23.46

Table B-5
GHG Emission Calculations - Natural Gas Heater
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Maximum Heat Input[1] MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[2]	GHG Mass Emissions ton/yr	Global Warming Potential[3]	CO_2e ton/yr
GAS-HTR	84,972	CO_2	116.89	4,966.1	1	4,966.1
		CH_4	2.2E-03	0.09	25	2.3
		N_2O	2.2E-04	0.009	298	2.8
			Total:	**4,966.2**		**4,971.2**

Notes:

1. Annual fuel use and heating value of natural gas from Table A-9 State/PSD air permit application.
2. Factors based on Table C-1 and C-2 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

EPN GAS-HTR Criteria Pollutant BACT

Based on vendor data for emissions, NOx emissions will be limited to 0.012 lb/MMBtu and CO emissions will be limited to 50 ppmvd @ 3% O_2 (0.037 lb/MMBtu). Emissions of VOC, particulate matter, and sulfur compounds will be reduced through good combustion practices and firing sweet natural gas. CB5 proposes that these measures and the proper operation and maintenance of the heater constitutes BACT for the Dew Point Heater.

EPN GAS-HTR Greenhouse Gas Emissions BACT

The following technologies were identified as potential control options for the heater:

- Use of low carbon fuels;
- Use of good operating and maintenance practices; and
- Energy efficient design.

The heater will utilize natural gas which is the lowest carbon fuel available at the Cedar Bayou Plant. Therefore, formation of CO_2 from combustion of the fuel will be minimized. Good operating and maintenance practices for the heater include following the manufacturer's recommended operating and maintenance procedures; maintaining good fuel mixing in the combustion zone; and maintaining the proper air-to-fuel ratio so that sufficient oxygen is provided to provide complete combustion of the fuel while at the same time preventing introduction of more air than is necessary into the unit. The energy efficient design of the heater includes insulation to retain heat within the unit and a computerized process control system that will optimize the fuel/air mixture. CB5 concludes that the use of natural gas as a low carbon fuel; good operating and maintenance practices and the energy efficient design are selected as BACT for the gas heater.

EMISSION POINT INFORMATION

EPN EMGEN: Emergency Diesel Generator and EPN DSL-TNK: Emergency Diesel Generator Tank

EPN EMGEN and DSL-TNK Process Description

One diesel engine-driven emergency generator will be installed to provide electric power to essential service users during emergencies. Emissions from the emergency engine will be exhausted through stack EPN: EMGEN. The combined cycle option will utilize a 2,000 kW emergency and the simple cycle option will utilize a 750 kW emergency generator. A 750-gallon diesel storage tank is included within the emergency generator housing. Emissions from this diesel storage tank will be exhausted through vent EPN: DSL-TNK.

EPN EMGEN and DSL-TNK Criteria Pollutant Emission Calculation Methodology

Operation of the emergency generator will be limited to 100 hours per year for testing and maintenance purposes. The exhaust emissions from the diesel fuel-fired equipment were calculated using vendor emission factors. SO_2 emissions are based on firing with ultra-low sulfur diesel with a maximum sulfur content of 15 parts per million by weight. The estimated emissions are calculated in Table A-12A for the 2,000 kW engine and Table A-12B for the 750 kW engine. A diesel storage tank (EPN: DSL-TNK) are included within the generator and pump housings. The estimated emissions from the diesel storage tank are calculated in Table A-13 of Appendix A.

EPN EMGEN Greenhouse Gas Emissions Calculation Methodology

CO_2 emissions from the diesel-fired emergency generator are calculated using the emission factors (kg/MMBtu) for Distillate Fuel Oil No. 2 from Table C-1 of the Mandatory Greenhouse Gas Reporting Rules. CH_4 and N_2O emissions from the diesel-fired engines are calculated using the emission factors (kg/MMBtu) for Petroleum from Table C-2 of the Mandatory Greenhouse Gas Reporting Rules. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules. Calculations of GHG emissions from the combined cycle option emergency engine are presented on Table B-8A. Calculations of GHG emissions from the simple cycle option emergency engine are presented on Table B-8B.

Table A-12A
Diesel-Fired Emergency Generator (Combined Cycle Option) - Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Max Daily Operating Schedule	1	hours/day
Annual Operating Schedule	100	hours/year
Power Rating	2,937	bhp
Power Rating	2,000	kW
Fuel Consumption	138.00	gal/hr
Density of No. 2 Fuel Oil:	7.67	lb/gal
Max Fuel Consumption	1058.9	lb fuel/hr
Heating Value of No. 2 Fuel Oil:	0.138	MMBtu/gal
Max Heat Input:	19.04	MMBtu/hr
Maximum Sulfur Content (S)	15.00	ppmw

Calculations:

Emission Rate = Emission Factor * Power rating * hours of operation / averaging period

Pollutant	Emission	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x [1]	6.56	g/HP-hr	42.48	2.12
CO [1]	0.54	g/HP-hr	3.50	0.17
VOC[1]	0.14	g/HP-hr	0.91	0.05
PM/PM_{10} [1]	0.04	g/HP-hr	0.26	0.01
SO_2 [2]	Mass Balance		0.0318	0.0016

Sample Calculations:

NO_x lb/hr = 6.56 g/HP-hr * 2,937 bhp * lb/453.6g = 42.48 lb/hr

CO lb/hr = 0.54 g/HP-hr * 2,937 bhp * lb/453.6g = 3.50 lb/hr

VOC lb/hr = 0.14 g/HP-hr * 2,937 bhp * lb/453.6g = 0.91 lb/hr

PM lb/hr = 0.04 g/HP-hr * 2,937 bhp * lb/453.6g = 0.26 lb/hr

SO_2 lb/hr = 1,059 lb fuel/hr * 15 lb S/1,000,000 lb fuel * lbmol S/32 lb S * 64 lb SO2/lbmol SO2

SO_2 lb/hr = 0.032 lb/hr

Notes:

1. Manufacturer specifications
2. Calculated based on maximum fuel sulfur content and max fuel consumption.

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
1.00	15,292.8	752.1	324.52

Table A-12B
Diesel-Fired Emergency Generator (Simple Cycle Option) - Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Max Daily Operating Schedule	1	hours/day
Annual Operating Schedule	100	hours/year
Power Rating	1,112	bhp
Power Rating	750	kW
Fuel Consumption	54.3	gal/hr
Density of No. 2 Fuel Oil	7.67	lb/gal
Max Fuel Consumption	416.6	lb fuel/hr
Heating Value of No. 2 Fuel Oil	0.138	MMBtu/gal
Max Heat Input	7.49	MMBtu/hr
Maximum Sulfur Content (S)	15.00	ppmw

Calculations:

Emission Rate = Emission Factor * Power rating * hours of operation / averaging period

Pollutant	Emission	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x [1]	5.85	g/HP-hr	14.34	0.72
CO [1]	0.41	g/HP-hr	1.01	0.05
VOC[1]	0.11	g/HP-hr	0.27	0.01
PM/PM_{10} [1]	0.06	g/HP-hr	0.15	0.007
SO_2 [2]	Mass Balance		0.0125	0.0006

Sample Calculations:

NO_x lb/hr =	5.85 g/HP-hr * 1,112 bhp * lb/453.6g =	14.34	lb/hr
CO lb/hr =	0.41 g/HP-hr * 1,112 bhp * lb/453.6g =	1.01	lb/hr
VOC lb/hr =	0.11 g/HP-hr * 1,112 bhp * lb/453.6g =	0.27	lb/hr
PM lb/hr =	0.06 g/HP-hr * 1,112 bhp * lb/453.6g =	0.15	lb/hr
SO_2 lb/hr =	417 lb fuel/hr * 15 lb S/1,000,000 lb fuel * lbmol S/32 lb S * 64 lb SO2/lbmol SO2		
SO_2 lb/hr =	0.012 lb/hr		

Notes:
1. Manufacturer specifications
2. Calculated based on maximum fuel sulfur content and max fuel consumption.

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
0.50	6,028.4	847.3	511.71

Table A-13
Diesel Fuel Tank Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Reference: Compilation of Air Pollutant Emission Factors (AP-42)
5th Edition, January 1995, Section 7.1, Liquid Storage Tanks
Volume I: Stationary Point and Area Sources
U.S. Environmental Protection Agency Office of Air and Radiation, Office of Air Quality Planning and Standards
TNRCC Technical Guidance Package - Storage Tanks - February 2001

Assumptions:

Emergency Diesel Generator Tank (DSL-TNK) is a horizontal fixed roof tank
1 - Horizontal roof tank
2 - Maximum Fill Rate (gal/hr) 750
3 - Tank capacity (gal) 750
4 - Maximum annual turnovers= 9.33
5 - Tank diameter (ft) 4
6 - Tank length (ft) 6

Standing Losses from a Fixed Roof Tank (L_S):

Parameter Input:

Tank No.	Tank Name	M_V (lb/lbmol)	P_A (psia)	P_{VA} (psia)	D or Deff (feet)	HVO (feet)	T_{AX} (°R)	T_{AN} (°R)	alpha (unitless)	I (Btu/ft^2)	P_{BP} (psig)	P_{BV} (psig)
DSL-TNK	Emergency Diesel Generator Tank	130	14.70	0.01	5.53	1.57	536.57	514.67	0.17	1468.00	0.03	-0.03

Deff = effective diameter for horizontal tanks = sqrt((length x diameter)/0.785)
Hvo = One half of actual diameter for horizontal roof tanks.

Intermediate Calculations:

Tank No.	Tank Name	T_{AA} (°R)	T_B (°R)	T_{LA} (°R)	dT_A (°R)	dP_B (psia)	dT_V (°R)	T_{LX} (°R)	T_{LN} (°R)	P_{VX} (psia)	P_{VN} (psia)	dP_V (psia)
DSL-TNK	Emergency Diesel Generator Tank	525.62	525.64	527.6	21.9	0.06	22.8	533.3	521.9	0.0100	0.0070	0.003

Average Annual Standing Losses (L_S):

Tank No.	Chemical Name	V_V (ft^3)	W_V (lb/ft^3)	K_E (unitless)	K_S (unitless)	L_S (lb/yr)	L_S (ton/yr)	L_S (lb/hr)
DSL-TNK	Diesel	38	0.0002	0.041	0.999	0.11	0.00005	0.000012

Average Annual Working Losses from a Fixed Roof Tank

L_W = $(0.001)(M_V)(P_{VA})(Q)(K_N)(K_P)$ (Equation 1-29)

Where:
L_W = Storage Tank Working Losses, lb/year
M_V = Molecular Weight of Vapor in Storage Tank, lb/lb-mole
P_{VA} = True Vapor Pressure at Daily Average Liquid Surface Temperature, psia
P_{VAM} = True Vapor Pressure at Daily Maximum Liquid Surface Temperature, psia (used for max. hourly calculations)
Q = Annual Net Throughput, barrels/yr
K_N = Turnover Factor from AP-42 Figure 12.3-6, dimensionless
K_P = Product Factor, dimensionless. Kc equals 1.0 for liquids except crude oil.

Tank No.	Chemical Name	M_V (lb/lb-mol)	P_{VA} (psia)	P_{VAM} (psia)	Q (barrels/yr)	K_N (unitless)	K_P (unitless)
DSL-TNK	Diesel	130.00	0.01	0.010	167	1.00	1.0

Average Annual and Maximum Annual Working Losses (L_W and L_{WMAX}):

Tank No.	Chemical Name	L_W (lb/year)	L_W (ton/year)	L_{WMAX}* (lb/year)
DSL-TNK	Diesel	0.18	0.0001	0.22

*L_{WMAX} assumes a K_N value of 1, per TCEQ guidance document dated February 1995.

Table A-13
Diesel Fuel Tank Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Maximum Short-Term Working Losses calculated according to the TNRCC Guidance Document dated February 1995:

L_{WMAXH} = $((L_W)(FR_m))/((TO)(TC_g))$

Where:

L_{WMAXH} = Maximum Hourly Working Loss, lb/hr
L_{WMAX} = Maximum Working Losses from AP-42 , lb/year
FR_m = Maximum Filling Rate, gallons/hour
TO = Turnovers per Year, dimensionless
TCg = Tank Working Capacity , gallons

Maximum Hourly Working Losses per tank calculated according to the TNRCC (L_{WMAXH}):

Tank No.	Chemical Name	L_{WMAX} (lb/year)	FR_m (gal/hr)	TO (unitless)	TC_g (gal)	L_{WMAXH} (lb/hr)
DSL-TNK	Diesel	0.22	750	9	750	0.023

7.1.3.1 Total Losses From Fixed Roof Tanks:

L_T = $L_S + L_W$ **(Equation 1-1)**

Where:

L_T = Total losses, lb/yr
L_S = Standing Storage Losses, lb/yr
L_W = Working Losses, lb/yr

Tank No.	Chemical Name	Maximum Standing Loss (L_S) lb/hr	Average Standing Loss (L_S) ton/yr	Maximum Working Loss (L_W) lb/hr	Average Working Loss (L_W) tons/yr	Total Maximum Hourly Emissions (L_T) lb/hr	Total Average Annual Emissions (L_T) tons/yr
DSL-TNK	Diesel	0.00001	0.0001	0.023	0.0001	0.023	0.0001

Table B-8A
GHG Emission Calculations - Diesel Combustion in Emergency Engines (Combined Cycle Option)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Annual Operating Schedule:	100	hours/year
Power Rating:	2,937	hp
Max Hourly Fuel Use:	138.0	gal/hr
Heating Value of No. 2 Fuel Oil:	0.138	MMBtu/gal
Max Hourly Heat Input:	19.0	MMBtu/hr
Annual Heat Input:	1,904.4	MMBtu/yr

EPN	Heat Input (MMBtu/yr)	Pollutant	Emission Factor (kg/MMBtu)[2]	GHG Mass Emissions (tpy)	Global Warming Potential[3]	CO_2e (tpy)
EMGEN	1904.4	CO_2	73.96	155.3	1	155.3
		CH_4	3.0E-03	0.0063	25	0.2
		N_2O	6.0E-04	0.0013	298	0.4
			Total:	**155.26**		**155.8**

Notes:

1. Default high heat value based on Table C-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
2. GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

Annual Emission Rate = Annual Heat Input X Emission Factor X 2.2 lbs/kg X Global Warming Potential / 2,000 lbs/ton

Table B-8B
GHG Emission Calculations - Diesel Combustion in Emergency Engines (Simple Cycle Option)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Annual Operating Schedule:	100	hours/year
Power Rating:	1,112	hp
Max Hourly Fuel Use:	54.3	gal/hr
Heating Value of No. 2 Fuel Oil:	0.138	MMBtu/gal
Max Hourly Heat Input:	7.5	MMBtu/hr
Annual Heat Input:	749.3	MMBtu/yr

EPN	Heat Input (MMBtu/yr)	Pollutant	Emission Factor (kg/MMBtu)[2]	GHG Mass Emissions (tpy)	Global Warming Potential[3]	CO_2e (tpy)
EMGEN	749.3	CO_2	73.96	61.1	1	61.1
		CH_4	3.0E-03	0.0025	25	0.1
		N_2O	6.0E-04	0.0005	298	0.1
			Total:	**61.09**		**61.3**

Notes:

1. Default high heat value based on Table C-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
2. GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

Annual Emission Rate = Annual Heat Input X Emission Factor X 2.2 lbs/kg X Global Warming Potential / 2,000 lbs/ton

EPN EMGEN Criteria Pollutant BACT

BACT for the diesel-fired emergency generator engine will be achieved through the installation of a engine that meet the vendor certification requirements of 40 CFR 60, Subpart IIII, through the proper operation and maintenance of the engines, and through the burning of diesel fuels meeting the sulfur requirements of 40 CFR 80.510(c).

EPN DSL-TNK Criteria Pollutant BACT

TCEQ Tier I BACT for storage tanks with a capacity less than 25,000 gallons or containing a material with a true vapor pressure of less than 0.5 psia is listed as fixed roof tank with submerged fill. Uninsulated exterior surfaces exposed to the sun shall be white or aluminum. The diesel storage tank is provided as part of the emergency engine installation. Tanks that are smaller than 1,000 gallons typically are not constructed with a submerged fill pipe. There are no NSPS or Chapter 115 requirements that apply to the diesel storage tank because the storage capacity is less than 1,000 gallons. Therefore, CB5 proposes that BACT is satisfied for the diesel tank based upon the very low vapor pressure of diesel (0.01 psia) and the size of the tank (750 gallons).

EPN EMGEN Greenhouse Gas Emissions BACT

The emergency generator will provide electricity to the facility in case of power failure. The following technologies were identified as potential control options for emergency engines:

- Use of low carbon fuel
- Use of good operating and maintenance practices
- Low annual capacity factor.

Engine options include engines powered with electricity, natural gas, or liquid fuel, such as gasoline or fuel oil. Good operating and maintenance practices for the engines include the following:

- Operating with recommended fuel to air ratio recommended by the manufacturer and
- Appropriate maintenance of equipment, such as periodic readiness testing.

Each emergency engine will be limited to 100 hours of non-emergency operation per year for purposes of maintenance checks and readiness testing.

The purpose of the emergency engine is to provide a power source during emergencies, which includes outages of the combustion turbine, natural gas supply outages, and natural disasters, such as floods and hurricanes. As such, the engine must be available during emergencies. Electricity and natural gas may not be available during an emergency and therefore cannot be used as an energy source for the emergency engines.

The engine must be powered by a liquid fuel that can be stored on-site in a tank and supplied to the engines on demand, such as gasoline or diesel fuels. The default CO_2 emission factors for gasoline and diesel are very similar, 70.22 kg/MMBtu for gasoline and 73.96 kg/MMBtu for diesel. Diesel fuel has a much lower volatility than gasoline and can be stored for longer periods of time. Therefore, diesel is typically the chosen fuel for emergency engines. Because of the need to store the emergency engine fuel on-site and the ability to store diesel for longer periods of time than gasoline, it is technically infeasible to utilize a lower carbon fuel than diesel.

The use of good operating and maintenance practices is technically feasible for the emergency engines. Also, a low annual capacity factor for the engines is technically feasible since the engine will only be operated either for readiness testing or for actual emergencies. As a result of this analysis, appropriate operation of the engine through proper fuel to air ratios and maintenance based on recommended readiness testing and low annual hours of operation are selected as BACT for the proposed engines.

EMISSION POINT INFORMATION

EPN C-TOWER1: Cooling Tower

EPN C-TOWER1 Process Description

A condenser/cooling tower arrangement will cool steam exhausted from the steam turbine. The condenser will be a surface contact heat exchanger and the cooling tower will be a multi-cell, motor-driven, mechanical draft, crossflow tower with film fill. The cooling tower will have a 161,154 gallon per minute circulation rate and will have a design drift rate of 0.0005%. Emissions from the cooling tower are identified as EPN: C-TOWER1.

EPN C-TOWER1 Emission Calculation Methodology

Emissions from the cooling tower were calculated based on the amount of water that may be entrained into the air stream and carried away from the tower as drift. While the larger drift particles will settle very close to the cooling towers, PM_{10} emissions will be generated when the drift droplets evaporate and leave behind fine particulate matter formed by crystallization of total dissolved solids (TDS).

PM emissions from the cooling tower are based on a total dissolved solids concentration at blowdown of 60,000 milligrams per liter (mg/l). A drift rate of 0.0005% was used in the calculation based on the design of the cooling tower mist eliminator. The PM_{10} and $PM_{2.5}$ fractions of the emissions were calculated using a methodology published by Reisman and Frisbie.

The cooling tower emission calculations and the calculation of PM_{10} and $PM_{2.5}$ fractions of cooling tower emissions is presented in Table A-9.

Table A-9
Cooling Tower PM Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Cooling Tower PM Calculation Variables:

Variable	Value	Units	Reference
Drift Eliminator Efficiency	0.0005%	percent	TCEQ BACT (2011)
Cooling Water Circulation Rate	161,154	gallons/min	Design Data
Annual Operation	8,760	hours/yr	Design Data
Total Dissolved Solids (TDS) concentration	60,000	mg/l	Design Data

Percentage of PM that is PM_{10}	0.31%	From linear regression indicated on chart below with x = 10 µm and y (calculated) = % mass smaller than 10 µm
Percentage of PM that is $PM_{2.5}$	0.00%	From linear regression indicated on chart below with x = 10 µm and y (calculated) = % mass smaller than 2.5 µm

Pollutant	Cooling Tower Emissions	
	lb/hr	tpy
PM	24.21	106.03
PM_{10}	0.08	0.33
$PM_{2.5}$ [1]	0.001	0.001

Notes:

1. Note that the Reisman and Frisbie calculation methodology shows zero $PM_{2.5}$ emissions for cooling tower water with a TDS level of 60,000 mg/l. For conservative purposes, a $PM_{2.5}$ emission rate of 0.001 lb/hr and 0.001 ton/yr will be assumed.

Sample Calculations:

PM (lb/hr) = water circulation (gal/min) * drift rate (fraction) * TDS (mg/l) * 1 l/0.264172 gal* 1 g/1000 mg * 1 lb/453.6 g * 60 min/hr

PM10 (lb/hr) = lb/hr PM emission rate x PM10 %

PM2.5 (lb/hr) = lb/hr PM emission rate x PM2.5 %

Constants:

Field	Value	Units
TDS Density (assumed to be equal to that of NaCl)	2.165	g/cm^3
	2.17E+06	g/m^3
Water Density	8.34	lb/gal (including TDS)
	1.00	g/cm^3
	1.0E+06	g/m^3

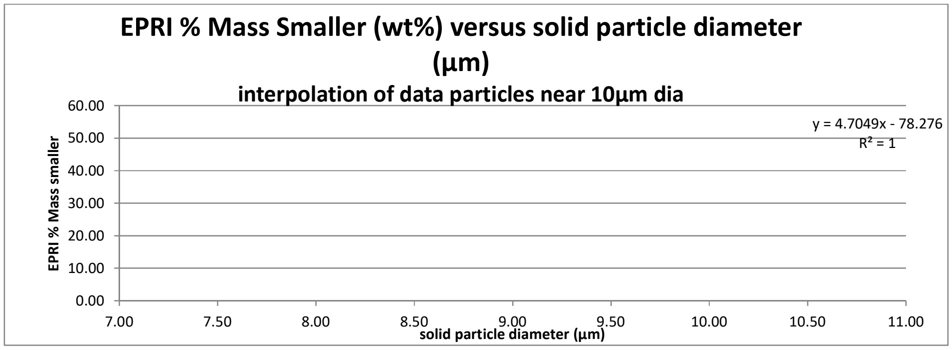
Particle Size Distribution Calculations for PM_{10}/PM Ratio [1]:

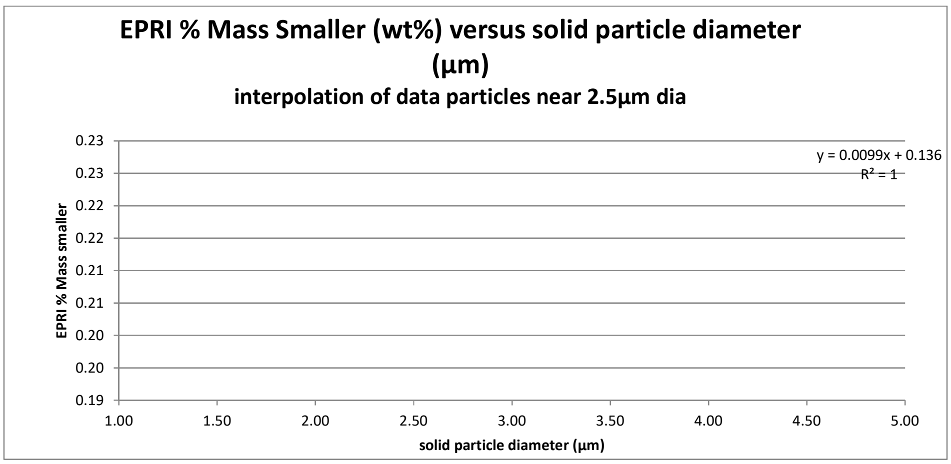
EPRI Droplet Diameter (µm) [1]	EPRI Droplet Diameter (m) [2]	Droplet Volume (m^3) [3]	Solid Particle Mass (g) [4]	Solid Particle Volume (m^3) [5]	Solid Particle Diameter (m) [6]	Solid Particle Diameter (µm) [2]	EPRI % Mass Smaller (wt%) [1]
10	1.00E-05	5.23E-16	3.14E-11	1.45E-17	3.02E-06	3.02	0.00
20	2.00E-05	4.19E-15	2.51E-10	1.16E-16	6.05E-06	6.05	0.20
30	3.00E-05	1.41E-14	8.47E-10	3.91E-16	9.07E-06	9.07	0.23
40	4.00E-05	3.35E-14	2.01E-09	9.27E-16	1.21E-05	12.10	0.51
50	5.00E-05	6.54E-14	3.92E-09	1.81E-15	1.51E-05	15.12	1.82
60	6.00E-05	1.13E-13	6.77E-09	3.13E-15	1.81E-05	18.15	5.70
70	7.00E-05	1.80E-13	1.08E-08	4.97E-15	2.12E-05	21.17	21.35
90	9.00E-05	3.82E-13	2.29E-08	1.06E-14	2.72E-05	27.22	49.81
110	1.10E-04	6.97E-13	4.17E-08	1.93E-14	3.33E-05	33.27	70.51
130	1.30E-04	1.15E-12	6.89E-08	3.18E-14	3.93E-05	39.32	82.02
150	1.50E-04	1.77E-12	1.06E-07	4.89E-14	4.54E-05	45.37	88.01
180	1.80E-04	3.05E-12	1.83E-07	8.45E-14	5.44E-05	54.45	91.03
210	2.10E-04	4.85E-12	2.90E-07	1.34E-13	6.35E-05	63.52	92.47
240	2.40E-04	7.23E-12	4.34E-07	2.00E-13	7.26E-05	72.60	94.09
270	2.70E-04	1.03E-11	6.17E-07	2.85E-13	8.17E-05	81.67	94.69
300	3.00E-04	1.41E-11	8.47E-07	3.91E-13	9.07E-05	90.75	96.29
350	3.50E-04	2.24E-11	1.34E-06	6.21E-13	1.06E-04	105.87	97.01
400	4.00E-04	3.35E-11	2.01E-06	9.27E-13	1.21E-04	121.00	98.34
450	4.50E-04	4.77E-11	2.86E-06	1.32E-12	1.36E-04	136.12	99.07
500	5.00E-04	6.54E-11	3.92E-06	1.81E-12	1.51E-04	151.25	99.07
600	6.00E-04	1.13E-10	6.77E-06	3.13E-12	1.81E-04	181.49	100

Notes:

1. Methodology and EPRI droplet and mass distribution from Reisman and Frisbie *Calculating Realistic PM10 emissions from Cooling Towers* (2000).
EPRI data based on test conducted with Brentwood Industries (drift eliminator manufacturer) in Electric Power Research Institute Houston, TX test facility in 1988.
2. Converted using 1 m = 10^6 µm.
3. Calculated as: droplet volume (m^3) = π * (4/3) * (Diameter / 2)^3
4. Solid particle mass (g) = droplet volume (m^3) * water density (g/m^3) * TDS (ppm) / 10^6
5. Solid particle volume (m^3) = solid particle mass (g) / solid particle density (g/m^3). Solid particle density = TDS density, taken as NaCl density.
6. Diameter solid particle (m) = (solid particle volume (m^3) / (4/3) * π)^(1/3) * 2

Calculations for diameter of 1.00E-05 m
Droplet Volume (m^3) = π x (4/3) x (0.00001 /2)^3 = 5.23E-16 (m^3)
Solid Particle Mass (g) = 5.23E-16 (m^3) x 0.998718336(g/cm3) x 60000 (ppm) = 3.14E-11 (g)
Solid Particle Volume (m^3) =3.14E-11 (g) / 2165000 (g/m3) = 1.45E-17 (m^3)
Diameter Solid Particle (m) = 1.45E-17 (m^3) / (4/3) x π)^(1/3) x 2 = 3.02E-06 (m)





Notes:

1. The emission calculations included above are provided in support of the basis for estimating the total emissions for this type of activity and are not representations of specific limits for each source. These emission calculations are not to be considered enforceable representations of a specific plant or activity condition under 116.116(a) including but not limited to volume, concentration, duration, and frequency of individual activities. The compliance basis for these activities is based on the total emissions as shown on the Table 1a.

EPN C-TOWER1 Criteria Pollutant BACT

Water droplets are formed in the cooling tower as the hot water is passed downward through the contact media or fill, and air is drawn upward and countercurrent to the water flow. Some of these droplets become entrained in the air stream and exit the cooling towers with the air. These droplets are referred to as drift. The dissolved solids in the water result in atmospheric particulate matter from the droplets that do not fall out prior to evaporation of the water. PM emissions from drift can be minimized by limiting either the amount of drift or the level of dissolved solids in the water. Dissolved solids build up in the circulating water as a result of the evaporation that occurs in the cooling tower and must be limited to prevent scaling problems in the cooling towers. This is done by blowing down a portion of the water and adding makeup water that is low in dissolved solids. Water availability and cost considerations impose limits on the amount of makeup water that can be used. These factors limit the degree to which particulate emissions from drift can be controlled by reducing the total dissolved solids (TDS) concentration in the water. Limiting the drift rate, expressed as a percentage of the circulating water rate, also controls the PM emissions from a cooling tower. Drift mist eliminators of varying efficiencies are typically available and included with most cooling tower packages. The design of the cooling tower itself also affects the drift rate. A search of the RBLC database did not identify any additional technologies to control particulate from cooling towers. The drift rate limits in the RBLC database range from 0.0005% to 0.008%.

Both limiting of the TDS concentration and designing the cooling towers to minimize the drift rate are proposed as BACT for PM emissions. The design, which will include drift eliminators, will limit drift to 0.0005% of the recirculation rate.

The proposed BACT for the control of particulate emissions from the cooling towers complies with TCEQ's Tier I BACT guidance (see *TCEQ Chemical Sources – Current Tier I BACT Required* Cooling Towers [June 4, 2019]). Emissions of particulate matter will be reduced through use of drift eliminators with drift less than 0.001%. CB5 proposes that the use of drift eliminator designed to reduce drift to less than 0.0005% as BACT for the Cooling Towers.

CB5 will demonstrate that BACT is achieved through the keeping of records of the measured TDS concentration and of the circulating water flow rate.

EMISSION POINT INFORMATION

EPN FUG-MSS: Maintenance Activities

EPN FUG-MSS Process Description

The new turbine at the Cedar Bayou Station will perform the following planned maintenance activities that may generate fugitive emissions:

- Air intake filter change-outs
- Catalyst management and handling
- Inspection, repair, replacement, adjusting, testing, and calibration of analytical equipment and process instrumentation including site glasses, meters, gauges
- Continuous emissions monitoring system (CEMS) calibrations
- Management of sludge
- Small equipment maintenance – Low vapor pressure VOC
- Small equipment maintenance – Ammonia

Emissions from the planned maintenance activities associated with the new simple or combined cycle operation are identified as EPN: FUG-MSS.

EPN FUG-MSS Criteria Pollutant Emission Calculation Methodology

The following maintenance-related activities that are part of the project that will potentially produce emissions are listed below:

- Combustion turbine optimization
- Online turbine washing
- Air intake filter change-out
- Inspection, repair, replacement, adjusting, testing, and calibration of analytical equipment and process instruments including site glasses, meters, and gauges
- CEMS calibration
- Management of sludge
- Catalyst handling/maintenance
- Boiler tube cleaning
- Small equipment maintenance, ammonia equipment
- Small equipment maintenance, low-VOC vapor pressure equipment

Maximum hourly and total annual emissions associated with combustion turbine optimization, tuning and testing, a non-inherently low emitting (non-ILE) activity, and online turbine washing, an ILE activity, are no higher than the emission rates requested in this application for normal or planned SUSD operations and are already included in the emission rates estimated for the turbine EPN: CBY51.

Emissions from each of the other categories of maintenance activities that are associated with operation of the proposed turbines in combined cycle mode, all of which are ILE, are summarized on Table A-18 and are calculated in Tables A-19 through A-26 of Appendix A.

Table 18
Maintenance Emissions Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Hourly Emissions

Activity	Calc. Table	Estimated Emissions (lb/hr)						
		NOx	CO	PM	PM_{10}	$PM_{2.5}$	VOC	NH_3
Air Intake Filter Maintenance	A-19			1.67E-03	7.92E-04	1.20E-04		
CEMS Calibration	A-20	1.19E-04	7.27E-05					
Analytical Equipment	A-21						2.71E-03	
Sludge Maintenance	A-22						8.51E-03	
Catalyst Handling/Maintenance Annual	A-23			5.13E-02	5.13E-02	5.13E-02		
Boiler Tube Cleaning	A-24						3.40E-02	
Small Equipment Maintenance – NH_3	A-25							3.58E-03
Small Equipment Maintenance – Low VP	A-26						7.05E-02	
	TOTALS	**1.19E-04**	**7.27E-05**	**5.29E-02**	**5.21E-02**	**5.14E-02**	**1.16E-01**	**3.58E-03**

Annual Emissions

Activity	Calc. Table	Estimated Emissions (tons/yr)						
		NOx	CO	PM	PM_{10}	$PM_{2.5}$	VOC	NH_3
Air Intake Filter Maintenance	A-19			5.02E-06	2.38E-06	3.60E-07		
CEMS Calibration	A-20	1.19E-06	7.27E-07					
Analytical Equipment	A-21						8.70E-06	
Sludge Maintenance	A-22						1.66E-03	
Catalyst Handling/Maintenance Annual	A-23			1.23E-03	1.23E-03	1.23E-03		
Boiler Tube Cleaning	A-24						6.79E-05	
Small Equipment Maintenance – NH_3	A-25							8.94E-06
Small Equipment Maintenance – Low VP	A-26						9.24E-04	
	TOTALS	**1.19E-06**	**7.27E-07**	**1.24E-03**	**1.23E-03**	**1.23E-03**	**2.66E-03**	**8.94E-06**

Table A-19
Miscellaneous Particulate Filter Change Maintenance Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Variables			Source/Notes/Assumptions
E	**Emission Factor (lb TSP/ton)**	**0.01133**	
E	**Emission Factor (lb PM_{10}/ton)**	**0.005357**	
E	**Emission Factor (lb $PM_{2.5}$/ton)**	**0.0008112**	
$E = k * (0.0032) * \frac{(U/5)^{1.3}}{(M/2)^{1.4}} (lb/ton)$			Based on U.S. EPA AP-42, 13.2.4 "Aggregate Handling and Storage Piles" (Equation 1).
U	Mean Wind Speed (mph)	7.90	The mean wind speed is from the average windspeed for Houston, TX in TANKS 4.09d.
M	Material Moisture Content (%)	1	Estimate based on process knowledge
K (TSP)	TSP Particle Size Multiplier	0.74	Particle size multiplier taken from AP-42, Chapter 13.2.4.
K (PM_{10})	PM_{10} Particle Size Multiplier	0.35	Particle size multiplier taken from AP-42, Chapter 13.2.4.
K ($PM_{2.5}$)	$PM_{2.5}$ Particle Size Multiplier	0.05	Particle size multiplier taken from AP-42, Chapter 13.2.4.
CE	Control Efficiency	0%	Assumed Control Efficiency.
-	Hourly Throughput (ton/hr)	0.1478	Assumed hourly throughput and 500 filter changeouts/hour.
-	Annual Throughput (tons/yr)	0.89	Assumed 6,000 filters/yr.

Emission Summary		Source/Notes/Assumptions
Frequency Routine Maintenance (activity/hr)	**500**	Assume conservative 500 activities per hour
Frequency Routine Maintenance (activity/yr)	**3000**	Assume maximum activity every year - Two proposed units

Misc. Filter Changeout		
TSP	1.67E-03	lb/hr
TSP	5.02E-06	ton/yr
PM_{10}	7.92E-04	lb/hr
PM_{10}	2.38E-06	ton/yr
$PM_{2.5}$	1.20E-04	lb/hr
$PM_{2.5}$	3.60E-07	ton/yr

Notes:

1. The emission calculations above represent the worst case emissions that could occur on a "per filter change" basis.

Table A-20
CEMS Calibration Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Activity	Max Concentration[1] ppm	Flow Rate scfm	Duration Per Event min	Event Frequency		Emissions	
				per hr	per yr	lb/hr	tpy
NO_x Cal Gas	1000	1	1	1	20	1.19E-04	1.19E-06
CO Cal Gas	1000	1	1	1	20	7.27E-05	7.27E-07

Notes:

1. Conservatively based on worst case max cal gas concentrations
2. Calculation Basis: Electric Utility MSS Workgroup.
3. The emission calculations above represent the worst case emissions that could occur during routine maintenance or a unit turnaround.

Sample Calculation: NOx CEMS Calibration Hourly Emissions

1000 lbmol NOx/1e6 lbmol Gas * 46 lb NOx/lbmol NOx * 1bmol Gas/385.1 scf * 1 scf/min * 1 min/event * 1 events/hr = 0.000119 lb/hr

Table A-21
Inspection, Repair, Replacement, Adjusting, Testing, and Calibration
of Analytical Equipment, Process Instruments Including Sight Glasses, Meters, and Gauges
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Step 1. Clingage Loss Calculation:

Variables			Source/Notes/Assumptions
Lc	**Clingage Loss (lb/activity)**	**0.00135**	
$L_C = A_S \times T_f \times D$			
A_s	Surface Area (feet)	0.31	Based on an average size of the equipment.
T_f	Clingage Film Thickness (feet)	8.33E-05	95ºF per TCEQ Guidance.
D	Density of Material (lb/feet^3)	52.46	Based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.

Step 2. Splash Loading Loss Calculation:

Variables			Source/Notes/Assumptions
L_l	**Equipment Draining Loading Loss (lb/10^3 gal loaded)**	**0.493**	
$L_l = 12.46\left(\frac{SPM_V}{T}\right)$			Based on U.S. EPA AP-42, 5.2 "Transportation and Marketing of Petroleum Liquids" (Equation 1).
S	Loading Loss Factor	1.45	Per U.S. EPA AP-42 Table 5.2-1, based on splash loading per TCEQ Guidance.
P	Vapor Pressure of Liquid Loaded (psia)	0.15	Based on representative material.
M_V	Vapor molecular weight (lb/lb-mole)	103	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.

Variables			Source/Notes/Assumptions
L_D	**Equipment Draining Loading loss (lb/activity)**	**1.11E-07**	
$L_D = L_l V_t$			
L_l	Loading Loss (lb/10^3 gal loaded)	0.493	See calculation above.
V_t	Volume of liquid drained (gallon/activity)	0.0002	Assumed to be 1% of total volume (0.02244 gallons) is left in the equipment and drained to pan/enclosed drain.

Step 3. Evaporative Loss Calculation:

Variables			Source/Notes/Assumptions
L_E	**Evaporation Loss (lb/activity)**	**0.000386**	
$L_E = 7920 * A\left(\frac{P_a M_w}{RT}\right)\frac{D_{i,a}}{Z_2 - Z_1}\ln\left[\frac{1}{(1-y_{c1})}\right] * t$			Ajay Kumar, N.S. Vatcha, and John Schmelzle, "Estimate Emissions From Atmospheric Releases of Hazardous Substances," Environmental Engineering World, November-December 1996, pages 20-23.
A	Vessel opening area (m^2)	0.07	Area for a 5 gal bucket (~11.75 in. dia.)
P_a	Atmospheric Pressure (Pa)	101,325	
M_W	Molecular weight (kg/kgmol)	103	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.
R	Universal Gas Constant (J/°K-kgmol)	8314	
T	Temperature (ºK)	308	95ºF per TCEQ Guidance.
$D_{i,a}$	Diffusivity of component through air (m^2/s)	6.28E-06	Assumed diffusivity of diesel fuel
Z_2-Z_1	Empty vapor space above liquid level in vessel (m)	0.37	Assumed 5 gal bucket (14.5 in)
y_{c1}	Volume fraction of component in air	0.010	
t	Time that material sits in pan before removed by vacuum truck (hr)	0.25	Based on past experience.

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	0.00174	Summation of Steps 1 through 3.
Frequency Routine Maintenance Activity (activity/hour)	2	Based on process knowledge and historical information.
Frequency Routine Maintenance Activity (activity/yr)	10	Based on process knowledge and historical information.

Total VOC Emissions	
lb/hr	**ton/yr**
0.00271	8.70E-06

Notes:
1. Calculation Basis: Electric Utility MSS Workgroup.

Table A-22
Management of Sludge Maintenance Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Activity 1. Sludge/Sediment Management

FIN	Description	Worst-Case VOC Concentration ppmw	Sludge Density [1] lb/ft^3	Worst-Case Annual Volume of Sludge Removed yd^3	Worst-Case Monthly Volume of Sludge Removed yd^3	Annual Total Mass of Sludge Removed lb/yr	Hourly Total Mass of Sludge Removed [2] lb/hr	VOC lb/hr	VOC ton/yr
SLUDGEMSS	Sludge/Sediment Management	5.00	45.01	545.00	56.00	662,322	1,701	0.009	0.002

Notes:
1. Engineering Estimate.
2. Assumes worst-case monthly volume of sludge removed in one 40-hour week.
3. The emission calculations below represent the worst case emissions that could occur during routine maintenance or a unit turnaround. For calculation purposes, sludge management via vacuum truck was considered, but emissions from an open pit are provided as more conservative.

Sample Calculations:

Annual Emissions (ton/yr) = Total Mass of Sludge (lbs/yr) x VOC Concentration (ppmw) / 1,000,000 / 2000 lb/ton
= (662322.15 lbs/yr) * (5 ppmw) / 1,000,000 / 2000 lbs/ton = 0.002 tpy

Hourly Emissions (lb/hr) = Total Mass of Sludge (lbs/hr) x VOC Concentration (ppmw) / 1,000,000
= (1701.378 lbs/hr) * (5 ppmw) / 1,000,000 = 0.01 lb/hr

Table A-23
Catalyst Handling and Maintenance
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Variables		Source/Notes/Assumptions
Assumed surface area of SCR grid (ft^2)	100	
Assumed dust thickness (mm)	10	
Assumed dust thickness (ft)	0.03281	
Assumed dust density (lb/ft^3)	75	
Activity Throughput (lb/activity)	246.06	
Control Efficiency	99.00%	Assumed control efficiency of fabric filter
Total Emissions per activity (lb/activity)	**2.46**	As PM_{10}

Emission Summary		Source/Notes/Assumptions
Frequency Routine Maintenance Activity (activity/hour)	**1**	Based on process knowledge and historical information.
Frequency Routine Maintenance Activity (activity/yr)	**1**	Based on process knowledge and historical information.
Duration Routine Maintenance (hours/activity)	**48**	Based on process knowledge and historical information.

Catalyst Maintenance		
PM/PM_{10}	0.0513	lb/hr
PM/PM_{10}	0.00123	ton/yr

Notes:
1. Calculation Basis: Simple fabric filter calculation.

Table A-24
Boiler Tube Cleaning (CHELCLEAN665)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Splash Loading Loss Calculation:

Variables			Source/Notes/Assumptions
L_l	**Equipment Draining Loading Loss (lb/10^3 gal loaded)**	**0.0021**	
			Based on U.S. EPA AP-42, 5.2 "Transportation and Marketing of Petroleum Liquids" (Equation 1).
S	Loading Loss Factor	1.45	Per U.S. EPA AP-42 Table 5.2-1, based on splash loading per TCEQ Guidance.
P	Vapor Pressure of Liquid Loaded (psia)	0.0002	Conservatively utilized TCEQ vapor pressure limit for compounds considered to be air contaminants for this low-vapor pressure mixture.
M_V	Vapor molecular weight (lb/lb-mole)	326	Molecular Weight for 40% solution di-ammonium EDTA.
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.

Variables			Source/Notes/Assumptions
L_D	**Equipment Draining Loading loss (lb/activity)**	**0.14**	
L_l	Loading Loss (lb/10^3 gal loaded)	0.002	See calculation above.
V_t	Volume of liquid drained (gallon/activity)	64,000	Approximate, one HRSG

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	**0.14**	
Frequency Routine Maintenance Activity (activity/hour)	**1**	Assumed
Frequency Routine Maintenance Activity (activity/yr)	**1**	Assumed
Duration Routine Maintenance (hours/activity)	**4**	Assumed

Total Emissions	
(lb/hr)	**(tpy)**
0.0340	6.79E-05

Notes:

1.The emission calculations above represent the worst case emissions that could occur during a unit turnaround.

Table A-25
Small Equipment and Fugitive Component Repair/Replacement (Anhydrous Ammonia Emissions)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Step 1. Equipment Opening Maintenance Vapor Space Calculation:

L_o	Opening Loss (lb/activity)	0.00358	Source/Notes/Assumptions
			Based on the Ideal Gas Law with modification for VOC molecular weight.
P	Vapor Pressure of Material (psia)	14.70	Since the vapor pressure of anhydrous ammonia is greater than 14.7 the tank pressure prior to venting was used.
V	Vapor space volume ($feet^3$)	0.08522	Based on worst case equipment: 10 feett of 2 inch pipe
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.
R	Gas constant (psia ft^3 per lb-mole ºR)	10.73	
M_V	Vapor molecular weight (lb/lb-mole)	17	Molecular weight for ammonia.

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	**0.00358**	
Frequency Routine Maintenance Activity (activity/hour)	**1**	Assumed
Frequency Routine Maintenance Activity (activity/yr)	**5**	Assumed
Duration Routine Maintenance (hours/activity)	**1**	Assumed

Total NH_3 Emissions	
lb/hr	**ton/yr**
0.00358	8.94E-06

Notes:
1. The emission calculations above represent the worst case emissions that could occur during routine maintenance or a unit turnaround.
2. Calculation Basis: Electric Utility MSS Workgroup. Applicable section utilized for small volume.

Table A-26
Low VP Small Equipment & Fugitive Component Maintenance Emissions (VOC Service)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Step 1. Clingage Loss Calculation:

Variables			Source/Notes/Assumptions
Lc	**Clingage Loss (lb/activity)**	**0.0141**	
$L_C = A_S \times T_f \times D$			
A_s	Surface Area (feet)	3.12	Conservatively based on clingage loss from final 5 ft of pipe section being worked on.
T_f	Clingage Film Thickness (feet)	8.33E-05	95ºF per TCEQ Guidance.
D	Density of Material (lb/feet^3)	54.16	Based on API Power Regression Analysis for a material with a vapor pressure of 0.5 psia.

Step 2. Splash Loading Loss Calculation:

Variables			Source/Notes/Assumptions
L_l	**Equipment Draining Loading Loss (lb/10^3 gal loaded)**	**0.0423**	
$L_l = 12.46\left(\frac{SPM_V}{T}\right)$			Based on U.S. EPA AP-42, 5.2 "Transportation and Marketing of Petroleum Liquids" (Equation 1).
S	Loading Loss Factor	1.45	Per U.S. EPA AP-42 Table 5.2-1, based on splash loading per TCEQ Guidance.
P	Vapor Pressure of Liquid Loaded (psia)	0.01	Based on representative material.
M_V	Vapor molecular weight (lb/lb-mole)	130	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.5 psia.
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.

Variables			Source/Notes/Assumptions
L_D	**Equipment Draining Loading Loss (lb/activity)**	**0.0000982**	
$L_D = L_l V_t$			
L_l	Loading Loss (lb/10^3 gal loaded)	0.042	See calculation above.
V_t	Volume of liquid drained (gallon/activity)	2.32	Assumed to be 1% of total volume (232.4036 gallons) is left in the equipment and drained to pan/enclosed drain

Step 3. Evaporative Loss Calculation:

Variables			Source/Notes/Assumptions
L_E	**Evaporation Loss (lb/activity)**	**0.0000208**	
$L_E = 7920 * A\left(\frac{P_a M_w}{RT}\right)\frac{D_{i,a}}{Z_2 - Z_1}\ln\left[\frac{1}{(1-y_{c1})}\right] * t$			Ajay Kumar, N.S. Vatcha, and John Schmelzle, "Estimate Emissions From Atmospheric Releases of Hazardous Substances," Environmental Engineering World, November-December 1996, pages 20-23.
A	Vessel opening area (m^2)	0.02	Opening on a tote (~6 in. dia.)
P_a	Atmospheric Pressure (Pa)	101,325	
M_W	Molecular weight (kg/kgmol)	130	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.
R	Universal Gas Constant (J/°K-kgmol)	8314	
T	Temperature (ºK)	308	95ºF per TCEQ Guidance.
$D_{i,a}$	Diffusivity of component through air (m^2/s)	6.28E-06	Assumed diffusivity of diesel fuel
Z_2-Z_1	Empty vapor space above liquid level in vessel (m)	0.15	Assumed 6 in
y_{c1}	Volume fraction of component in air	0.001	
t	Time vessel remains open to atmosphere	0.25	Based on past experience.

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	**0.0142**	Summation of Steps 1 through 3.
Frequency Routine Maintenance Activity (activity/hour)	**5**	Assumed
Frequency Routine Maintenance Activity (activity/yr)	**130**	Assumed

Total Emissions	
lb/hr	ton/yr
0.070	0.00092

Notes:
1. The emission calculations above represent the worst case emissions that could occur during routine maintenance or a unit turnaround.

EPN FUG-MSS Criteria Pollutant BACT

Emissions associated with EPN MSS-FUG result from routine maintenance activities undertaken to ensure the proper operability of equipment. The frequency and duration of the identified maintenance activities will be limited such that the calculated emissions will be low enough to be classified as Inherently Low Emitting (ILE) activities. The emissions associated with these ILE maintenance activities are so low that alternative work practices would not result in meaningful emission reductions. The limited duration and frequency of the identified ILE maintenance activities result in insignificant emission, which satisfies BACT.

EMISSION POINT INFORMATION

EPN SF6FUG: SF6 Insulated Equipment

EPN SF6FUG Process Description

The generator circuit breakers associated with the proposed units will be insulated with SF_6. SF_6 is a colorless, odorless, non-flammable gas. It is a fluorinated compound that has an extremely stable molecular structure. The unique chemical properties of SF_6 make it an efficient electrical insulator. The gas is used for electrical insulation, arc quenching, and current interruption in high-voltage electrical equipment. SF_6 is only used in sealed and safe systems, which under normal circumstances, do not leak gas. The capacity of the circuit breakers associated with the proposed plant is estimated to be 820 lbs of SF_6. Fugitive emissions of SF_6 are designated as EPNs SF6FUG.

The proposed circuit breakers will have a low-pressure alarm and a low-pressure lockout. The alarm will alert operating personnel of any leakage in the system and the lockout prevents any operation of the breaker in the event there is a lack of “quenching and cooling” SF_6 gas.

EPN SF6FUG Greenhouse Gas Emissions Calculation Methodology

SF_6 emissions from the SF_6 circuit breakers associated with the proposed units are calculated using a predicted SF_6 annual leak rate of 0.5% by weight. The global warming potential factors used to calculate CO_2e emissions are based on Table A-1 of the Mandatory Greenhouse Gas Reporting Rules.

Calculations of GHG emissions from electrical equipment insulated with SF_6 are presented on Table B-9.

Table B-9
GHG Emission Calculations - Electrical Equipment Insulated With SF_6
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Insulated circuit breaker SF_6 capacity:	410	lb
Estimated annual SF_6 leak rate:	0.5%	by weight
Estimated annual SF_6 mass emission rate:	0.0010	ton/yr
Global Warming Potential[1]:	22,800	
Estimated annual CO_2e emission rate:	23.4	ton/yr

Notes:

1. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

EPN SF6 FUG Greenhouse Gas BACT

The generator circuit breakers associated with the proposed combustion units will be insulated with SF_6. SF_6 is a colorless, odorless, non-flammable gas. It is a fluorinated compound that has an extremely stable molecular structure. The unique chemical properties of SF_6 make it an efficient electrical insulator. The gas is used for electrical insulation, arc quenching, and current interruption in high-voltage electrical equipment. SF_6 is only used in sealed and safe systems, which under normal circumstances, do not leak gas.

An available technology is the use of state-of-the-art SF_6 technology with leak detection to limit fugitive emissions. In comparison to older SF_6 circuit breakers, modern breakers are designed as a totally enclosed-pressure system with far lower potential for SF_6 emissions. In addition, the effectiveness of leak-tight closed systems can be enhanced by equipping them with a density alarm that provides a warning when 10% of the SF_6 (by weight) has escaped. The use of an alarm identifies potential leak problems before the bulk of the SF_6 has escaped, so that it can be addressed proactively in order to prevent further release of the gas.

CB5 concludes that using state-of-the-art enclosed-pressure SF_6 circuit breakers with leak detection is BACT. The circuit breakers will be designed to meet the latest American National Standards Institute (ANSI) C37.013 standard for high voltage circuit breakers.[2] The proposed SF_6 circuit breakers will have a low pressure alarm and a low pressure lockout. This alarm will function as an early leak detector that will bring potential fugitive SF_6 emissions leaks to the attention of the operations/maintenance staff before a substantial portion of the SF_6 escapes. The lockout prevents any operation of the breaker due to lack of "quenching and cooling" SF_6 gas.

[2] ANSI Standard C37.013, *Standard for AC High-Voltage Generator Circuit Breakers on a Symmetrical Current*.

VI. APPLICATION MATERIALS

VI.H. MATERIAL BALANCE TABLE

VIII.E TECHNICAL INFORMATION

TABLE 2 - MATERIAL BALANCE FOR PROPOSED PROJECT

This material balance table is used to quantify possible emissions of air contaminants and special emphasis should be placed on potential air contaminants, for example: If feed contains sulfur, show distribution to all products. Please relate each material (or group of materials) listed to its respective location in the process flow diagram by assigning point numbers (taken from the flow diagram) to each material.

LIST EVERY MATERIAL INVOLVED IN EACH OF THE FOLLOWING GROUPS	Point No. from Flow Diagram	Process Rate (lbs/hr or SCFM) standard conditions: 70 F 14.7 psia. Check appropriate column at right for each process.	Meas.	Est.	Calc.
1. Raw Materials - Input					
2. Fuels - Input					
Natural Gas		See Appendix A, Tables A-2 and A-4		x	
3. Products and By-products - Output					
Electricity		See Appendix A, Tables A-2 and A-4		x	
4. Solid Wastes and By-products - Output					
5. Liquid Wastes - Output					
6. Airborne Waste (Solid) - Output		See Table 1(a)		x	
7. Airborne Wastes (gaseous) - Output					
See Table 1(a)		See Table 1(a)		x	

VI. APPLICATION MATERIALS

VI.J. STATE REGULATORY REQUIREMENTS

Emissions from the proposed units will comply with all the rules and regulations of the TCEQ and the intent of the Texas Clean Air Act (TCAA), including protection of the health and physical property of the public. No schools are located within 3,000 feet of the site. Compliance with applicable rules and regulations of the Commission are discussed below.

30 TAC Chapter 101, Subchapter A - General Rules

§101.2 Multiple Air Contaminant Sources or Properties – CB5 will demonstrate through air dispersion modeling that the sources to be permitted will not cause or contribute to violations of any TCEQ standards.

§101.3 Circumvention – CB5 will not use any plan, activity, device, or contrivance that will, without resulting in an actual reduction of air contaminants, conceal or appear to minimize the effects of emissions which would otherwise constitute a violation of the TCAA or TCEQ regulations.

§101.4 Nuisance – CB5 will demonstrate through air dispersion modeling that discharges to the atmosphere from the proposed project will not be in such concentration and of such duration that they will or may tend to be injurious to or adversely affect human health or welfare, animal life, vegetation, or property, or interfere with the normal use and enjoyment of animal life, vegetation, or property.

§101.5 Traffic Hazard – No discharge of air contaminants, uncombined water or other materials from the project will cause or have a tendency to cause a traffic hazard or an interference with normal road use.

§101.8 Sampling – All stack testing and sampling will meet requirements imposed by §101.8, and data will be reported and maintained as required.

§101.9 Sampling Ports – CB5 will comply with TCEQ requests for location of sampling ports in accordance with §101.9.

§101.10 Emissions Inventory Requirements – CB5 will submit emissions inventories as required by §101.10.

§101.20 Compliance with Environmental Protection Agency Standards – As described in the sections which follow, CB5 will comply with applicable requirements of New Source Performance Standards (40 CFR 60). The project will not be subject to National Emissions Standards for Hazardous Air Pollutants under 40 CFR 61, but will be subject to the National Emission Standards for Hazardous Air Pollutants for Source Categories under 40 CFR 63 (MACT ZZZZ for the emergency diesel generator; MACT YYYY for the combustion turbine; and MACT DDDDD for the auxiliary boiler).

§101.24-27 Fees – CB5 will comply with all applicable requirements of these sections and will pay the required fees and surcharges as specified.

30 TAC Chapter 101, Subchapter F – Emissions Events and Scheduled Maintenance, Start-up, and Shutdown Activities

§101.201 Emissions Event Reporting and Recordkeeping Requirements – CB5 will follow the notification requirements in §101.201, should a reportable emissions event, as defined in §101.1, occur. Records of non-reportable events will be maintained.

§101.211 Scheduled Maintenance, Start-up and Shutdown Reporting, and Recordkeeping Requirements – CB5 will comply with the provisions of §101.211 to the extent that they apply to the operation of the facilities described in this application.

§101.221-§101.224 Operational Requirements, Demonstrations, and Excessive Emissions Events – CB5 will comply with these provisions to the extent that they apply to the facilities described in this application. CB5 will maintain in good working order and properly operate all pollution emission capture and abatement equipment.

30 TAC Chapter 101, Subchapter H – Emissions Banking and Trading

The project is located in Chambers County which is affected by the Mass Emissions Cap and Trade Program of Division 3 of this subchapter. The existing units and the new CB5 project will continue to comply with all applicable requirements of Division 3. Additionally, Division 7 of this subchapter, which relates to the Clean Air Interstate Rule (CAIR), potentially applies to the proposed project. In January 2012, the Cross-State Air Pollution Rule (CSAPR) replaced CAIR. CB5 will meet any applicable requirements of Division 7, if they become applicable to the proposed project.

30 TAC Chapter 111 - Control of Air Pollution from Visible Emissions and Particulate Matter

§111.111(a) (1) Requirements for Specified Sources: Stationary Vents - Emissions from the simple cycle stacks and HRSG stacks will meet the requirement of §111.111(a) (1) (C) specifying an opacity limitation of 15 percent averaged over a six-minute period. Initial stack testing will be performed using EPA Method 9. Emissions from other vents at the site being permitted under this application will not exceed the six-minute opacity limit of 20 percent in §111.111(a)(1)(B).

§111.111(a) (7) (A) Requirements for Specified Sources: Structures - Emissions from buildings, enclosed facilities and structures at the site will meet the opacity limitation of 30 percent averaged over a six-minute period.

§111.151. Allowable Emissions Limits - Emissions of total suspended particulates from all sources with specific stack flow rates will be within the limits specified in §111.151(a), Table 1, based on calculated emission rates. See Table A-17 for the calculated §111.151(a) allowable emission rates.

30 TAC Chapter 112 - Control of Air Pollution from Sulfur Compounds

§112.2. Compliance, Reporting, and Recordkeeping – CB5 will maintain on site and submit all records requested by the TCEQ to demonstrate compliance with Chapter 112 SO_2 limits.

§112.3. Net Ground Level Concentrations – The only new sources of SO_2 at the site will be the combustion of natural gas in the combustion turbine, the duct burners, and the auxiliary boiler and the

combustion of ultra-low-sulfur diesel fuel in the emergency generator engine. Therefore, the project will not cause the net ground level property line standard for SO_2 to be exceeded.

§112.41. Sulfuric Acid Emission Limits - The combustion of natural gas in the CTG, the duct burners, and the auxiliary boiler will be a potential source of H_2SO_4 at the project. However, the project will not cause the net ground level property line standard for H_2SO_4 to be exceeded.

No other paragraphs in Chapter 112 apply to the project. CB5 will not operate a sulfuric acid plant, sulfur recovery plant, nonferrous smelter, Kraft pulp mill, or a liquid fuel-fired source in association on-site. CB5 does not anticipate the need to use higher sulfur fuels due to a temporary fuel shortage but will comply with the requirements of §§112.15-18 should a fuel shortage occur. CB5 does not intend to apply for an area control plan for emissions of sulfur dioxide. Additionally, no sources will produce emissions of hydrogen sulfide.

30 TAC Chapter 113, Control of Air Pollution from Toxic Materials

Chapter 113 incorporates by reference National Emission Standards for Hazardous Air Pollutants for Source Categories (40 CFR Part 63). Based on emission estimates for the CTG, the site will have greater than 10 tons per year of formaldehyde emissions making the site a major HAP source.

The proposed diesel generator emergency engine will be subject to the requirements of 40 CFR 63, Subpart ZZZZ. CB5 will comply with these standards as discussed in Section IX.C of this application.

Since the Cedar Bayou site will be a major HAP source, MACT Subpart YYYY, National Emission Standards for Hazardous Air Pollutants for Stationary Gas Turbines applies to the CTG.

MACT Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Heaters will apply to the auxiliary boiler (EPN AUX-BLR). CB5 will comply with all applicable work practice standards, monitoring, recordkeeping and reporting requirements of this subpart. The HRSGs are "waste heat boilers" as defined in 40 CFR 63.7575 and are not subject to 40 CFR 63, Subpart DDDDD.

MACT Subpart UUUUU, National Emission Standards for Hazardous Air Pollutants: Coal and Oil-fired Electric Utility Steam Generating Units, does not apply to gas-fired electric generating units.

30 TAC Chapter 114, Control of Air Pollution from Motor Vehicles

CB5 will comply with all applicable requirements of this regulation regarding inspection, maintenance and operation of air pollution control systems/devices for motor vehicles operated at the site.

30 TAC Chapter 115, Control of Air Pollution from Volatile Organic Compounds

Chapter 115, Subchapter A, Division 1: Storage of Volatile Organic Compounds does not apply to the diesel tank because it is less than 1,000 gallons (exemption in 115.111(a)(8)) and the vapor pressure of diesel is less than 1.5 psia (exemption in 115.111(a)(1)). Chapter 115, Subchapter D, Division 3: Fugitive Emission Control in Petroleum Refining, Natural Gas/Gasoline Processing, and Petrochemical Processes in Ozone Nonattainment Areas do not apply to natural gas piping at the CB5 plant because the plant is not a petroleum refinery; a synthetic organic chemical, polymer, resin, or methyl-tert-butyl ether manufacturing process; or a natural gas/gasoline processing operation.

30 TAC Chapter 116, Subchapter B. Control of Air Pollution by Permits for New Construction or Modification

§116.111(a)(1) – PI-1 Form, General Application – This application provides complete information required by the TCEQ's Form PI-1, General Application Form. As such, the completed form, signed by an authorized representative of CB5, is included. All additional support information specified on the form is provided as part of this application or will be provided in the air dispersion modeling report, which will be submitted at a later date and after consultation with the TCEQ.

§116.111(a)(2)(A) – Protection of Public Health and Welfare – As described in this application and in the air dispersion modeling report to be submitted, emissions from the project will comply with all the rules and regulations of the Commission and the intent of the TCAA, including protection of the health and physical property of the public.

§116.111(a)(2)(B) – Measurement of Emissions – In addition to compliance with applicable NSPS requirements, CB5 will measure emissions from the proposed facilities as described in Section VIII.B. of this application and install sampling ports in accordance with guidelines in the "Texas Commission on Environmental Quality (TCEQ) Sampling Procedures Manual."

§116.111(a)(2)(C) – Best Available Control Technology (BACT) – As demonstrated in this application, best available control technology will be used to control emissions from the proposed facilities.

§116.111(a)(2)(D) – Federal New Source Performance Standards (NSPS) – The combustion turbine and duct-fired HRSG will be subject to NSPS Subpart KKKK, Standards of Performance for Stationary Combustion Turbines, and NSPS Subpart TTTT, Standards of Performance For Greenhouse Gas Emissions for Electric Generating Units. The emergency generator will be subject to NSPS Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. In addition, the auxiliary boiler will be subject to limited recordkeeping requirements of NSPS Subpart Dc, Small Industrial- Commercial-Institutional Steam Generating Units.

§116.111(a)(2)(E) – National Emission Standards for Hazardous Air Pollutants (NESHAP) – The project is not be subject to any NESHAP as codified in 40 CFR Part 61.

§116.111(a)(2)(F) – NESHAP for Source Categories, MACT Standards, 40 CFR Part 63 – Based on emission estimates for the combustion turbine, the site will have greater than 10 tons per year of formaldehyde emissions making the site a major HAP source. MACT Subpart YYYY, National Emission Standards for Hazardous Air Pollutants for Stationary Gas Turbines applies to the combustion turbine.

The proposed diesel generator emergency engine will be subject to the requirements of 40 CFR 63, Subpart ZZZZ. CB5 will comply with these standards as discussed in Section IX.C of this application.

MACT Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Heaters will apply to the auxiliary boiler (EPN AUX-BLR). CB5 will comply with all applicable work practice standards, monitoring, recordkeeping and reporting requirements of this subpart. The HRSGs are "waste heat boilers" as defined in 40 CFR 63.7575 and are not subject to 40 CFR 63, Subpart DDDDD.

MACT Subpart UUUUU, National Emission Standards for Hazardous Air Pollutants: Coal and Oil-fired Electric Utility Steam Generating Units, does not apply to gas-fired electric generating units.

§116.111(a)(2)(G) – Performance Demonstration – The proposed units will achieve the performance specified in the representations in this application and required by the permit. CB5 will submit any additional information as may be required by the TCEQ to demonstrate that the represented performance will be achieved.

§116.111(a)(2)(H) – Nonattainment Review – Chambers County is located in a designated ozone nonattainment area. The site operates under a PAL for NOx. Including emissions from the project, CB5 will maintain NOx emissions at or below the established PAL. Nonattainment New Source Review will also not be triggered for VOC emission increases.

§116.111(a)(2)(I) – Prevention of Significant Deterioration (PSD) Review – The proposed project will be a major modification at an existing major source under 30 TAC §116.160. Therefore, a PSD permit is required for the PSD-regulated contaminants for which there will be a significant net emissions increase. Compliance with PSD permitting requirements is described in Section IX.E and the air dispersion modeling report to be submitted. BACT is discussed in Section VIII.C of this application.

§116.111(a)(2)(J) – Air Dispersion Modeling – CB5 will perform an air dispersion modeling study in order to demonstrate compliance with applicable standards. This study will be completed upon acceptance of emissions calculations and proposed BACT by the TCEQ.

§116.111(a)(2)(K) – Hazardous Air Pollutants – The proposed project will not be a major source of HAPs. Therefore, this section does not apply to the project.

§116.111(a)(2)(L) – The project is located in Chambers County which is affected by the Mass Emissions Cap and Trade Program of Division 3 of this subchapter. The existing units and the new project at the Cedar Bayou Station will continue to comply with all applicable requirements of Division 3.

30 TAC Chapter 117, Control of Air Pollution from Nitrogen Compounds

The project is located in Chambers County which is affected by the Mass Emissions Cap and Trade Program of Division 3 of this subchapter. The existing units and the new project at the Cedar Bayou site will continue to comply with all applicable requirements of Division 3. Additionally, Division 7 of this subchapter, which relates to the Clean Air Interstate Rule (CAIR), potentially applies to the proposed project. In January 2012, the Cross-State Air Pollution Rule (CSAPR) replaced CAIR. CB5 will meet any applicable requirements of Division 7, if they become applicable to the proposed project.

30 TAC Chapter 118, Control of Air Pollution Episodes

The project sources will be operated in compliance with any orders of the Commission relating to generalized and localized air pollution episodes. The Emission Reduction Plan requirements in 30 TAC 118.5 do not apply to Chambers County.

30 TAC Chapter 122, Federal Operating Permits

CB5 will apply for the appropriate Federal Operating Permit authorizations for the project. The application will address the required Acid Rain permitting requirements and any applicable requirements of the CSAPR.

VI. APPLICATION MATERIALS

VI.K. TABLE 1a and CORE Data Form

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Combined Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	**3. Air Contaminant Emission Rate #**	
EPN (A)	**FIN (B)**	**NAME (C)**		**Pounds per Hour (A)**	**TPY (B)**
CBY51	CBY51	Combustion Turbine 1 (Combined Cycle)	NO_X	32.29	---
		(Normal Operating Emissions)	CO	34.40	---
			SO_2	12.65	---
			VOC	5.63	---
			PM / PM_{10} / $PM_{2.5}$ [(a) (b)]	36.57	---
			H_2SO_4 [(a)]	9.16	---
			NH_3	41.83	---
CBY51	CBY51	Combustion Turbine 1 (Combined Cycle)	NO_X	43.96	---
		(Maximum Short-Term	CO	533.4	---
		Startup/Shutdown Emissions)	SO_2	76.83	---
			VOC	76.83	---
			PM / PM_{10} / $PM_{2.5}$ [(a) (b)]	36.57	---
			H_2SO_4 [(a)]	9.16	---
			NH_3	41.83	---
CBY51	CBY51	Combustion Turbine 1 (Combined Cycle)	NO_X	---	122.86
		(Normal Operating and	CO	---	150.29
		Startup/Shutdown Emissions)	SO_2	---	23.98
			VOC	---	24.28
			PM / PM_{10} / $PM_{2.5}$ [(a) (b)]	---	93.25
			H_2SO_4 [(a)]	---	16.17
			NH_3	---	156.99

NOX lb/hr represents a maximum hourly emission rate over a three-hour average.

[(a)] PM / PM_{10} / $PM_{2.5}$ from both front-half and back-half.

[(b)] PM / PM_{10} / $PM_{2.5}$ values include $(NH_4)_2SO_4$ emissions.

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Combined Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
C-TOWER1	C-TOWER1	Cooling Tower	PM	24.21	106.03
			PM_{10}	0.08	0.33
			$PM_{2.5}$	<0.01	<0.01
AUX-BLR	AUX-BLR	Auxiliary Boiler	NO_X	0.89	0.89
			CO	3.29	3.29
			SO_2	0.25	0.12
			VOC	0.48	0.48
			PM / PM_{10} / $PM_{2.5}$	0.66	0.66
GAS-HTR	GAS-HTR	Gas Heater	NO_X	0.12	0.51
			CO	0.36	1.57
			SO_2	0.027	0.06
			VOC	0.03	0.14
			PM / PM_{10} / $PM_{2.5}$	0.05	0.21
EMGEN	EMGEN	Emergency Diesel Generator	NO_X	42.48	2.12
			CO	3.50	0.17
			SO_2	0.03	<0.01
			VOC	0.91	0.05
			PM / PM_{10} / $PM_{2.5}$	0.26	0.01

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Combined Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
DSL-TNK	DSL-TNK	Emergency Diesel Generator Tank	VOC	0.02	< 0.01
FUG-SCR	FUG-SCR	Ammonia Component Fugitives	NH_3	0.02	0.0993
FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	VOC	0.0024	0.0103
CBY51-LOV	CBY51-LOV	Unit 1 Lube Oil Vent	VOC	0.003	0.01
			PM / PM_{10} / $PM_{2.5}$	0.003	0.01
CBYST1-LOV	CBYST1-LOV	Steam Turbine 1 Lube Oil Vent	VOC	0.003	0.01
			PM / PM_{10} / $PM_{2.5}$	0.003	0.01
FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	NO_X	<0.01	<0.01
			CO	<0.01	<0.01
			VOC	0.12	<0.01
			PM	0.05	<0.01
			PM_{10}	0.05	<0.01
			$PM_{2.5}$	0.05	<0.01
			NH_3	<0.01	<0.01

EPN = Emission Point Number
FIN = Facility Identification Number

Table 1(a) Emission Point Summary
Combined Cycle Option

Date:	03/18/2020	Permit No.:	TBD	Regulated Entity No.:	RN100825371
Area Name:	Cedar Bayou Electric Generating Station			Customer Reference No.:	TBD

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate #	
EPN (A)	FIN (B)	NAME (C)		Pounds per Hour (A)	TPY (B)
CBY51	CBY51	Combustion Turbine 1 (Combined Cycle)	CO_2e		2,047,146.48
			CO_2		2,045,067.78
			CH_4		37.93
			N_2O		3.79
AUX-BLR	AUX-BLR	Auxiliary Boiler	CO_2e		10,425.48
			CO_2		10,414.71
			CH_4		0.20
			N_2O		0.02
GAS-HTR	GAS-HTR	Gas Heater	CO_2e		4,971.23
			CO_2		4,966.10
			CH_4		0.09
			N_2O		0.01
FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	CO_2e		55.21
			CO_2		0.0050
			CH_4		2.21
FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	CO_2e		2.69
			CO_2		0.0002
			CH_4		0.11

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Combined Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			2. Component or Air Contaminant Name	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
EMGEN	EMGEN	Emergency Diesel Generator	CO_2e		155.79
			CO_2		155.26
			CH_4		0.01
			N_2O		0.001
SF6FUG	SF6FUG	SF6 Insulated Equipment	CO_2e		23.37
			SF_6		0.0010

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Combined Cycle Option

Date:	03/18/2020	Permit No.:	TBD	Regulated Entity No.:	RN100825371
Area Name:	Cedar Bayou Electric Generating Station			Customer Reference No.:	TBD

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA			EMISSION POINT DISCHARGE PARAMETERS										
1. Emission Point			4. UTM Coordinates of Emission Point (NAD83)			Source							
						5. Building Height (ft)	6. Height Above Ground (ft)	7. Stack Exit Data			8. Fugitives		
EPN (A)	FIN (B)	NAME (C)	Zone	East (Meters)	North (Meters)			Diameter (ft) (A)	Velocity (fps) (B)	Temperature (°F) (C)	Length (ft) (A)	Width (ft) (B)	Axis Degrees (C)
CBY51	CBY51	Combustion Turbine 1 (Combined Cycle)	15	314,225	3,292,887		200	23	64.7	163			
C-TOWER1	C-TOWER1	Cooling Tower	15	314,275	3,292,865		45	20	15.0	100			
AUX-BLR	AUX-BLR	Auxiliary Boiler	15	314,224	3,292,891		200	4	36.0	299			
GAS-HTR	GAS-HTR	Gas Heater	15	314,149	3,292,824		50	2	23.5	250			
EMGEN	EMGEN	Emergency Diesel Generator	15	314,208	3,292,755		15	1	324.5	752.1			
DSL-TNK	DSL-TNK	Emergency Diesel Generator Tank	15	314,197	3,292,754		10	1	0.003	Ambient			
FUG-SCR	FUG-SCR	Ammonia Component Fugitives	15	314,206	3,292,858						161	201	4
FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	15	314,215	3,292,802						266	207	1
CBY51-LOV	CBY51-LOV	Unit 1 Lube Oil Vent	15	314,236	3,292,832		30	0.003	0.003	Ambient			
CBYST1-LOV	CBYST1-LOV	Steam Turbine 1 Lube Oil Vent	15	314,192	3,292,798		30	0.003	0.003	Ambient			
FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	15	314,169	3,292,734						633	460	8

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Simple Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	**3. Air Contaminant Emission Rate #**	
EPN (A)	**FIN (B)**	**NAME (C)**		**Pounds per Hour (A)**	**TPY (B)**
CBY51	CBY51	Combustion Turbine 1 (Simple Cycle)	NO_X	34.65	---
		(Normal Operating Emissions)	CO	29.54	---
			SO_2	10.81	---
			VOC	7.25	---
			$PM / PM_{10} / PM_{2.5}$ [(a) (b)]	19.28	---
			H_2SO_4 [(a)]	7.12	---
			NH_3	51.31	---
CBY51	CBY51	Combustion Turbine 1 (Simple Cycle)	NO_X	38.10	---
		(Maximum Short-Term	CO	256.7	---
		Startup/Shutdown Emissions)	SO_2	10.81	---
			VOC	62.83	---
			$PM / PM_{10} / PM_{2.5}$ [(a) (b)]	19.28	---
			H_2SO_4 [(a)]	7.12	---
			NH_3	51.31	---
CBY51	CBY51	Combustion Turbine 1 (Simple Cycle)	NO_X	---	65.14
		(Normal Operating and	CO	---	113.53
		Startup/Shutdown Emissions)	SO_2	---	10.16
			VOC	---	24.33
			$PM / PM_{10} / PM_{2.5}$ [(a) (b)]	---	27.49
			H_2SO_4 [(a)]	---	6.69
			NH_3	---	95.64

NOX lb/hr represents a maximum hourly emission rate over a three-hour average.

[(a)] $PM / PM_{10} / PM_{2.5}$ from both front-half and back-half.

[(b)] $PM / PM_{10} / PM_{2.5}$ values include $(NH_4)_2SO_4$ emissions.

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Simple Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
GAS-HTR	GAS-HTR	Gas Heater	NO_X	0.12	0.51
			CO	0.36	1.57
			SO_2	0.027	0.06
			VOC	0.03	0.14
			PM / PM_{10} / $PM_{2.5}$	0.05	0.21
EMGENSC	EMGENSC	Emergency Diesel Generator	NO_X	14.34	0.72
			CO	1.01	0.05
			SO_2	0.01	<0.01
			VOC	0.27	0.01
			PM / PM_{10} / $PM_{2.5}$	0.15	<0.01
DSL-TNK	DSL-TNK	Emergency Diesel Generator Tank	VOC	0.02	< 0.01
FUG-SCR	FUG-SCR	Ammonia Component Fugitives	NH_3	0.02	0.0993
FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	VOC	0.0024	0.0103
CBY51-LOV	CBY51-LOV	Unit 1 Lube Oil Vent	VOC	0.003	0.01
			PM / PM_{10} / $PM_{2.5}$	0.003	0.01

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Simple Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	NO_X	<0.01	<0.01
			CO	<0.01	<0.01
			VOC	0.12	<0.01
			PM	0.05	<0.01
			PM_{10}	0.05	<0.01
			$PM_{2.5}$	0.05	<0.01
			NH_3	<0.01	<0.01

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Simple Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
CBY51	CBY51	Combustion Turbine 1 (Simple Cycle)	CO_2e		865,715.66
			CO_2		864,836.60
			CH_4		16.04
			N_2O		1.60
GAS-HTR	GAS-HTR	Gas Heater	CO_2e		4,971.23
			CO_2		4,966.10
			CH_4		0.09
			N_2O		0.009
FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	CO_2e		55.21
			CO_2		0.005
			CH_4		2.21
FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	CO_2e		2.69
			CO_2		0.0002
			CH_4		0.11
EMGENSC	EMGENSC	Emergency Diesel Generator	CO_2e		61.30
			CO_2		61.09
			CH_4		0.003
			N_2O		0.000

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TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Simple Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA					
1. Emission Point			**2. Component or Air Contaminant Name**	3. Air Contaminant Emission Rate #	
EPN (A)	**FIN (B)**	**NAME (C)**		Pounds per Hour (A)	TPY (B)
SF6FUG	SF6FUG	SF6 Insulated Equipment	CO_2e		23.37
			SF_6		0.0010

EPN = Emission Point Number
FIN = Facility Identification Number

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
Table 1(a) Emission Point Summary
Simple Cycle Option

Date:	**03/18/2020**	Permit No.:	**TBD**	Regulated Entity No.:	**RN100825371**
Area Name:	**Cedar Bayou Electric Generating Station**			Customer Reference No.:	**TBD**

Review of applications and issuance of permits will be expedited by supplying all necessary information requested on this Table.

AIR CONTAMINANT DATA			EMISSION POINT DISCHARGE PARAMETERS										
1. Emission Point			4. UTM Coordinates of Emission Point (NAD83)			Source							
						5. Building Height (ft)	6. Height Above Ground (ft)	7. Stack Exit Data			8. Fugitives		
EPN (A)	FIN (B)	NAME (C)	Zone	East (Meters)	North (Meters)			Diameter (ft) (A)	Velocity (fps) (B)	Temperature (°F) (C)	Length (ft) (A)	Width (ft) (B)	Axis Degrees (C)
CBY51	CBY51	Combustion Turbine 1 (Simple Cycle)	15	314,227	3,292,889		200	31.33	108.6	825			
GAS-HTR	GAS-HTR	Gas Heater	15	314,149	3,292,824		50	2	23.5	250			
EMGENSC	EMGENSC	Emergency Diesel Generator	15	314,261	3,292,782		15	1	511.7	847.3			
DSL-TNK	DSL-TNK	Emergency Diesel Generator Tank	15	314,264	3,292,778		10	1	0.003	Ambient			
FUG-SCR	FUG-SCR	Ammonia Component Fugitives	15	314,191	3,292,856						160	279	8
FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	15	314,196	3,292,796						275	300	5
CBY51-LOV	CBY51-LOV	Unit 1 Lube Oil Vent	15	314,191	3,292,856		30	0.003	0.003				
FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	15	314,169	3,292,734						633	460	8

EPN = Emission Point Number
FIN = Facility Identification Number

TCEQ Core Data Form

TCEQ Use Only

For detailed instructions regarding completion of this form, please read the Core Data Form Instructions or call 512-239-5175.

SECTION I: General Information

1. Reason for Submission *(If other is checked please describe in space provided.)*

☒ New Permit, Registration or Authorization (*Core Data Form should be submitted with the program application.)*

☐ Renewal (*Core Data Form should be submitted with the renewal form)* ☐ Other

2. Customer Reference Number *(if issued)*	Follow this link to search for CN or RN numbers in Central Registry**	3. Regulated Entity Reference Number *(if issued)*
CN		RN 100825371

SECTION II: Customer Information

4. General Customer Information | **5. Effective Date for Customer Information Updates** (mm/dd/yyyy) 01/21/2020

☒ New Customer ☐ Update to Customer Information ☐ Change in Regulated Entity Ownership
☐ Change in Legal Name (Verifiable with the Texas Secretary of State or Texas Comptroller of Public Accounts)

The Customer Name submitted here may be updated automatically based on what is current and active with the Texas Secretary of State (SOS) or Texas Comptroller of Public Accounts (CPA).

6. Customer Legal Name *(If an individual, print last name first: eg: Doe, John)* — *If new Customer, enter previous Customer below:*

NRG Cedar Bayou 5, LLC

7. TX SOS/CPA Filing Number	8. TX State Tax ID (11 digits)	9. Federal Tax ID (9 digits)	10. DUNS Number *(if applicable)*
0803524698	32073158514		

11. Type of Customer: ☒ Corporation ☐ Individual Partnership: ☐ General ☐ Limited
Government: ☐ City ☐ County ☐ Federal ☐ State ☐ Other ☐ Sole Proprietorship ☐ Other:

12. Number of Employees
☐ 0-20 ☐ 21-100 ☐ 101-250 ☐ 251-500 ☐ 501 and higher

13. Independently Owned and Operated?
☐ Yes ☐ No

14. Customer Role (Proposed or Actual) – *as it relates to the Regulated Entity listed on this form. Please check one of the following:*

☐ Owner ☐ Operator ☒ Owner & Operator
☐ Occupational Licensee ☐ Responsible Party ☐ Voluntary Cleanup Applicant ☐ Other:

15. Mailing Address:							
	City		State		ZIP		ZIP + 4

16. Country Mailing Information *(if outside USA)*	17. E-Mail Address *(if applicable)*

18. Telephone Number	19. Extension or Code	20. Fax Number *(if applicable)*
( ) -		( ) -

SECTION III: Regulated Entity Information

21. General Regulated Entity Information *(If 'New Regulated Entity" is selected below this form should be accompanied by a permit application)*

☐ New Regulated Entity ☐ Update to Regulated Entity Name ☐ Update to Regulated Entity Information

The Regulated Entity Name submitted may be updated in order to meet TCEQ Agency Data Standards (removal of organizational endings such as Inc, LP, or LLC.)

22. Regulated Entity Name *(Enter name of the site where the regulated action is taking place.)*

23. Street Address of the Regulated Entity: *(No PO Boxes)*							
	City		State		ZIP		ZIP + 4
24. County							

Enter Physical Location Description if no street address is provided.

25. Description to Physical Location:	

26. Nearest City	State	Nearest ZIP Code

27. Latitude (N) In Decimal:			28. Longitude (W) In Decimal:		
Degrees	Minutes	Seconds	Degrees	Minutes	Seconds

29. Primary SIC Code (4 digits)	30. Secondary SIC Code (4 digits)	31. Primary NAICS Code (5 or 6 digits)	32. Secondary NAICS Code (5 or 6 digits)

33. What is the Primary Business of this entity? *(Do not repeat the SIC or NAICS description.)*

34. Mailing Address:							
	City		State		ZIP		ZIP + 4
35. E-Mail Address:							

36. Telephone Number	37. Extension or Code	38. Fax Number *(if applicable)*
( ) -		( ) -

39. TCEQ Programs and ID Numbers Check all Programs and write in the permits/registration numbers that will be affected by the updates submitted on this form. See the Core Data Form instructions for additional guidance.

☐ Dam Safety	☐ Districts	☐ Edwards Aquifer	☐ Emissions Inventory Air	☐ Industrial Hazardous Waste
☐ Municipal Solid Waste	☒ New Source Review Air	☐ OSSF	☐ Petroleum Storage Tank	☐ PWS
☐ Sludge	☐ Storm Water	☒ Title V Air	☐ Tires	☐ Used Oil
☐ Voluntary Cleanup	☐ Waste Water	☐ Wastewater Agriculture	☐ Water Rights	☐ Other:

SECTION IV: Preparer Information

40. Name:	Craig Eckberg	41. Title:	Sr. Director, Env. Services
42. Telephone Number	**43. Ext./Code**	**44. Fax Number**	**45. E-Mail Address**
(713) 537-2776		( ) -	craig.eckberg@nrg.com

SECTION V: Authorized Signature

46. By my signature below, I certify, to the best of my knowledge, that the information provided in this form is true and complete, and that I have signature authority to submit this form on behalf of the entity specified in Section II, Field 6 and/or as required for the updates to the ID numbers identified in field 39.

Company:	NRG Energy	Job Title:	Sr. Director, Environmental Services
Name*(In Print)* :	Craig Eckberg	Phone:	(713) 537-2776
Signature:		Date:	

VIII. FEDERAL REGULATORY REQUIREMENTS

VIII.A. NEW SOURCE PERFORMANCE STANDARDS (NSPS)

The following NSPS apply or potentially apply to this project:

Subpart A – General Provisions

The facility is in compliance with general reporting and testing requirements of the General Provisions, where applicable.

Subpart Dc – Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units

NSPS Subpart Dc applies to the proposed auxiliary boiler. However, since auxiliary boiler will fire only pipeline quality natural gas, the emission standards related to sulfur dioxide and particulate matter are not applicable. CB5, however, will maintain records of the annual capacity factor of the boilers, as required by Subpart Dc.

Subpart IIII – Standards of Performance For Stationary Compression Ignition Combustion Engines

NSPS Subpart IIII applies to the emergency engine to be installed as part of this project. CB5 will comply with Subpart IIII through the use of a Subpart IIII certified engine, proper operation and maintenance of the unit, and firing of fuel meeting federal diesel fuel specifications.

Subpart KKKK – Standards of Performance For Stationary Combustion Turbines

NSPS Subpart KKKK applies to the new turbine and HRSG. CB5 will meet the required NOx limit of 15 ppm @ 15% O2. The NOx limit is on a 30 unit operating day rolling average for combined cycle combustion turbines and a 4-hour rolling average for simple cycle units. The fuel burned will not contain total potential sulfur in excess of 0.060 lb/MMBtu.

Subpart TTTT – Standards of Performance For Stationary for Greenhouse Gas Emissions for Electric Generating Units

NSPS Subpart TTTT will applies to both the combined cycle combustion turbine and the simple cycle combustion turbine. The Subpart TTTT GHG limit for the combined cycle turbine is 1,000 lb CO_2/MWh, 12-operating month rolling average basis. The Subpart TTTT GHG limit for the simple cycle turbine is 120 lb CO_2/MMBtu, 12-operating month rolling average. The 120 lb/MMBtu limit applies to combustion turbines that supply its design efficiency or 50 percent, whichever is less, times its potential electric output or less as net-electric sales on either a 12-operating month or a 3-year rolling average basis and combusts more than 90% natural gas on a heat input basis on a 12-operating-month rolling average basis. The CB5 simple cycle turbine will be subject to the 120 lb/MMBtu limit because the annual hours of operation will be limited to 3,850 hours per year.

VIII. FEDERAL REGULATORY REQUIREMENTS

VIII.B. NATIONAL EMISSION STANDARDS FOR HAZARDOUS AIR POLLUTANTS

There are no NESHAPs (40 CFR Part 61) promulgated by the US EPA pursuant to Section 112 of the Federal Clean Air Act (FCAA) that apply to the Cedar Bayou Station**.**

VIII. FEDERAL REGULATORY REQUIREMENTS

VIII.C. MAXIMUM ACHIEVABLE CONTROL TECHNOLOGIES FOR NESHAP SOURCE CATEGORIES

The following MACT Standards apply or potentially apply to this project:

Subpart A - General Provisions

The facility is in compliance with general reporting and testing requirements of the General Provisions, where applicable.

Subpart YYYY - National Emission Standards for Hazardous Air Pollutants for Stationary Combustion Turbines

Since the site will be a major HAP source, MACT Subpart YYYY, National Emission Standards for Hazardous Air Pollutants for Stationary Gas Turbines applies to the new combustion turbine. CB5 will comply with all applicable emission standards for new lean premix gas-fired stationary combustion turbine which limits the concentration of formaldehyde to 91 parts per billion by volume, dry, (ppbvd) at 15 percent O_2. CB5 will maintain the 4-hour rolling average of the oxidation catalyst inlet temperature within the range suggested by the catalyst manufacturer.

Subpart ZZZZ - National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines

The emergency diesel engine will be subject to 40 CFR 63, Subpart ZZZZ. Per 40 CFR§63.6590(c)(1), CB5 will demonstrate compliance with 40 CFR 63, Subpart ZZZZ by complying with 40 CFR 60, Subpart IIII.

Subpart DDDDD - National Emission Standards for Hazardous Air Pollutants for Major Sources: Industrial, Commercial, and Institutional Boilers and Process Heaters

MACT Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Heaters will apply to the auxiliary boiler (EPN AUX-BLR). CB5 will comply with all applicable work practice standards including:

- Conduct a tune-up of the boiler annually;
- Conduct a one-time energy assessment performed by a qualified energy assessor.

The HRSG is classified as a "waste heat boilers" as defined in 40 CFR 63.7575 and is not subject to 40 CFR 63, Subpart DDDDD.

IX.B. DISASTER REVIEW

The new simple cycle turbine or combined cycle turbine will use aqueous ammonia in the SCR system, therefore there will not be any chemicals of concern either stored or handled in sufficient quantities or concentrations to trigger the requirement for a disaster review.

IX.C. AIR POLLUTANT WATCH LIST

There are no pollutants listed for Chambers County on the TCEQ Air Pollutant Watch List. Therefore, this section does not apply.

MEASUREMENT OF EMISSIONS

CB5 will measure emissions of regulated air contaminants through a combination of emissions performance testing and continuous emissions monitoring. Emissions measurement and testing primarily will be those associated with the following standards:

- New Source Performance Standard (40 CFR 60, Subpart KKKK), applicable to the natural gas-fired combustion turbine
- New Source Performance Standard (40 CFR 60, Subpart TTTT), applicable to the natural gas-fired combustion turbine
- New Source Performance Standard (40 CFR 60, Subpart Dc), applicable to the Auxiliary Boiler
- New Source Performance Standard (40 CFR 60, Subpart IIII), applicable to the diesel fuel-fired emergency generator
- MACT Subpart DDDDD, National Emission Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Heaters, applicable to the auxiliary boiler

In addition, as discussed in Section VIII.C of this application, CB5 will employ procedures to continuously demonstrate compliance with the requirements of the permit for those sources not subject to these NSPS subparts.

The methods used to demonstrate compliance are summarized in the following table:

METHODS OF COMPLIANCE – MEASUREMENT OF EMISSIONS

EPN	Pollutant	Demonstration Method
Combustion Turbine CBY51	NO_x	CEMS
	CO	CEMS
	SO_2, H_2SO_4, $(NH_4)_2SO_4$	Use of pipeline quality natural gas; fuel supplier certifications that fuel sulfur content limits are met
	PM/PM_{10}	Proper operation of units
	VOC	Proper operation of units
	NH_3	Method acceptable to TCEQ
	CO_2	Continuous Monitoring in accordance with 40 CFR Part 75
Auxiliary Boiler AUX-BLR	NO_x	Proper operation of unit
	CO	Proper operation of unit
	SO_2	Use of gaseous fuel; keeping of records showing fuel sulfur content
	PM/PM_{10}	Proper operation of unit
	VOC	Proper operation of unit
Piping Fugitives FUG-SCR	NH_3	Audio/visual/olfactory observations
Diesel-fired Equipment	Products of Combustion	Use of Subpart IIII certified engines, proper operation and maintenance of units, burning of fuel meeting federal diesel fuel specifications

PERFORMANCE DEMONSTRATION

CB5 will operate all process and emissions control equipment in compliance with applicable regulatory requirements and the terms of any TCEQ permit. TCEQ equipment tables in Appendix E provide available information about the design parameters for this equipment.

NONATTAINMENT APPLICABILITY DETERMINATION

The Cedar Bayou Station is located in Chambers County, which is classified as a serious nonattainment county for ozone under the federal 8-hour standard. The site is an existing major source with respect to the nonattainment new source review (NNSR) program since the site has the potential to emit over 50 tons per year (tpy) each of NOx and VOC. Although CB5 is seeking a new permit, the project is considered a modification to an existing facility for purposes of NNSR permitting, since the site is an existing major source. The site operates under a plantwide applicability limit (PAL) for NOx. CB5 will maintain NOx, emissions at or below the established PAL9 from all sources at the site, including the proposed facilities; therefore, a detailed NNSR applicability analysis is not required for NOx, and NNSR will not apply to the proposed facilities for NOx. CB5 will submit a permit alteration to add the new turbine authorized by this permit application into PAL9.

The project increases are shown on the respective Tables 1F (Air Quality Application Supplement) included in Appendix C of this application. As shown on Table 1F and 2F, the project does not exceed NNSR significance thresholds for VOC. Nonattainment review will not be triggered for VOC as a precursor for ozone, since there are no other projects in the contemporaneous period.

PSD APPLICABILITY DETERMINATION

The Cedar Bayou Station is an existing major source with respect to the prevention of significant deterioration (PSD) program since the site is a listed source category in the PSD regulations and has the potential to emit over 100 tpy of one or more attainment pollutants. Although CB5 is seeking a new permit, the project is considered a modification to an existing facility for purposes of PSD permitting, since the site is an existing major source. The site operates under a PAL limit for NOx. CB5 will maintain NOx, emissions at or below the established PAL9 from all sources at the site, including the proposed facilities; therefore, a detailed PSD applicability analysis is not required for NOx, and PSD will not apply to the proposed facilities for NOx. NRG Texas will submit a permit alteration to add the new turbine authorized by this permit application into PAL9.

The project increases are shown on the respective Tables 1F (Air Quality Application Supplement) and Table 2F (Project Emission Increase) provided in Appendix C of this application. As shown on Table 1F, the project exceeds PSD significance thresholds for VOC, CO, PM, PM_{10}, $PM_{2.5}$, H_2SO_4, and CO_2e. PSD review will be triggered for VOC, CO, PM, PM_{10}, $PM_{2.5}$, H_2SO_4 since there are no other projects in the contemporaneous period. The net emissions increase of GHG emissions also exceeds the 75,000 tpy significance level; therefore, a PSD permit must also be obtained for GHG emissions.

The TCEQ issued Permit Nos. 105810 and PSDTX1308 in August 29, 2014 authorizing NRG Texas to construct two additional natural gas fired combustion turbines to operate in either simple or combined cycle mode at the Cedar Bayou Station. Extension for start of construction of that project were authorized and the new date by which construction had to commence was extended to April 15, 2020. CB5 does not anticipate the previously permitted project will be built. The application being submitted by CB5 to construct a much more efficient simple or combined cycle gas turbine will supplant the previously permitted project. CB5 anticipates the TCEQ will issue a permit for the new project after April 15, 2020, after authorization to construct the previously authorized project has lapsed. For this reason, the previous project has not been represented in contemporaneous netting.

The contemporaneous period for this project is defined as the period between the date the increase from the proposed change occurs and 60 months (5 years) prior to the date that construction of the proposed Project commences. Because construction of the project is expected to commence on December 31, 2020, the contemporaneous period for this project extends from June December 31, 2015 to the anticipated start of operation date, which is June 1, 2022. The only emissions changes occurring at the Cedar Bayou Station during the contemporaneous period are the emissions associated with this project. Because the contemporaneous period only includes emission increases, the project emission increases are equal to the net emissions increases.

The net emissions increase from the project were calculated based on the potential to emit and annual operating hours. The maximum project emissions increase is associated with the combined cycle configuration. These annual emission calculations are shown in Appendix A to this application. Since PSD applicability for the project is the same based upon either the project PTE or project net PTE, this application uses the Tables 1F and 2F and not Table 3F to simply report the project PTE.

An air quality modeling analysis is being submitted to demonstrate the proposed emissions will not cause or contribute to a violation of any National Ambient Air Quality Standard (NAAOS) or PSD increment for pollutants subject to PSD review (CO and $PM/PM_{10}/PM_{2.5}$). There are no NAAQS or PSD increments for H_2SO_4. The TCEQ may also require a demonstration of compliance with the NAAQS and TCEQ property line standards for other pollutants. Modeling will be performed based on guidance from the

TCEQ during application review. The results of these analyses will be submitted to the TCEQ in a separate document.

Aspects of the PSD analysis related to impacts on soils, vegetation, visibility, and Class I areas, as well as the demonstration that the proposed project will not cause exceedances of the NAAQS and the PSD increments will be included in the air quality analysis report (the dispersion modeling analysis) to be provided as a separate submittal.

PSD regulations require collection of up to one year of pre-construction ambient air quality monitoring data for each pollutant subject to PSD review unless the air quality impacts from the proposed source or modification are shown to be de minimis. The PSD regulations contain de minimis levels for each pollutant. The air quality impact analysis, which will be submitted separately from this application, is expected to demonstrate that the project is exempt from preconstruction monitoring. The report documenting the modeling analysis will verify this assumption. In the event that de minimis pre-construction monitoring levels are exceeded, representative ambient monitoring data from existing nearby monitors may be used in lieu of pre-construction monitoring.

This permit application contains a demonstration that the proposed new facilities will utilize BACT to control emissions.

EXISTING AUTHORIZATIONS

Existing authorizations for the Cedar Bayou Station are summarized by Emission Point Number (EPN) in the table below.

EPN	Description	Existing Authorization
Emission Point No.	**Emission Point Description**	**New Source Review Authorization**
CBY1	Cedar Bayou Unit 1	1532
CBY1	Cedar Bayou Unit 2	1532
CBY41	Cedar Bayou 4	80289
CBY42	Cedar Bayou 4	80289
CBAB2N	Auxiliary Boiler	49590
CBAB3N	Auxiliary Boiler	49590
CBAB	Auxiliary Boiler AB1	53235

PERMIT FEE

Pursuant to 30 TAC §116.163(e) for PSD permit reviews, CB5 is remitting a fee of $75,000. Since the maximum potential fee amount is being remitted, a Table 30 fee calculation sheet is not necessary and so is not included. A copy of the permit fee check is included in this section.

NRG Texas Power LLC

REFERENCE NUMBER	DATE	VOUCHER	GROSS AMOUNT	DISCOUNT	NET AMOUNT
031120	03/11/2020	1700082237	$75,000.00	0.00	$75,000.00

RECEIVED
MAR 1 8 2020
TCEQ/Revenue Section

COPY

CHECK NUMBER	DATE	VENDOR NUMBER	VENDOR NAME	TOTAL AMOUNT
07000290	03/11/20	0000239689	TEXAS COMMISSION ON ENVIRONMENTAL	$75,000.00

0022

Refer to above check number and voucher number when inquiring about your payment

nrg

60-160
433

Bank Of New York Mellon
Pittsburgh, PA 15262

Date: 03/11/2020
Check Number: 07000290
Vendor Number: 0000239689

NRG Texas Power LLC
804 Carnegie Center,
Princeton, NJ 08540

COPY

PAY *Seventy five thousand and 00/100 Dollars*

Pay Exactly
****$75,000.00

TO THE
ORDER OF

TEXAS COMMISSION ON ENVIRONMENTAL Q
PO BOX 13089
AUSTIN TX 78711-3089

AUTHORIZED SIGNATURE
VOID WITHOUT SIGNATURE
VOID AFTER NINETY DAYS

⑈07000290⑈ ⑆043301601⑆ 185⑈0904⑈

APPENDIX A EMISSION CALCULATIONS FOR CRITERIA POLLUTANTS

Table A-1
Emission Source Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Description	FIN	EPN
Combustion Turbine 1 (Combined Cycle)	CBY51	CBY51
Combustion Turbine 1 (Simple Cycle)	CBY51	CBY51
Auxiliary Boiler	AUX-BLR	AUX-BLR
Gas Heater	GAS-HTR	GAS-HTR
Emergency Diesel Generator	EMGEN	EMGEN
Unit 1 Lube Oil Vent	CBY51-LOV	CBY51-LOV
Steam Turbine 1 Lube Oil Vent	CBYST1-LOV	CBYST1-LOV
Cooling Tower	C-TOWER1	C-TOWER1
Natural Gas Component Fugitives	FUG-NGAS	FUG-NGAS
Ammonia Component Fugitives	FUG-SCR	FUG-SCR
Emergency Diesel Generator Tank	DSL-TNK	DSL-TNK
Planned Maintenance Activities Fugitives	FUG-MSS	FUG-MSS

Table A-2
Emission Calculations - Maximum Hourly Turbine
Normal Operating Conditions
M501JAC Combined Cycle - Single Unit
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

OPERATING CONDITIONS:		Case 1	Case 13	Case 14	Case 16	Case 18	Case 24	Case 25	Case 26	Case 28
		Fired	Fired			MECL	Fired			MECL
		Base	Base	Base	75% Load	35% Load	Base	Base	75% Load	41.9% Load
		Evap On	Evap On	Evap On	Evap Off	Evap Off	Evap Off	Evap Off	Evap Off	Evap Off
		Input	Input	Input	Input	Input				
Ambient Dry Bulb Temperature	ºF	97	59	59	59	59	10	10	10	10
Ambient Relative Humidity	%	45	60	60	60	60	75	75	75	75
Ambient Pressure	psia	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431	14.685431
NATURAL GAS FUEL PROPERTIES:										
Natural Gas Fuel	BTU/lb - HHV	23,643	23,643	23,643	23,643	23,643	23,643	23,643	23,643	23,643
Heating Value, Natural Gas	BTU/scf - HHV	1022	1022	1022	1022	1022	1022	1022	1022	1022
Natural Gas MW	lb/lbmole	16.41	16.41	16.41	16.41	16.41	16.41	16.41	16.41	16.41
Sulfur Content, Natural Gas 1-Hr	grains S/100 scf	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulfur Content, Natural Gas Annual	grains S/100 scf	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
CTG EFFECTS:										
Evaporative cooler On/Off		On	On	On	Off	Off	Off	Off	Off	Off
Evaporative cooler effectiveness	%	90	90	90	0	0	0	0	0	0
GT output power	kW	687,485	710,427	630,237	488,077	290,662	724,203	642,646	520,656	346,229
Heat Input	MMBTU/hr - HHV	3,657.0	3,794.8	3,797.1	3,003.5	2,044.4	3,885.5	3,889.0	3,238.9	2,395.9
DUCT BURNER EFFECTS:										
Duct Burner Heat Rate	MMBTU/hr - HHV	674	628	0	0	0	643	0	0	0
DB Fuel Flow	lb/hr	28,508	26,568	0	0	0	27,186	0	0	0
DB Fuel Flow	scf/hr	659,596	614,716	0	0	0	628,997	0	0	0
DB Fuel Flow	mol/hr	1,737	1,619	0	0	0	1,657	0	0	0
CTG & DUCT BURNER COMBINED EXHAUST:										
HRSG stack exhaust gas mass flow	lb_m/hr	5,810,888	5,997,649	5,971,080	4,854,180	3,919,860	6,016,626	5,989,440	5,220,360	4,303,380
HRSG stack gas temperature	°F	171.9	169.0	178.0	171.7	165.3	162.7	176.2	174.4	169.3
HRSG stack gas N2 volume percentage	%	71.50	72.98	73.54	73.80	74.29	73.67	74.25	74.43	74.74
HRSG stack gas O2 volume percentage	%	8.58	9.01	10.63	10.95	12.38	8.87	10.53	11.00	11.95
HRSG stack gas CO2 volume percentage	%	5.35	5.35	4.61	4.49	3.84	5.51	4.75	4.53	4.10
HRSG stack gas H2O volume percentage	%	13.66	11.74	10.29	9.83	8.55	11.03	9.54	9.10	8.27
HRSG stack gas Ar volume percentage	%	0.90	0.92	0.93	0.93	0.94	0.92	0.93	0.94	0.94
HRSG stack gas O2 volume percentage - Dry Basis	%	9.94	10.21	11.85	12.14	13.54	9.97	11.64	12.10	13.03
HRSG stack gas molecular weight		27.95	28.17	28.26	28.30	28.38	28.26	28.35	28.38	28.43
HRSG stack PM	lb/hr	23.71	23.77	14.30	11.48	8.47	24.23	14.48	12.39	6.43
Exit Flow Rate	lb_{mol}/hr	207,867	212,942	211,305	171,540	138,121	212,932	211,257	183,944	151,356
Exit Flow Rate	lb_{mol}/hr - dry	179,469	187,937	189,562	154,678	126,312	189,440	191,103	167,205	138,838
Exit Flow Rate	scf/hr	80,132,804	82,089,297	81,458,239	66,128,787	53,245,820	82,085,250	81,439,525	70,910,348	58,347,569
Exit Flow Rate	scf/hr - dry	69,185,250	72,449,745	73,076,186	59,628,327	48,693,302	73,029,205	73,670,195	64,457,506	53,522,225
CTG & DUCT BURNER COMBINED EXHAUST:										
NO_X	ppmvd@15%O_2	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
NO_X	ppmvd	3.71631	3.62492	3.06804	2.96823	2.49578	3.70473	3.13881	2.98264	2.66869
NO_X as NO_2	lb/hr	30.68	31.34	26.76	21.12	14.50	32.29	27.60	22.94	17.05
CO	ppmvd@15%O_2	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
CO	ppmvd	6.50	6.34	5.37	5.19	4.37	6.48	5.49	5.22	4.67
CO	lb/hr	32.69	33.39	28.51	22.51	15.45	34.40	29.40	24.45	18.16
VOC, as CH_4	ppmvd@15%O_2	1	1	0.9	0.9	0.9	1	0.9	0.9	0.9
VOC, as CH_4	ppmvd	1.86	1.81	1.38	1.34	1.12	1.85	1.41	1.34	1.20
VOC, as CH_4	lb/hr	5.35	5.46	4.20	3.31	2.28	5.63	4.33	3.60	2.67
H_2CO	ppmvd@15%O_2	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0	91.0
H_2CO	ppmvd	169.09	164.93	139.60	135.05	113.56	168.57	142.82	135.71	121.43
H_2CO	lb/hr	0.91	0.93	0.79	0.63	0.43	0.96	0.82	0.68	0.51
NH_3	ppmvd@15%O_2	7	7	7	7	7	7	7	7	7
NH_3	ppmvd	13.01	12.69	10.74	10.39	8.74	12.97	10.99	10.44	9.34
NH_3	lb/hr	39.75	40.61	34.67	27.37	18.79	41.83	35.75	29.73	22.08
SO_2, Maximum Hourly	lb/hr	12.10	12.36	10.61	8.39	5.71	12.65	10.86	9.05	6.69
SO_2, Annual Average	lb/hr	6.05	6.18	5.30	4.19	2.86	6.32	5.43	4.52	3.35
SO_2 to SO_3 Conversion in Turbine	%	5	5	5	5	5	5	5	5	5
SO_2 to SO_3 Conversion in Duct Burner	%	10	10	0	0	0	10	0	0	0
SO_2 to SO_3 Conversion in Catalyst Beds	%	40	40	40	40	40	40	40	40	40
H_2SO_4, Maximum Hourly (100% converted SO_3)	lb/hr	8.74	8.94	6.98	5.52	3.76	9.16	7.15	5.96	4.41
H_2SO_4, Annual Average (100% converted SO_3)	lb/hr	4.37	4.47	3.49	2.76	1.88	4.58	3.58	2.98	2.20
$(NH_4)_2SO_4$, Maximum Hourly (100% converted SO_3)	lb/hr	11.77	12.05	9.41	7.44	5.07	12.34	9.63	8.02	5.94
$(NH_4)_2SO_4$, Annual Average (100% converted SO_3)	lb/hr	5.89	6.03	4.70	3.72	2.53	6.17	4.82	4.01	2.97
PM FH+BH, Maximum Hourly (including Sulfates)	lb/hr	35.49	35.83	23.70	18.92	13.53	36.57	24.12	20.41	12.37
PM FH+BH, Annual Average (including Sulfates)	lb/hr	29.60	29.80	19.00	15.20	11.00	30.40	19.30	16.40	9.40

Table A-3
Sample Emission Calculations
M501JAC Combined Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Case 24		
Exhaust Flow Rate	6,016,626	lb/hr
Exhaust Flow MW	28.26	lb/lbmole
CTG Heat Input	3,886	MMBtu / hr, HHV
DB Heat Input.	643	MMBtu / hr, HHV
Natural Gas	1,021.9	Btu / scf, HHV
Exhaust Content	8.87	% O2 wet
Exhaust Content	11.03	% H2O

Exhaust Flow = $\frac{6{,}016{,}626 \text{ lb exhaust}}{\text{hr}} \left| \frac{\text{lbmole}}{28.26 \text{ lb}} \right| \frac{1 - (11.03\%\ H2O)/100)}{}$ = 189,440.2 lbmole/hr (dry)

Convert Oxygen Concentration to Dry Basis

$O_2 = \frac{8.87\ \%\ O2\ \text{wet}}{(1 - (11.03\ \%\ H20)\ /100))}$ = 9.97 % dry

Natural Gas Usage

CTG NG Flow = $\frac{3{,}886 \text{ MMBtu HHV}}{\text{hr}} \left| \frac{1{,}000{,}000 \text{ Btu}}{\text{MMBtu}} \right| \frac{\text{scf}}{1{,}021.9 \text{ MMBtu HHV}}$ = 3,802,397.2 scfh

DB NG Flow = $\frac{643 \text{ MMBtu HHV}}{\text{hr}} \left| \frac{1{,}000{,}000 \text{ Btu}}{\text{MMBtu}} \right| \frac{\text{scf}}{1{,}021.9 \text{ MMBtu HHV}}$ = 628,997.3 scfh

Total NG Flow = 3,802,397.2 scfh + 628,997.3 scfh = 4,431,394.5 scfh

Gaseous Pollutant Sample Calculation - Oxides of Nitrogen (NOx)

Emission Factor	2.0	ppmvd NOx @ 15% O_2
NO_2 MW	46.01	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Oxides of Nitrogen

Emission Factor = $\frac{2.0 \text{ ppmd @ 15\%}}{} \left| \frac{(20.9 - 9.97\ O2\%\ \text{dry})}{(20.9 - 15)} \right.$ = 3.7 ppmvd NOx

Emission Rate Calculation - Oxides of Nitrogen

ST Emissions = $\frac{3.7 \text{ lbmole NOx}}{1{,}000{,}000 \text{ lbmole exhaust}} \left| \frac{189{,}440 \text{ lbmole exhaust}}{\text{hr}} \right| \frac{46.01 \text{ lb NOx/lb mole}}{\text{lbmole NOx}}$ = 32.29 lb/hr NOx as NO2

Gaseous Pollutant Sample Calculation - Carbon Monoxide (CO)

Emission Factor	3.5	ppmvd CO @ 15% O_2
CO MW	28.01	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Carbon Monixide

Emission Factor = $\frac{3.5 \text{ ppmd @ 15\%}}{} \left| \frac{(20.9 - 9.97\ O2\%\ \text{dry})}{(20.9 - 15)} \right.$ = 6.48 ppmvd CO

Emission Rate Calculation - Carbon Monoxide

ST Emissions = $\frac{6.48 \text{ lbmole CO}}{1{,}000{,}000 \text{ lbmole exhaust}} \left| \frac{189{,}440 \text{ lbmole exhaust}}{\text{hr}} \right| \frac{28.01 \text{ lb CO/lb mole}}{\text{lbmole CO}}$ = 34.4 lb/hr CO

Gaseous Pollutant Sample Calculation - Volatile Organic Compound (VOC)

Emission Factor	1.0	ppmvd VOC @ 15% O_2
VOC MW	16.04	lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - VOC

Emission Factor = $\frac{1.0 \text{ ppmd @ 15\%}}{} \left| \frac{(20.9 - 9.97\ O2\%\ \text{dry})}{(20.9 - 15)} \right.$ = 1.85 ppmvd VOC

Emission Rate Calculation - VOC

ST Emissions = $\frac{1.85 \text{ lbmole VOC}}{1{,}000{,}000 \text{ lbmole exhaust}} \left| \frac{189{,}440 \text{ lbmole exhaust}}{\text{hr}} \right| \frac{16.04 \text{ lb VOC/lb mole}}{\text{lbmole VOC}}$ = 5.63 lb/hr VOC

Table A-3
Sample Emission Calculations
M501JAC Combined Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Sample Calculation - Sulfur Dioxide (SO_2), Sulfuric Acid (H_2SO_4) and Ammonium Sulfate $(NH_4)_2SO_4$

Emission Factor	1	grain S / 100 scf, Natural Gas, Max Hourly
Emission Factor	0.5	grain S / 100 scf, Natural Gas, Annual Average
S MW	32.06	lb / lb_{mole}
SO_2 MW	64.06	lb / lb_{mole}
H_2SO_4 MW	98.07	lb / lb_{mole}
$(NH_4)_2SO_4$ MW	132.13	lb / lb_{mole}

Sample Calculation - Sulfur Dioxide (SO_2)

$$\text{CTG/DB ST Emissions} = \frac{1 \text{ grain S}}{100 \text{ scf}} \left| \frac{\text{lb}}{7000 \text{ grain}} \right| \frac{4{,}431{,}395 \text{ Total NG scf}}{\text{hr}} \left| \frac{64.06 \text{ lbmole SO2}}{32.06 \text{ lbmole S}} \right. = 12.65 \text{ lb/hr SO2}$$

Sample Calculation - Sulfuric Acid (H_2SO_4)

SO2 to SO3 Conversion in Turbine	5	%
SO2 to SO3 Conversion in Duct Burner	10	%
SO2 to SO3 Conversion in Catalyst Beds	40	%

$$\text{Turbine Conversion} = \frac{1 \text{ grain S}}{100 \text{ scf}} \left| \frac{\text{lb S}}{7000 \text{ grain}} \right| \frac{3{,}802{,}397 \text{ scf NG to CGT}}{\text{hr}} \left| \frac{\text{lbmole SO2}}{32.06 \text{ lb S}} \right.$$

$$\left| \frac{(5/100) \text{ lbmole SO3}}{\text{lbmole SO2}} \right| \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \left| \frac{98.07 \text{ lb H2SO4}}{\text{lbmole H2SO4}} \right. = 0.8 \text{ lb/hr H2SO4}$$

$$\text{Duct Burner Conversion} = 1 - (5/100) \left| \frac{3{,}802{,}397 \text{ scf NG to CGT}}{\text{hr}} \right| \frac{1 \text{ grain S}}{100 \text{ scf}} \left| \frac{\text{lb S}}{7000 \text{ grain}} \right| \frac{\text{lbmole SO2}}{32.06 \text{ lb S}}$$

$$\left| \frac{(10/100) \text{ lbmole SO3}}{\text{lbmole SO2}} \right| \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \left| \frac{98.07 \text{ lb H2SO4}}{\text{lbmole H2SO4}} \right. = 1.6 \text{ lb/hr H2SO4}$$

$$\text{Catalyst Bed Conversion} = \frac{(1 - (5 + 10)/100)) * 3{,}802{,}397) \text{ scf NG to CGT} + 628{,}997 \text{ scf NG to DB}}{\text{hr}} \left| \frac{1 \text{ grain S}}{100 \text{ scf}} \right| \frac{\text{lb S}}{7000 \text{ grain}}$$

$$\left| \frac{\text{lbmole SO2}}{32.06 \text{ lb S}} \right| \frac{(40/100) \text{ lbmole SO3}}{\text{lbmole SO2}} \left| \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \right| \frac{98.07 \text{ lb H2SO4}}{\text{lbmole H2SO4}} = 6.7 \text{ lb/hr H2SO4}$$

Total H2SO4 = 0.8 lb/hr + 1.6 lb/hr +6.7 lb/hr = 9.2 lb/hr H2SO4

Sample Calculation - Ammonium Sulfate ($(NH_4)_2SO_4$)

Assume 100% of H_2SO_4.converts to $(NH_4)_2SO_4$.

$$\text{ST Emissions} = \frac{9.2 \text{ lb H2SO4}}{\text{hr}} \left| \frac{\text{lbmole H2SO4}}{98 \text{ lb H2SO4}} \right| \frac{\text{lbmole (NH4)2SO4}}{\text{lbmole H2SO4}} \left| \frac{132 \text{ lb (NH4)2SO4}}{\text{lbmole (NH4)2SO4}} \right.$$

= 12.34 lb/hr (NH4)2(SO4) lb/hr

Sample Calculation - Particulate Matter ($PM_{10}/PM_{2.5}$)

CTG Emission Rate =	24.23	lb/hr, front and back half, vendor supplied
(NH4)2SO4 Emissions =	12.34	lb/hr
Total PM =	36.57	lb/hr

Table A-4
Emission Calculations - Maximum Hourly Turbine
Normal Operating Conditions
M501JAC Simple Cycle - Single Unit
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

ERATING CONDITIONS:		1	13	15	17	22	23	25
		WC			MECL			MECL
		Base	Base	80% Load	35.1% Load	Base	80% Load	43.9% Load
		Evap On	Evap On	Evap Off	Evap Off	Evap Off	Evap Off	Evap Off
Ambient Dry Bulb Temperature	ºF	97	59	59	59	10	10	10
Ambient Relative Humidity	%	45	60	60	60	75	75	75
Ambient Pressure	psia	14.69	14.69	14.69	14.69	14.69	14.69	14.69
TURAL GAS FUEL PROPERTIES:								
Natural Gas Fuel	BTU/lb - HHV	23,643	23,643	23,643	23,643	23,643	23,643	23,643
Heating Value, Natural Gas	BTU/scf - HHV	1022	1022	1022	1022	1022	1022	1022
Natural Gas MW	lb/lbmole	16.41	16.41	16.41	16.41	16.41	16.41	16.41
Sulfur Content, Natural Gas 1-Hr	grains S/100 scf	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Sulfur Content, Natural Gas Annual	grains S/100 scf	0.5	0.5	0.5	0.5	0.5	0.5	0.5
G EFFECTS:								
Evaporative cooler On/Off		On	On	Off	Off	Off	Off	Off
Evaporative cooler effectiveness	%	90	90	0	0	0	0	0
GT output power	kW	410,868	419,568	333,707	146,243	432,929	362,293	189,950
Heat Input	MMBTU/hr - LHV	3,397	3,409	2,822	1,859	3,490	3,048	2,144
Heat Input	MMBTU/hr - HHV	3,767	3,780	3,130	2,062	3,871	3,380	2,378
G & DUCT BURNER COMBINED EXHAUST:								
HRSG stack exhaust gas mass flow	lb_m/hr	9,516,171	9,399,447	8,088,635	6,558,693	9,176,365	8,262,762	6,956,166
HRSG stack gas temperature	°F	825.0	825.0	825.0	825.0	825.0	825.0	825.0
HRSG stack gas N2 volume percentage	%	73.22	74.88	75.08	75.5	75.5	75.57	75.95
HRSG stack gas O2 volume percentage	%	13.98	14.23	14.49	15.66	14.04	14.26	15.31
HRSG stack gas CO2 volume percentage	%	2.872	2.98	2.869	2.331	3.159	3.058	2.573
HRSG stack gas H2O volume percentage	%	9.023	6.986	6.625	5.582	6.37	6.175	5.226
HRSG stack gas Ar volume percentage	%	0.9059	0.9303	0.9303	0.9303	0.933	0.9396	0.9396
HRSG stack gas O2 volume percentage - Dry Basis	%	15.3647	15.2944	15.5228	16.5863	14.9926	15.1984	16.1568
HRSG stack gas molecular weight		28.24	28.47	28.5	28.56	28.55	28.57	28.63
HRSG stack PM	lb/hr	9.30	9.60	8.12	6.03	9.69	8.85	6.68
Exit Flow Rate	lb_{mol}/hr	337,006	330,142	283,811	229,608	321,369	289,241	242,999
Exit Flow Rate	lb_{mol}/hr - dry	306,599	307,078	265,009	216,792	300,898	271,380	230,301
Exit Flow Rate	scf/hr	129,915,860	127,269,562	109,408,959	88,513,716	123,887,667	111,502,277	93,676,131
Exit Flow Rate	scf/hr - dry	118,193,952	118,378,542	102,160,928	83,573,283	115,996,014	104,616,957	88,780,899
G & DUCT BURNER COMBINED EXHAUST:								
NO_X	ppmvd@15%O2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
NO_X	ppmvd	2.34545	2.37524	2.27847	1.82784	2.50312	2.41593	2.00981
NO_X as NO_2	lb/hr	33.08	33.56	27.78	18.23	34.65	30.16	21.29
CO	ppmvd@15%O2	3.5	3.5	3.5	3.5	3.5	3.5	3.5
CO	ppmvd	3.28	3.33	3.19	2.56	3.50	3.38	2.81
CO	lb/hr	28.20	28.60	23.68	15.54	29.54	25.71	18.15
VOC, as CH_4	ppmvd@15%O2	1.5	1.5	1.5	1.5	1.5	1.5	1.5
VOC, as CH_4	ppmvd	1.41	1.43	1.37	1.10	1.50	1.45	1.21
VOC, as CH_4	lb/hr	6.92	7.02	5.81	3.81	7.25	6.31	4.46
H_2CO	ppbvd@15%O2	91.0	91.0	91.0	91.0	91.0	91.0	91.0
H_2CO	ppmvd	85.37	86.46	82.94	66.53	91.11	87.94	73.16
H_2CO	lb/hr	0.79	0.80	0.66	0.43	0.82	0.72	0.51
NH_3	ppmvd@15%O2	10	10	10	10	10	10	10
NH_3	ppmvd	9.38	9.50	9.11	7.31	10.01	9.66	8.04
NH_3	lb/hr	48.99	49.69	41.13	26.99	51.31	44.66	31.53
SO_2, Maximum Hourly	lb/hr	10.52	10.56	8.74	5.76	10.81	9.44	6.64
SO_2, Annual Average	lb/hr	5.26	5.28	4.37	2.88	5.41	4.72	3.32
SO_2 to SO_3 Conversion in Turbine	%	5	5	5	5	5	5	5
SO_2 to SO_3 Conversion in Catalyst Beds	%	40	40	40	40	40	40	40
H_2SO_4, Maximum Hourly (100% converted SO_3)	lb/hr	6.93	6.95	5.75	3.79	7.12	6.22	4.37
H_2SO_4, Annual Average (100% converted SO_3)	lb/hr	3.46	3.48	2.88	1.90	3.56	3.11	2.19
$(NH_4)_2SO_4$, Maximum Hourly (100% converted SO_3)	lb/hr	9.33	9.36	7.75	5.11	9.59	8.37	5.89
$(NH_4)_2SO_4$, Annual Average (100% converted SO_3)	lb/hr	4.67	4.68	3.88	2.55	4.79	4.19	2.95
PM FH+BH, Maximum Hourly (including Sulfates and VOC)	lb/hr	18.63	18.96	15.88	11.14	19.28	17.22	12.57
PM FH+BH, Annual Average (including Sulfates and VOC)	lb/hr	13.97	14.28	12.00	8.59	14.49	13.04	9.63

Table A-5
Sample Emission Calculations
M501JAC Simple Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Case 22		
Exhaust Flow Rate	9,176,365	lb/hr
Exhaust Flow MW	28.55	lb/lbmole
CTG Heat Input	3,871	MMBtu / hr, HHV
Natural Gas	1,021.9	Btu / scf, HHV
Exhaust Content	14.04	% O2 wet
Exhaust Content	6.37	% H2O

Exhaust Flow = $\frac{9,176,365 \text{ lb exhaust}}{\text{hr}} \Big| \frac{\text{lbmole}}{28.55 \text{ lb}} \Big| \frac{1 - (6.37\% \text{ H2O})/100)}{}$ = 300,897.6 lbmole/hr (dry)

Convert Oxygen Concentration to Dry Basis

O_2 = $\frac{14.04 \text{ \% O2 wet}}{(1 - (6.37 \text{ \% H20) /100))}}$ = 14.99 % dry

Natural Gas Usage

CTG NG Flow = $\frac{3,871 \text{ MMBtu HHV}}{\text{hr}} \Big| \frac{1,000,000 \text{ Btu}}{\text{MMBtu}} \Big| \frac{\text{scf}}{1,021.9 \text{ MMBtu HHV}}$ = 3,787,785.8 scfh

Gaseous Pollutant Sample Calculation - Oxides of Nitrogen (NOx)

Emission Factor 2.5 ppmvd NOx @ 15% O_2

NO_2 MW 46.01 lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Oxides of Nitrogen

Emission Factor = $\frac{2.5 \text{ ppmd @ 15\%}}{} \Big| \frac{(20.9 - 14.99 \text{ O2\% dry})}{(20.9 - 15)}$ = 2.5 ppmvd NOx

Emission Rate Calculation - Oxides of Nitrogen

ST Emissions = $\frac{2.5 \text{ lbmole NOx}}{1,000,000 \text{ lbmole exhaust}} \Big| \frac{300,898 \text{ lbmole exhaust}}{\text{hr}} \Big| \frac{46.01 \text{ lb NOx/lb mole}}{\text{lbmole NOx}}$ = 34.65 lb/hr NOx as NO2

Gaseous Pollutant Sample Calculation - Carbon Monoxide (CO)

Emission Factor 3.5 ppmvd CO @ 15% O2

CO MW 28.01 lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Carbon Monoxide

Emission Factor = $\frac{3.5 \text{ ppmd @ 15\%}}{} \Big| \frac{(20.9 - 14.99 \text{ O2\% dry})}{(20.9 - 15)}$ = 3.5 ppmvd CO

Emission Rate Calculation - Carbon Monoxide

ST Emissions = $\frac{3.5 \text{ lbmole CO}}{1,000,000 \text{ lbmole exhaust}} \Big| \frac{300,898 \text{ lbmole exhaust}}{\text{hr}} \Big| \frac{28.01 \text{ lb CO/lb mole}}{\text{lbmole CO}}$ = 29.54 lb/hr CO

Gaseous Pollutant Sample Calculation - Volatile Organic Compound (VOC)

Emission Factor 1.5 ppmvd VOC @ 15% O2

VOC MW 16.04 lb / lb_{mole}

Emission Factor Corrected for Actual Oxygen Concentration - Volatile Organic Compound

Emission Factor = $\frac{1.5 \text{ ppmd @ 15\%}}{} \Big| \frac{(20.9 - 14.99 \text{ O2\% dry})}{(20.9 - 15)}$ = 1.5 ppmvd VOC

Emission Rate Calculation - Volatile Organic Compound

ST Emissions = $\frac{1.5 \text{ lbmole VOC}}{1,000,000 \text{ lbmole exhaust}} \Big| \frac{300,898 \text{ lbmole exhaust}}{\text{hr}} \Big| \frac{16.04 \text{ lb CO/lb mole}}{\text{lbmole CO}}$ = 7.25 lb/hr VOC

Table A-5
Sample Emission Calculations
M501JAC Simple Cycle Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Sample Calculation - Sulfur Dioxide (SO_2), Sulfuric Acid (H_2SO_4) and Ammonium Sulfate $(NH_4)_2SO_4$

Emission Factor	1	grain S / 100 scf, Natural Gas, Max Hourly
Emission Factor	0.5	grain S / 100 scf, Natural Gas, Annual Average
S MW	32.06	lb / lb_{mole}
SO_2 MW	64.06	lb / lb_{mole}
H_2SO_4 MW	98.07	lb / lb_{mole}
$(NH_4)_2SO_4$ MW	132.13	lb / lb_{mole}

Sample Calculation - Sulfur Dioxide (SO_2)

CTG/DB ST Emissions = $\frac{\text{1 grain S}}{\text{100 scf}} \Big| \frac{\text{lb}}{\text{7000 grain}} \Big| \frac{\text{3,787,786 Total NG scf}}{\text{hr}} \Big| \frac{\text{64.06 lbmole SO2}}{\text{32.06 lbmole S}}$ = 10.81 lb/hr SO2

Sample Calculation - Sulfuric Acid (H_2SO_4)

SO2 to SO3 Conversion in Turbine	5	%
SO2 to SO3 Conversion in Catalyst Beds	40	%

Turbine Conversion = $\frac{\text{1 grain S}}{\text{100 scf}} \Big| \frac{\text{lb S}}{\text{7000 grain}} \Big| \frac{\text{3,787,786 scf NG to CGT}}{\text{hr}} \Big| \frac{\text{lbmole SO2}}{\text{32.06 lb S}}$

$\Big| \frac{\text{(5/100) lbmole SO3}}{\text{lbmole SO2}} \Big| \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \Big| \frac{\text{98.07 lb H2SO4}}{\text{lbmole H2SO4}}$ = 0.8 lb/hr H2SO4

Catalyst Bed Conversion = $\frac{\text{(1 - 5/100)) * 3,787,786) scf NG to CGT}}{\text{hr}} \Big| \frac{\text{1 grain S}}{\text{100 scf}} \Big| \frac{\text{lb S}}{\text{7000 grain}} \Big|$

$\Big| \frac{\text{lbmole SO2}}{\text{32.06 lb S}} \Big| \frac{\text{(40/100) lbmole SO3}}{\text{lbmole SO2}} \Big| \frac{\text{lbmole H2SO4}}{\text{lbmole SO3}} \Big| \frac{\text{98.07 lb H2SO4}}{\text{lbmole H2SO4}}$ = 6.3 lb/hr H2SO4

Total H2SO4 = 0.8 lb/hr + 6.3 lb/hr = 7.12 lb/hr H2SO4

Sample Calculation - Ammonium Sulfate ($(NH_4)_2SO_4$)

Assume 100% of H_2SO_4.converts to $(NH_4)_2SO_4$.

ST Emissions = $\frac{\text{7.1 lb H2SO4}}{\text{hr}} \Big| \frac{\text{lbmole H2SO4}}{\text{98 lb H2SO4}} \Big| \frac{\text{lbmole (NH4)2SO4}}{\text{lbmole H2SO4}} \Big| \frac{\text{132 lb (NH4)2SO4}}{\text{lbmole (NH4)2SO4}}$

= 9.59 lb/hr (NH4)2(SO4) lb/hr

Sample Calculation - Particulate Matter ($PM_{10}/PM_{2.5}$)

CTG Emission Rate =	9.69	lb/hr, front and back half, vendor supplied
(NH4)2SO4 Emissions =	9.59	lb/hr
Total PM =	19.28	lb/hr

Table A-6
Hourly Emission Summary
Normal Operating Conditions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

M501JAC Combined Cycle

Pollutant	Maximum For Averaging Period	Single Turbine (lb/hr)					
		Maximum Hourly	MSS Max Hourly (Cold Start)			Annual	Annual
		Case 24 Fired Base Evap Off 10 °F lb/hr	MSS Emissions lbs	MSS Duration minutes	First Hour Emissions MSS/Routine lb/hr	Case 13 Duct Fired Base Evap On 59 °F lb/hr	Case 14 No Duct Firing Base Evap On 59 °F lb/hr
NO_X	1-Hour	32.29	22	19	43.96		
	Annual					31.34	26.76
CO	1-Hour	34.40	510	19	533.39		
	Annual					33.39	28.51
VOC	1-Hour	5.630	73	19	76.83		
	Annual					5.46	4.20
SO_2	1-Hour	12.65					
	Annual					6.18	5.30
Particulates (FH&BH)	1-Hour	36.57					
	Annual					29.80	19.00
H_2SO_4	1-Hour	9.16					
	Annual					4.47	3.49
NH_3	1-Hour	41.83					
	Annual					40.61	34.67
$(NH_4)_2SO_4$	1-Hour	12.34					
	Annual					6.03	4.70

M501JAC Simple Cycle

Pollutant	Maximum For Averaging Period	Single Turbine				
		Maximum Hourly	MSS Max Hourly (Cold Start)			Annual
		Case 22 Base Load; 10 F lb/hr	MSS Emissions lbs	MSS Duration minutes	First Hour Emissions MSS/Routine lb/hr	Case 13 Base Load; 59 F lb/hr
NO_X	1-Hour	34.65	15	20	38.10	
	Annual					33.56
CO	1-Hour	29.54	237	20	256.69	
	Annual					28.60
VOC	1-Hour	7.250	58	20	62.83	
	Annual					7.02
SO_2	1-Hour	10.81				
	Annual					5.28
Particulates (FH&BH)	1-Hour	19.28				
	Annual					14.28
H_2SO_4	1-Hour	7.12				
	Annual					3.48
NH_3	1-Hour	51.31				
	Annual					49.69
$(NH_4)_2SO_4$	1-Hour	9.59				
	Annual					4.68

Notes:
1. VOCs are non-methane, non-ethane as CH_4.
2. Particulates are front and back half by EPA Method 5/202 and include condensables.

Table A-7
Gas Turbine Annual Emission Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Annual Emissions for M501JAC Combined Cycle

Annual Operating Hours with Duct Firing:	1910.0
Annual Operating Hours without Duct Firing	6819.9
Annual SS Operating Hours:	30.1

Pollutant	Annual Emissions Based on 1,910.0 hrs/yr of Normal Operations with Duct Firing tons/yr	Annual Emissions Based on 6,819.9 hrs/yr of Normal Operations without Duct Firing tons/yr	Estimated Annual Emissions From SS Operations tons/yr	Estimated SS Annual Operating Hours[1] hrs/yr
NO_X	29.93	91.24	1.69	30.1
CO	31.89	97.21	21.19	30.1
VOC	5.22	14.32	4.75	30.1
SO_2	5.90	18.08	---	---
$PM/PM_{10}/PM_{2.5}$	28.46	64.79	---	---
H_2SO_4	4.27	11.90	---	---
$(NH_4)_2SO_4$	5.75	16.04	---	---
NH_3	38.78	118.21	---	---

Notes:
1. Only emissions of NOx, CO, and VOC are shown in the startup/shutdown columns as emissions of other pollutants are expected to be less than during normal operation.

Annual Emissions for M501JAC Simple Cycle

Annual Operating Hours:	3850

Pollutant	Annual Emissions Based on 3,850 hrs/yr of Normal Operations tons/yr	Estimated Annual Emissions From SS Operations tons/yr	Estimated SS Annual Operating Hours[1] hrs/yr	Combined Routine/MSS Annual Emissions tons/yr
NO_X	64.59	1.84	77	65.14
CO	55.06	59.57	77	113.53
VOC	13.52	11.09	77	24.33
SO_2	10.16	---	---	10.16
$PM/PM_{10}/PM_{2.5}$	27.49	---	---	27.49
H_2SO_4	6.69	---	---	6.69
$(NH_4)_2SO_4$	9.01	---	---	9.01
NH_3	95.64	---	---	95.64

Notes:
1. Only emissions of NOx, CO, and VOC are shown in the startup/shutdown columns as emissions pollutants are expected to be less than during normal operation.

Table A-8
Hourly Emission Summary - Turbine Startup/Shutdown
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Startup/Shutdown Emissions for Mitsubishi M501JAC Combined Cycle Turbine

Type	Each Turbine Unit								
	Duration (min)	Events/yr[1]	MSS hr/yr	NOx		CO		VOC	
				lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr
Startup-Cold, Maximum (lb/event)	19.2	55	17.6	22	0.6	510	14.0	73	2.0
Startup-Warm, Maximum (lb/event)	19.2	5	1.6	22	0.1	403	1.0	73	0.2
Startup-Hot, Maximum (lb/event)	19.2	5	1.6	22	0.1	148	0.4	73	0.2
Shutdown, Maximum (lb/event)	8.6	65	9.3	30	1.0	178	5.8	73	2.4
			30.1		1.7		21.2		4.7

Notes:

1. This is an estimate for purposes of calculating annual emissions. It is not a representation of total number of annual MSS events.

Startup/Shutdown Emissions for Mitsubishi M501JAC Simple Cycle Turbine

Type	Each Turbine Unit								
	Duration (min)	Events/Yr[1]	MSS hr/yr	NOx		CO		VOC	
				lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr	lb MSS/event	ton MSS/yr
Startup (Normal - to 100% Load) (lb/event)	20	175	58.3	15	1.3	237	20.7	58	5.1
Start-up (10 min start)	10	18	3.0	5	0.0	230	2.1	57	0.5
Shutdown, Maximum (lb/event)	5	193	16.1	5	0.5	381	36.8	57	5.5
	--		77.4		1.8		59.6		11.1

Notes:

1. This is an estimate for purposes of calculating annual emissions. It is not a representation of total number of annual MSS events.

Table A-9
Cooling Tower PM Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Cooling Tower PM Calculation Variables:

Variable	Value	Units	Reference
Drift Eliminator Efficiency	0.0005%	percent	TCEQ BACT (2011)
Cooling Water Circulation Rate	161,154	gallons/min	Design Data
Annual Operation	8,760	hours/yr	Design Data
Total Dissolved Solids (TDS) concentration	60,000	mg/l	Design Data

Percentage of PM that is PM_{10}	0.31%	From linear regression indicated on chart below with x = 10 µm and y (calculated) = % mass smaller than 10 µm
Percentage of PM that is $PM_{2.5}$	0.00%	From linear regression indicated on chart below with x = 10 µm and y (calculated) = % mass smaller than 2.5 µm

Pollutant	Cooling Tower Emissions	
	lb/hr	tpy
PM	24.21	106.03
PM_{10}	0.08	0.33
$PM_{2.5}$ [1]	0.001	0.001

Notes:

1. Note that the Reisman and Frisbie calculation methodology shows zero $PM_{2.5}$ emissions for cooling tower water with a TDS level of 60,000 mg/l. For conservative purposes, a $PM_{2.5}$ emission rate of 0.001 lb/hr and 0.001 ton/yr will be assumed.

Sample Calculations:

PM (lb/hr) = water circulation (gal/min) * drift rate (fraction) * TDS (mg/l) * 1 l/0.264172 gal* 1 g/1000 mg * 1 lb/453.6 g * 60 min/hr

PM10 (lb/hr) = lb/hr PM emission rate x PM10 %

PM2.5 (lb/hr) = lb/hr PM emission rate x PM2.5 %

Constants:

Field	Value	Units
TDS Density (assumed to be equal to that of NaCl)	2.165	g/cm^3
	2.17E+06	g/m^3
Water Density	8.34	lb/gal (including TDS)
	1.00	g/cm^3
	1.0E+06	g/m^3

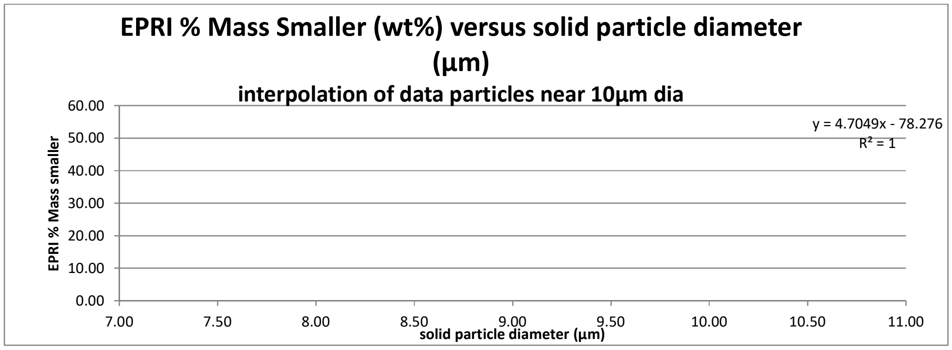
Particle Size Distribution Calculations for PM_{10}/PM Ratio [1]:

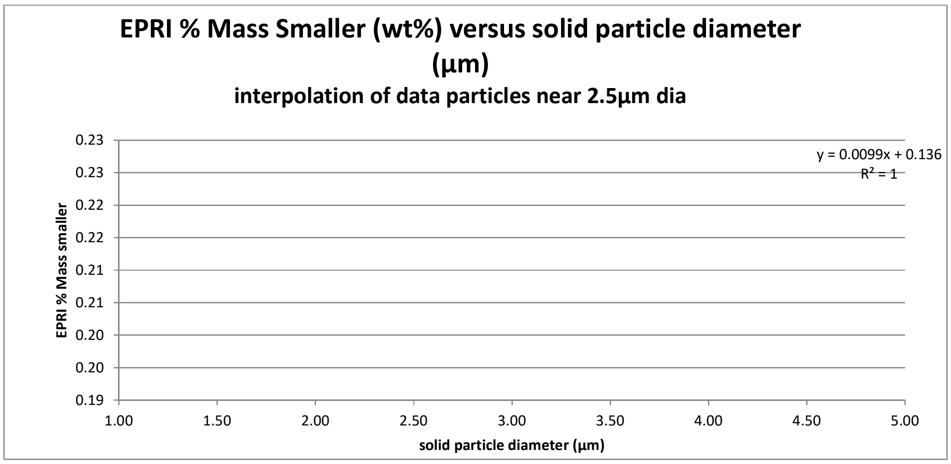
EPRI Droplet Diameter (µm) [1]	EPRI Droplet Diameter (m) [2]	Droplet Volume (m^3) [3]	Solid Particle Mass (g) [4]	Solid Particle Volume (m^3) [5]	Solid Particle Diameter (m) [6]	Solid Particle Diameter (µm) [2]	EPRI % Mass Smaller (wt%) [1]
10	1.00E-05	5.23E-16	3.14E-11	1.45E-17	3.02E-06	3.02	0.00
20	2.00E-05	4.19E-15	2.51E-10	1.16E-16	6.05E-06	6.05	0.20
30	3.00E-05	1.41E-14	8.47E-10	3.91E-16	9.07E-06	9.07	0.23
40	4.00E-05	3.35E-14	2.01E-09	9.27E-16	1.21E-05	12.10	0.51
50	5.00E-05	6.54E-14	3.92E-09	1.81E-15	1.51E-05	15.12	1.82
60	6.00E-05	1.13E-13	6.77E-09	3.13E-15	1.81E-05	18.15	5.70
70	7.00E-05	1.80E-13	1.08E-08	4.97E-15	2.12E-05	21.17	21.35
90	9.00E-05	3.82E-13	2.29E-08	1.06E-14	2.72E-05	27.22	49.81
110	1.10E-04	6.97E-13	4.17E-08	1.93E-14	3.33E-05	33.27	70.51
130	1.30E-04	1.15E-12	6.89E-08	3.18E-14	3.93E-05	39.32	82.02
150	1.50E-04	1.77E-12	1.06E-07	4.89E-14	4.54E-05	45.37	88.01
180	1.80E-04	3.05E-12	1.83E-07	8.45E-14	5.44E-05	54.45	91.03
210	2.10E-04	4.85E-12	2.90E-07	1.34E-13	6.35E-05	63.52	92.47
240	2.40E-04	7.23E-12	4.34E-07	2.00E-13	7.26E-05	72.60	94.09
270	2.70E-04	1.03E-11	6.17E-07	2.85E-13	8.17E-05	81.67	94.69
300	3.00E-04	1.41E-11	8.47E-07	3.91E-13	9.07E-05	90.75	96.29
350	3.50E-04	2.24E-11	1.34E-06	6.21E-13	1.06E-04	105.87	97.01
400	4.00E-04	3.35E-11	2.01E-06	9.27E-13	1.21E-04	121.00	98.34
450	4.50E-04	4.77E-11	2.86E-06	1.32E-12	1.36E-04	136.12	99.07
500	5.00E-04	6.54E-11	3.92E-06	1.81E-12	1.51E-04	151.25	99.07
600	6.00E-04	1.13E-10	6.77E-06	3.13E-12	1.81E-04	181.49	100

Notes:

1. Methodology and EPRI droplet and mass distribution from Reisman and Frisbie *Calculating Realistic PM10 emissions from Cooling Towers* (2000).
EPRI data based on test conducted with Brentwood Industries (drift eliminator manufacturer) in Electric Power Research Institute Houston, TX test facility in 1988.
2. Converted using 1 m = 10^6 µm.
3. Calculated as: droplet volume (m^3) = π * (4/3) * (Diameter / 2)^3
4. Solid particle mass (g) = droplet volume (m^3) * water density (g/m^3) * TDS (ppm) / 10^6
5. Solid particle volume (m^3) = solid particle mass (g) / solid particle density (g/m^3). Solid particle density = TDS density, taken as NaCl density.
6. Diameter solid particle (m) = (solid particle volume (m^3) / (4/3) * π)^(1/3) * 2

Calculations for diameter of 1.00E-05 m
Droplet Volume (m^3) = π x (4/3) x (0.00001 /2)^3 = 5.23E-16 (m^3)
Solid Particle Mass (g) = 5.23E-16 (m^3) x 0.998718336(g/cm3) x 60000 (ppm) = 3.14E-11 (g)
Solid Particle Volume (m^3) =3.14E-11 (g) / 2165000 (g/m3) = 1.45E-17 (m^3)
Diameter Solid Particle (m) = 1.45E-17 (m^3) / (4/3) x π)^(1/3) x 2 = 3.02E-06 (m)





Notes:

1. The emission calculations included above are provided in support of the basis for estimating the total emissions for this type of activity and are not representations of specific limits for each source. These emission calculations are not to be considered enforceable representations of a specific plant or activity condition under 116.116(a) including but not limited to volume, concentration, duration, and frequency of individual activities. The compliance basis for these activities is based on the total emissions as shown on the Table 1a.

Table A-10
Natural Gas Fired Auxiliary Boiler Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Maximum Natural Gas Firing Rate	89.1	MMBtu/hr
Maximum Natural Gas Firing Rate	87,087	scf/hr
Exhaust Gas	2,934	lbmol/hr-dry
Annual Operating Schedule	2,000	hours/year
Natural Gas Max Sulfur Content	1.0	gr/100scf
Natural Gas Annual Avg Sulfur Content	0.5	gr/100scf

Calculations:

Pollutant	Emission Factor[1]	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x[2]	0.01	lb/MMBtu	0.89	0.89
CO[2]	50	ppmvd at 3% O2	--	--
	0.037	lb/MMBtu	3.29	3.29
SO_2[3]	--	gr/100scf	0.25	0.12
$PM/PM_{10}/PM_{2.5}$[4]	7.6	lb/MMscf	0.66	0.66
VOC[4]	0.0054	lb/MMBtu	0.48	0.48

Notes:

1. These emission factors are used solely to calculate full load mass emission rates.
2. Proposed BACT limit.
3. Calculated based on fuel sulfur content and max fuel consumption.
4. EPA AP-42 Compilation of Air Pollution Emission Factors, Natural Gas Combustion Table 1.4-2 (7/98).

Sample Calculations:

NOx = (89 MMBtu/hr) * (0.01 lb/MMBtu) = 0.89 lb/hr NOx

SO2 = (87087 scf/hr) * (1 gr S/100scf) * (lb/ 7000 gr) * (lbmole S/32 lb S) * (1 lbmole SO2/ 1 lbmole S) * (64 lb SO2/lbmole SO2) = 0.25 lb/hr SO2

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
4.00	27,158.0	299	36.02

Table A-11
Natural Gas Fired Dewpoint Heater Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Maximum Natural Gas Firing Rate	9.7	MMBtu/hr
Maximum Natural Gas Hourly Firing Rate	9,454	scf/hr
Maximum Natural Gas Annual Firing Rate	82,818,713	scf/yr
Hours of Operation	8,760	hours/yr
Natural Gas Max Sulfur Content	1.0	gr/100scf
Natural Gas Annual Average Sulfur Content	0.5	gr/100scf

Calculations:

Pollutant	Emission Factor[1]	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x[1]	0.012	lb/MMBtu	0.12	0.51
CO[1]	0.037	lb/MMBtu	0.35890	1.57
VOC[1]	0.003	lb/MMBtu	0.03298	0.14
$PM/PM_{10}/PM_{2.5}$[1]	0.005	lb/MMBtu	0.04850	0.21
SO_2[2]			0.027	0.06

Notes:
1. Gas Heater Performance Data.
2. Calculated based on fuel sulfur content and max fuel consumption.

Sample Calculations:

NOx = (9.7 MMBtu/hr) * (0.012 lb/MMBtu) = 0.12 lb/hr NOx

SO2 = (9454 scf/hr)*(1 gr S/100scf)*(lb/7000 gr)*(lbmole S/32.065 lb S)*(1 lbmole SO2/1 lbmole S)*(64.064 lb SO2/lbmole SO2) = 0.03 lb/hr SO2

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
2.00	4,423.0	250	23.46

Table A-12A
Diesel-Fired Emergency Generator (Combined Cycle Option) - Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Max Daily Operating Schedule	1	hours/day
Annual Operating Schedule	100	hours/year
Power Rating	2,937	bhp
Power Rating	2,000	kW
Fuel Consumption	138.00	gal/hr
Density of No. 2 Fuel Oil:	7.67	lb/gal
Max Fuel Consumption	1058.9	lb fuel/hr
Heating Value of No. 2 Fuel Oil:	0.138	MMBtu/gal
Max Heat Input:	19.04	MMBtu/hr
Maximum Sulfur Content (S)	15.00	ppmw

Calculations:

Emission Rate = Emission Factor * Power rating * hours of operation / averaging period

Pollutant	Emission	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x [1]	6.56	g/HP-hr	42.48	2.12
CO [1]	0.54	g/HP-hr	3.50	0.17
VOC[1]	0.14	g/HP-hr	0.91	0.05
PM/PM_{10} [1]	0.04	g/HP-hr	0.26	0.01
SO_2 [2]	Mass Balance		0.0318	0.0016

Sample Calculations:

NO_x lb/hr =	6.56 g/HP-hr * 2,937 bhp * lb/453.6g =	42.48	lb/hr
CO lb/hr =	0.54 g/HP-hr * 2,937 bhp * lb/453.6g =	3.50	lb/hr
VOC lb/hr =	0.14 g/HP-hr * 2,937 bhp * lb/453.6g =	0.91	lb/hr
PM lb/hr =	0.04 g/HP-hr * 2,937 bhp * lb/453.6g =	0.26	lb/hr
SO_2 lb/hr =	1,059 lb fuel/hr * 15 lb S/1,000,000 lb fuel * lbmol S/32 lb S * 64 lb SO2/lbmol SO2		
SO_2 lb/hr =	0.032 lb/hr		

Notes:
1. Manufacturer specifications
2. Calculated based on maximum fuel sulfur content and max fuel consumption.

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature °F	Velocity ft/sec
1.00	15,292.8	752.1	324.52

Table A-12B
Diesel-Fired Emergency Generator (Simple Cycle Option) - Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Max Daily Operating Schedule	1	hours/day
Annual Operating Schedule	100	hours/year
Power Rating	1,112	bhp
Power Rating	750	kW
Fuel Consumption	54.3	gal/hr
Density of No. 2 Fuel Oil	7.67	lb/gal
Max Fuel Consumption	416.6	lb fuel/hr
Heating Value of No. 2 Fuel Oil	0.138	MMBtu/gal
Max Heat Input	7.49	MMBtu/hr
Maximum Sulfur Content (S)	15.00	ppmw

Calculations:

Emission Rate = Emission Factor * Power rating * hours of operation / averaging period

Pollutant	Emission	Units	Max Hourly Emission Rate lb/hr	Max. Annual Emission Rate ton/yr
NO_x [1]	5.85	g/HP-hr	14.34	0.72
CO [1]	0.41	g/HP-hr	1.01	0.05
VOC[1]	0.11	g/HP-hr	0.27	0.01
PM/PM_{10} [1]	0.06	g/HP-hr	0.15	0.007
SO_2 [2]	Mass Balance		0.0125	0.0006

Sample Calculations:

NO_x lb/hr = 5.85 g/HP-hr * 1,112 bhp * lb/453.6g = 14.34 lb/hr

CO lb/hr = 0.41 g/HP-hr * 1,112 bhp * lb/453.6g = 1.01 lb/hr

VOC lb/hr = 0.11 g/HP-hr * 1,112 bhp * lb/453.6g = 0.27 lb/hr

PM lb/hr = 0.06 g/HP-hr * 1,112 bhp * lb/453.6g = 0.15 lb/hr

SO_2 lb/hr = 417 lb fuel/hr * 15 lb S/1,000,000 lb fuel * lbmol S/32 lb S * 64 lb SO2/lbmol SO2

SO_2 lb/hr = 0.012 lb/hr

Notes:

1. Manufacturer specifications
2. Calculated based on maximum fuel sulfur content and max fuel consumption.

Stack Parameters			
Stack diameter ft	Exhaust Flow acfm wet	Temperature ^oF	Velocity ft/sec
0.50	6,028.4	847.3	511.71

Table A-13
Diesel Fuel Tank Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Reference: Compilation of Air Pollutant Emission Factors (AP-42)
5th Edition, January 1995, Section 7.1, Liquid Storage Tanks
Volume I: Stationary Point and Area Sources
U.S. Environmental Protection Agency Office of Air and Radiation, Office of Air Quality Planning and Standards
TNRCC Technical Guidance Package - Storage Tanks - February 2001

Assumptions: Emergency Diesel Generator Tank (DSL-TNK) is a horizontal fixed roof tank

1 - Horizontal roof tank
2 - Maximum Fill Rate (gal/hr) 750
3 - Tank capacity (gal) 750
4 - Maximum annual turnovers= 9.33
5 - Tank diameter (ft) 4
6 - Tank length (ft) 6

Standing Losses from a Fixed Roof Tank (L_S):

Parameter Input:

Tank No.	Tank Name	M_V (lb/lbmol)	P_A (psia)	P_{VA} (psia)	D or Deff (feet)	HVO (feet)	T_{AX} (°R)	T_{AN} (°R)	alpha (unitless)	I (Btu/ft^2)	P_{BP} (psig)	P_{BV} (psig)
DSL-TNK	Emergency Diesel Generator Tank	130	14.70	0.01	5.53	1.57	536.57	514.67	0.17	1468.00	0.03	-0.03

Deff = effective diameter for horizontal tanks = sqrt((length x diameter)/0.785)
Hvo = One half of actual diameter for horizontal roof tanks.

Intermediate Calculations:

Tank No.	Tank Name	T_{AA} (°R)	T_B (°R)	T_{LA} (°R)	dT_A (°R)	dP_B (psia)	dT_V (°R)	T_{LX} (°R)	T_{LN} (°R)	P_{VX} (psia)	P_{VN} (psia)	dP_V (psia)
DSL-TNK	Emergency Diesel Generator Tank	525.62	525.64	527.6	21.9	0.06	22.8	533.3	521.9	0.0100	0.0070	0.003

Average Annual Standing Losses (L_S):

Tank No.	Chemical Name	V_V (ft^3)	W_V (lb/ft^3)	K_E (unitless)	K_S (unitless)	L_S (lb/yr)	L_S (ton/yr)	L_S (lb/hr)
DSL-TNK	Diesel	38	0.0002	0.041	0.999	0.11	0.00005	0.000012

Average Annual Working Losses from a Fixed Roof Tank

$$L_W = (0.001)(M_V)(P_{VA})(Q)(K_N)(K_P) \quad \text{(Equation 1-29)}$$

Where:

L_W = Storage Tank Working Losses, lb/year
M_V = Molecular Weight of Vapor in Storage Tank, lb/lb-mole
P_{VA} = True Vapor Pressure at Daily Average Liquid Surface Temperature, psia
P_{VAM} = True Vapor Pressure at Daily Maximum Liquid Surface Temperature, psia (used for max. hourly calculations)
Q = Annual Net Throughput, barrels/yr
K_N = Turnover Factor from AP-42 Figure 12.3-6, dimensionless
K_P = Product Factor, dimensionless. Kc equals 1.0 for liquids except crude oil.

Tank No.	Chemical Name	M_V (lb/lb-mol)	P_{VA} (psia)	P_{VAM} (psia)	Q (barrels/yr)	K_N (unitless)	K_P (unitless)
DSL-TNK	Diesel	130.00	0.01	0.010	167	1.00	1.0

Average Annual and Maximum Annual Working Losses (L_W and L_{WMAX}):

Tank No.	Chemical Name	L_W (lb/year)	L_W (ton/year)	L_{WMAX}* (lb/year)
DSL-TNK	Diesel	0.18	0.0001	0.22

*L_{WMAX} assumes a K_N value of 1, per TCEQ guidance document dated February 1995.

Table A-13
Diesel Fuel Tank Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Maximum Short-Term Working Losses calculated according to the TNRCC Guidance Document dated February 1995:

L_{WMAXH} = $((L_W)(FR_m))/((TO)(TC_g))$

Where:

L_{WMAXH} = Maximum Hourly Working Loss, lb/hr
L_{WMAX} = Maximum Working Losses from AP-42 , lb/year
FR_m = Maximum Filling Rate, gallons/hour
TO = Turnovers per Year, dimensionless
TCg = Tank Working Capacity , gallons

Maximum Hourly Working Losses per tank calculated according to the TNRCC (L_{WMAXH}):

Tank No.	Chemical Name	L_{WMAX} (lb/year)	FR_m (gal/hr)	TO (unitless)	TC_g (gal)	L_{WMAXH} (lb/hr)
DSL-TNK	Diesel	0.22	750	9	750	0.023

7.1.3.1 Total Losses From Fixed Roof Tanks:

L_T = $L_S + L_W$ **(Equation 1-1)**

Where:

L_T = Total losses, lb/yr
L_S = Standing Storage Losses, lb/yr
L_W = Working Losses, lb/yr

Tank No.	Chemical Name	Maximum Standing Loss (L_S) lb/hr	Average Standing Loss (L_S) ton/yr	Maximum Working Loss (L_W) lb/hr	Average Working Loss (L_W) tons/yr	Total Maximum Hourly Emissions (L_T) lb/hr	Total Average Annual Emissions (L_T) tons/yr
DSL-TNK	Diesel	0.00001	0.0001	0.023	0.0001	0.023	0.0001

Table A-14
SCR Delivery System - Plantwide Ammonia Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Equipment/Service		Equipment Counts[1]	Factor[2] lb/hr-component	NH_3 % weight	AVO Control Credit[3]	Emission Rate lb/hr	Emission Rate ton/yr
Valves	Gas/Vapor	0	0.0089	100	97%	0.000	0.00
	Light Liquid	62.5	0.0035	100	97%	0.0066	0.029
	Heavy Liquid	0	0.0007	100	97%	0	0
Pumps	Light Liquid	0	0.0386	100	93%	0.0000	0.000
	Heavy Liquid	0	0.0161	100	93%	0	0
Flanges	Gas/Vapor	0	0.0029	100	97%	0.000	0.00
	Light Liquid	156.5	0.0005	100	97%	0.0023	0.0103
	Heavy Liquid	0	0.00007	100	97%	0	0
Compressors		0	0.5027	100	95%	0	0
Relief Valves		2	0.2293	100	97%	0.014	0.060
Open-Ended Lines		0	0.004	100	97%	0	0
Sampling Connections		0	0.033	100	97%	0	0
TOTAL						0.02	0.10

Notes:

1. Based on engineering judgment, all counts have been multiplied by a 1.2 safety factor.
2. EPA-453/R-93-026, June 1993, SOCMI w/o C2.
3. Air Permit Technical Guidance for Chemical Sources: Equipment Leak Fugitives, TNRCC, October 2000 Draft.

Table A-15
Fuel Delivery System - VOC Emission Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Equipment/Service	Equipment Counts[1]	Factor[2] lb/hr-component	C3+ Content % weight	Emission Rate	
				lb/hr	ton/yr
Valves	70	0.00992	0.25	0.0017	0.008
Pumps	0	0.00529	0.25	0	0
Flanges	175	0.00086	0.25	0.00038	0.0017
Compressors	0	0.0194	0.25	0	0
Relief Valves	5	0.0194	0.25	0.0002	0.0011
Open-Ended Lines	0	0.00441	0.25	0	0
TOTAL				0.0024	0.010

Notes:

1. Based on engineering judgment, all counts have been multiplied by a 1.2 safety factor.

2. EPA-453/R-95-017, November 1995, Table 2-4, Oil and Gas Operation Average Emission Factors.

Table A-16
Lube Oil System Vents Calculations
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Notes:

1 - The heating of recirculating lube oil in the gas turbine and steam turbine housing generates oil vapor and oil condensate droplets in the oil reservoir compartments. Lube oil mist emissions in each reservoir are controlled by a mist eliminator.

2 - Unloading, storage, and heated recirculation of lube oil in gas and steam turbine reservoirs will emit less than 0.3 gallon per day of oil per turbine mist eliminator vent, based on oil consumption estimated by GE. The calculated hourly emissions are based on the daily emission rate divided by 24 hours per day.

3 - Lube oil mist will be generated and the corresponding mist eliminator fan will be operated concurrently with turbine operation, including during startup and shutdown, plus additional time after turbine operation. When the gas turbines or steam turbines do not operate for extended periods such that lube oil is cooled to near-ambient temperatures, mist eliminators may be shut down. During this time, vapor breathing and filling losses may occur from each oil reservoir. These latter losses are significantly less than the emission rates calculated on this sheet.

Sample Calculations:

Hourly ER (lb/hr) = daily volumetric emission rate (gal/day) x density (lb/gal) x (day/24 hr)

$$\text{lb/hr} = \frac{X \text{ gal}}{\text{day}} \left| \frac{X \text{ lb}}{\text{gal}} \right| \frac{\text{day}}{24 \text{ hr}}$$

Annual ER (tpy) = daily volumetric emission rate (gal/day) x density (lb/gal) x days of operation (days/yr) x (ton/2000 lb)

$$\text{tpy} = \frac{X \text{ gal}}{\text{day}} \left| \frac{X \text{ lb}}{\text{gal}} \right| \frac{X \text{ day}}{\text{yr}} \left| \frac{\text{ton}}{2000 \text{ lb}} \right.$$

Calculation of Emissions:

EPN	Description	Pollutant	Maximum Annual No. of Days of Operation days/yr	Daily Volumetric Emission Rate Per Mist Eliminator Vent gal/day/vent	Approx. Density lb/gal	No. of Mist Eliminator Vents vents	Daily Emission Rate lb/day	Hourly Emission Rate lb/hr	Annual Emission Rate ton/yr
CBY51-LOV	Unit 1 Lube Oil Vent	VOC	365	0.01	7.26	1	0.07	0.003	0.01
		PM	365	0.01	7.26	1	0.07	0.003	0.01
CBYST1-LOV	Steam Turbine 1 Lube Oil Vent	VOC	365	0.01	7.26	1	0.07	0.003	0.01
		PM	365	0.01	7.26	1	0.07	0.003	0.01

Table A-17
Regulation 111.151 Demonstration - Calculation of Allowable TSP Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	CTG Data Case	Exhaust Flow scfh	Exhaust Flow acfm	Stack Height ft	Stack Diameter ft	Exit Velocity ft/sec	Exit Temperature R	Effective Stack Ht. ft	Std.Effective Stack Ht. ft	Mult. Factor[1]	Reg. 111.151 Allowable TSP lb/hr	Proposed TSP Emission lb/hr
CBY51	Combined Cycle - Case Case 24	82,085,250	1,613,681	200	23.0	64.7	622.40	656.4	156.3	1	338.91	36.6
CBY51	Simple Cycle - Case 22	123,887,667	5,027,103	200	31.3	108.7	1,284.70	4776.1	232.6	1	685.58	19.3
AUX-BLR		18,901	27,158	50	4.0	36.0	758.67	78.7	37.4	1	26.93	0.7
GAS-HTR		3,291	4,423	50	2.0	23.5	709.67	57.3	19.8	1	8.74	0.049
EMGEN		6,663	15,293	15	1.0	324.5	1,211.77	67.5	30.6	1	18.86	0.3

Notes:
1. According to §111.151, if the effective stack height is less than the standard effective stack height, the allowable emission level must be reduced by multiplying it by: (Effective Stack Height)/(Standard Effective Stack Height).

Table 18
Maintenance Emissions Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Hourly Emissions

Activity	Calc. Table	Estimated Emissions (lb/hr)						
		NOx	CO	PM	PM_{10}	$PM_{2.5}$	VOC	NH_3
Air Intake Filter Maintenance	A-19			1.67E-03	7.92E-04	1.20E-04		
CEMS Calibration	A-20	1.19E-04	7.27E-05					
Analytical Equipment	A-21						2.71E-03	
Sludge Maintenance	A-22						8.51E-03	
Catalyst Handling/Maintenance Annual	A-23			5.13E-02	5.13E-02	5.13E-02		
Boiler Tube Cleaning	A-24						3.40E-02	
Small Equipment Maintenance – NH_3	A-25							3.58E-03
Small Equipment Maintenance – Low VP	A-26						7.05E-02	
	TOTALS	**1.19E-04**	**7.27E-05**	**5.29E-02**	**5.21E-02**	**5.14E-02**	**1.16E-01**	**3.58E-03**

Annual Emissions

Activity	Calc. Table	Estimated Emissions (tons/yr)						
		NOx	CO	PM	PM_{10}	$PM_{2.5}$	VOC	NH_3
Air Intake Filter Maintenance	A-19			5.02E-06	2.38E-06	3.60E-07		
CEMS Calibration	A-20	1.19E-06	7.27E-07					
Analytical Equipment	A-21						8.70E-06	
Sludge Maintenance	A-22						1.66E-03	
Catalyst Handling/Maintenance Annual	A-23			1.23E-03	1.23E-03	1.23E-03		
Boiler Tube Cleaning	A-24						6.79E-05	
Small Equipment Maintenance – NH_3	A-25							8.94E-06
Small Equipment Maintenance – Low VP	A-26						9.24E-04	
	TOTALS	**1.19E-06**	**7.27E-07**	**1.24E-03**	**1.23E-03**	**1.23E-03**	**2.66E-03**	**8.94E-06**

Table A-19
Miscellaneous Particulate Filter Change Maintenance Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Variables			Source/Notes/Assumptions
E	**Emission Factor (lb TSP/ton)**	**0.01133**	
E	**Emission Factor (lb PM_{10}/ton)**	**0.005357**	
E	**Emission Factor (lb $PM_{2.5}$/ton)**	**0.0008112**	
$E = k * (0.0032) * \frac{(U/5)^{1.3}}{(M/2)^{1.4}} (lb/ton)$			Based on U.S. EPA AP-42, 13.2.4 "Aggregate Handling and Storage Piles" (Equation 1).
U	Mean Wind Speed (mph)	7.90	The mean wind speed is from the average windspeed for Houston, TX in TANKS 4.09d.
M	Material Moisture Content (%)	1	Estimate based on process knowledge
K (TSP)	TSP Particle Size Multiplier	0.74	Particle size multiplier taken from AP-42, Chapter 13.2.4.
K (PM_{10})	PM_{10} Particle Size Multiplier	0.35	Particle size multiplier taken from AP-42, Chapter 13.2.4.
K ($PM_{2.5}$)	$PM_{2.5}$ Particle Size Multiplier	0.05	Particle size multiplier taken from AP-42, Chapter 13.2.4.
CE	Control Efficiency	0%	Assumed Control Efficiency.
-	Hourly Throughput (ton/hr)	0.1478	Assumed hourly throughput and 500 filter changeouts/hour.
-	Annual Throughput (tons/yr)	0.89	Assumed 6,000 filters/yr.

Emission Summary		Source/Notes/Assumptions
Frequency Routine Maintenance (activity/hr)	**500**	Assume conservative 500 activities per hour
Frequency Routine Maintenance (activity/yr)	**3000**	Assume maximum activity every year - Two proposed units

	Misc. Filter Changeout	
TSP	1.67E-03	lb/hr
TSP	5.02E-06	ton/yr
PM_{10}	7.92E-04	lb/hr
PM_{10}	2.38E-06	ton/yr
$PM_{2.5}$	1.20E-04	lb/hr
$PM_{2.5}$	3.60E-07	ton/yr

Notes:
1. The emission calculations above represent the worst case emissions that could occur on a "per filter change" basis.

Table A-20
CEMS Calibration Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Activity	Max Concentration[1] ppm	Flow Rate scfm	Duration Per Event min	Event Frequency per hr	Event Frequency per yr	Emissions lb/hr	Emissions tpy
NO_x Cal Gas	1000	1	1	1	20	1.19E-04	1.19E-06
CO Cal Gas	1000	1	1	1	20	7.27E-05	7.27E-07

Notes:
1. Conservatively based on worst case max cal gas concentrations
2. Calculation Basis: Electric Utility MSS Workgroup.
3. The emission calculations above represent the worst case emissions that could occur during routine maintenance or a unit turnaround.

Sample Calculation: **NOx CEMS Calibration Hourly Emissions**

1000 lbmol NOx/1e6 lbmol Gas * 46 lb NOx/lbmol NOx * 1bmol Gas/385.1 scf * 1 scf/min * 1 min/event * 1 events/hr = 0.000119 lb/hr

Table A-21
Inspection, Repair, Replacement, Adjusting, Testing, and Calibration of Analytical Equipment, Process Instruments Including Sight Glasses, Meters, and Gauges
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Step 1. Clingage Loss Calculation:

Variables			Source/Notes/Assumptions
Lc	**Clingage Loss (lb/activity)**	**0.00135**	
$L_C = A_S \times T_f \times D$			
A_s	Surface Area (feet)	0.31	Based on an average size of the equipment.
T_f	Clingage Film Thickness (feet)	8.33E-05	95ºF per TCEQ Guidance.
D	Density of Material (lb/feet^3)	52.46	Based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.

Step 2. Splash Loading Loss Calculation:

Variables			Source/Notes/Assumptions
L_l	**Equipment Draining Loading Loss (lb/10^3 gal loaded)**	**0.493**	
$L_l = 12.46\left(\frac{SPM_V}{T}\right)$			Based on U.S. EPA AP-42, 5.2 "Transportation and Marketing of Petroleum Liquids" (Equation 1).
S	Loading Loss Factor	1.45	Per U.S. EPA AP-42 Table 5.2-1, based on splash loading per TCEQ Guidance.
P	Vapor Pressure of Liquid Loaded (psia)	0.15	Based on representative material.
M_V	Vapor molecular weight (lb/lb-mole)	103	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.

Variables			Source/Notes/Assumptions
L_D	**Equipment Draining Loading loss (lb/activity)**	**1.11E-07**	
$L_D = L_l V_t$			
L_l	Loading Loss (lb/10^3 gal loaded)	0.493	See calculation above.
V_t	Volume of liquid drained (gallon/activity)	0.0002	Assumed to be 1% of total volume (0.02244 gallons) is left in the equipment and drained to pan/enclosed drain.

Step 3. Evaporative Loss Calculation:

Variables			Source/Notes/Assumptions
L_E	**Evaporation Loss (lb/activity)**	**0.000386**	
$L_E = 7920 * A\left(\frac{P_a M_w}{RT}\right)\frac{D_{i,a}}{Z_2 - Z_1}\ln\left[\frac{1}{(1-y_{c1})}\right] * t$			Ajay Kumar, N.S. Vatcha, and John Schmelzle, "Estimate Emissions From Atmospheric Releases of Hazardous Substances," Environmental Engineering World, November-December 1996, pages 20-23.
A	Vessel opening area (m^2)	0.07	Area for a 5 gal bucket (~11.75 in. dia.)
P_a	Atmospheric Pressure (Pa)	101,325	
M_W	Molecular weight (kg/kgmol)	103	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.
R	Universal Gas Constant (J/°K-kgmol)	8314	
T	Temperature (ºK)	308	95ºF per TCEQ Guidance.
$D_{i,a}$	Diffusivity of component through air (m^2/s)	6.28E-06	Assumed diffusivity of diesel fuel
Z_2-Z_1	Empty vapor space above liquid level in vessel (m)	0.37	Assumed 5 gal bucket (14.5 in)
y_{c1}	Volume fraction of component in air	0.010	
t	Time that material sits in pan before removed by vacuum truck (hr)	0.25	Based on past experience.

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	0.00174	Summation of Steps 1 through 3.
Frequency Routine Maintenance Activity (activity/hour)	2	Based on process knowledge and historical information.
Frequency Routine Maintenance Activity (activity/yr)	10	Based on process knowledge and historical information.

Total VOC Emissions	
lb/hr	ton/yr
0.00271	8.70E-06

Notes:

1. Calculation Basis: Electric Utility MSS Workgroup.

Table A-22
Management of Sludge Maintenance Emissions
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Activity 1. Sludge/Sediment Management

FIN	Description	Worst-Case VOC Concentration ppmw	Sludge Density [1] lb/ft^3	Worst-Case Annual Volume of Sludge Removed yd^3	Worst-Case Monthly Volume of Sludge Removed yd^3	Annual Total Mass of Sludge Removed lb/yr	Hourly Total Mass of Sludge Removed [2] lb/hr	VOC lb/hr	VOC ton/yr
SLUDGEMSS	Sludge/Sediment Management	5.00	45.01	545.00	56.00	662,322	1,701	0.009	0.002

Notes:
1. Engineering Estimate.
2. Assumes worst-case monthly volume of sludge removed in one 40-hour week.
3. The emission calculations below represent the worst case emissions that could occur during routine maintenance or a unit turnaround. For calculation purposes, sludge management via vacuum truck was considered, but emissions from an open pit are provided as more conservative.

Sample Calculations:

Annual Emissions (ton/yr) = Total Mass of Sludge (lbs/yr) x VOC Concentration (ppmw) / 1,000,000 / 2000 lb/ton
= (662322.15 lbs/yr) * (5 ppmw) / 1,000,000 / 2000 lbs/ton = 0.002 tpy

Hourly Emissions (lb/hr) = Total Mass of Sludge (lbs/hr) x VOC Concentration (ppmw) / 1,000,000
= (1701.378 lbs/hr) * (5 ppmw) / 1,000,000 = 0.01 lb/hr

Table A-23
Catalyst Handling and Maintenance
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Variables		Source/Notes/Assumptions
Assumed surface area of SCR grid (ft^2)	100	
Assumed dust thickness (mm)	10	
Assumed dust thickness (ft)	0.03281	
Assumed dust density (lb/ft^3)	75	
Activity Throughput (lb/activity)	246.06	
Control Efficiency	99.00%	Assumed control efficiency of fabric filter
Total Emissions per activity (lb/activity)	**2.46**	As PM_{10}

Emission Summary		Source/Notes/Assumptions
Frequency Routine Maintenance Activity (activity/hour)	**1**	Based on process knowledge and historical information.
Frequency Routine Maintenance Activity (activity/yr)	**1**	Based on process knowledge and historical information.
Duration Routine Maintenance (hours/activity)	**48**	Based on process knowledge and historical information.

Catalyst Maintenance		
PM/PM_{10}	0.0513	lb/hr
PM/PM_{10}	0.00123	ton/yr

Notes:
1. Calculation Basis: Simple fabric filter calculation.

Table A-24
Boiler Tube Cleaning (CHELCLEAN665)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Splash Loading Loss Calculation:

Variables			Source/Notes/Assumptions
L_l	**Equipment Draining Loading Loss (lb/10^3 gal loaded)**	**0.0021**	
			Based on U.S. EPA AP-42, 5.2 "Transportation and Marketing of Petroleum Liquids" (Equation 1).
S	Loading Loss Factor	1.45	Per U.S. EPA AP-42 Table 5.2-1, based on splash loading per TCEQ Guidance.
P	Vapor Pressure of Liquid Loaded (psia)	0.0002	Conservatively utilized TCEQ vapor pressure limit for compounds considered to be air contaminants for this low-vapor pressure mixture.
M_V	Vapor molecular weight (lb/lb-mole)	326	Molecular Weight for 40% solution di-ammonium EDTA.
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.

Variables			Source/Notes/Assumptions
L_D	**Equipment Draining Loading loss (lb/activity)**	**0.14**	
L_l	Loading Loss (lb/10^3 gal loaded)	0.002	See calculation above.
V_t	Volume of liquid drained (gallon/activity)	64,000	Approximate, one HRSG

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	**0.14**	
Frequency Routine Maintenance Activity (activity/hour)	**1**	Assumed
Frequency Routine Maintenance Activity (activity/yr)	**1**	Assumed
Duration Routine Maintenance (hours/activity)	**4**	Assumed

Total Emissions	
(lb/hr)	**(tpy)**
0.0340	6.79E-05

Notes:

1.The emission calculations above represent the worst case emissions that could occur during a unit turnaround.

Table A-25
Small Equipment and Fugitive Component Repair/Replacement (Anhydrous Ammonia Emissions)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Step 1. Equipment Opening Maintenance Vapor Space Calculation:

L_o	Opening Loss (lb/activity)	0.00358	Source/Notes/Assumptions
			Based on the Ideal Gas Law with modification for VOC molecular weight.
P	Vapor Pressure of Material (psia)	14.70	Since the vapor pressure of anhydrous ammonia is greater than 14.7 the tank pressure prior to venting was used.
V	Vapor space volume (feet^3)	0.08522	Based on worst case equipment: 10 feett of 2 inch pipe
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.
R	Gas constant (psia ft^3 per lb-mole ºR)	10.73	
M_V	Vapor molecular weight (lb/lb-mole)	17	Molecular weight for ammonia.

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	**0.00358**	
Frequency Routine Maintenance Activity (activity/hour)	**1**	Assumed
Frequency Routine Maintenance Activity (activity/yr)	**5**	Assumed
Duration Routine Maintenance (hours/activity)	**1**	Assumed

Total NH_3 Emissions	
lb/hr	**ton/yr**
0.00358	8.94E-06

Notes:
1. The emission calculations above represent the worst case emissions that could occur during routine maintenance or a unit turnaround.
2. Calculation Basis: Electric Utility MSS Workgroup. Applicable section utilized for small volume.

Table A-26
Low VP Small Equipment & Fugitive Component Maintenance Emissions (VOC Service)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Step 1. Clingage Loss Calculation:

Variables			Source/Notes/Assumptions
Lc	**Clingage Loss (lb/activity)**	**0.0141**	
$L_C = A_S \times T_f \times D$			
A_s	Surface Area (feet)	3.12	Conservatively based on clingage loss from final 5 ft of pipe section being worked on.
T_f	Clingage Film Thickness (feet)	8.33E-05	95ºF per TCEQ Guidance.
D	Density of Material (lb/feet^3)	54.16	Based on API Power Regression Analysis for a material with a vapor pressure of 0.5 psia.

Step 2. Splash Loading Loss Calculation:

Variables			Source/Notes/Assumptions
L_l	**Equipment Draining Loading Loss (lb/10^3 gal loaded)**	**0.0423**	
$L_l = 12.46\left(\frac{SPM_V}{T}\right)$			Based on U.S. EPA AP-42, 5.2 "Transportation and Marketing of Petroleum Liquids" (Equation 1).
S	Loading Loss Factor	1.45	Per U.S. EPA AP-42 Table 5.2-1, based on splash loading per TCEQ Guidance.
P	Vapor Pressure of Liquid Loaded (psia)	0.01	Based on representative material.
M_V	Vapor molecular weight (lb/lb-mole)	130	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.5 psia.
T	Average daily temperature (ºR)	555.00	95ºF per TCEQ Guidance.

Variables			Source/Notes/Assumptions
L_D	**Equipment Draining Loading Loss (lb/activity)**	**0.0000982**	
$L_D = L_l V_t$			
L_l	Loading Loss (lb/10^3 gal loaded)	0.042	See calculation above.
V_t	Volume of liquid drained (gallon/activity)	2.32	Assumed to be 1% of total volume (232.4036 gallons) is left in the equipment and drained to pan/enclosed drain

Step 3. Evaporative Loss Calculation:

Variables			Source/Notes/Assumptions
L_E	**Evaporation Loss (lb/activity)**	**0.0000208**	
$L_E = 7920 * A\left(\frac{P_a M_w}{RT}\right)\frac{D_{i,a}}{Z_2 - Z_1}\ln\left[\frac{1}{(1-y_{c1})}\right] * t$			Ajay Kumar, N.S. Vatcha, and John Schmelzle, "Estimate Emissions From Atmospheric Releases of Hazardous Substances," Environmental Engineering World, November-December 1996, pages 20-23.
A	Vessel opening area (m^2)	0.02	Opening on a tote (~6 in. dia.)
P_a	Atmospheric Pressure (Pa)	101,325	
M_W	Molecular weight (kg/kgmol)	130	Molecular Weight based on API Power Regression Analysis for a material with a vapor pressure of 0.15 psia.
R	Universal Gas Constant (J/°K-kgmol)	8314	
T	Temperature (ºK)	308	95ºF per TCEQ Guidance.
$D_{i,a}$	Diffusivity of component through air (m^2/s)	6.28E-06	Assumed diffusivity of diesel fuel
Z_2-Z_1	Empty vapor space above liquid level in vessel (m)	0.15	Assumed 6 in
y_{c1}	Volume fraction of component in air	0.001	
t	Time vessel remains open to atmosphere	0.25	Based on past experience.

Emission Summary		Source/Notes/Assumptions
Total Emissions per activity (lb/activity)	**0.0142**	Summation of Steps 1 through 3.
Frequency Routine Maintenance Activity (activity/hour)	**5**	Assumed
Frequency Routine Maintenance Activity (activity/yr)	**130**	Assumed

Total Emissions	
lb/hr	**ton/yr**
0.070	0.00092

Notes:
1. The emission calculations above represent the worst case emissions that could occur during routine maintenance or a unit turnaround.

APPENDIX B EMISSION CALCULATIONS FOR GHG POLLUTANTS

Table B-1
Project GHG Emission Summary
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Combined Cycle Turbine Option

Name	EPN	CO_2 ton/yr	CH_4 ton/yr	N_2O ton/yr	SF_6 ton/yr	Total GHG Mass Emissions ton/yr	Total CO_2e ton/yr
Combustion Turbine 1 (Combined Cycle)	CBY51	2,045,067.8	37.9	3.8		2,045,109.5	2,047,146.5
Auxiliary Boiler	AUX-BLR	10,414.7	0.2	0.0		10,414.9	10,425.5
Gas Heater	GAS-HTR	4,966.1	0.1	0.0		4,966.2	4,971.2
Natural Gas Component Fugitives	FUG-NGAS	0.005	2.2			2.2	55.2
Planned Maintenance Activities Fugitives	FUG-MSS	0.0002	0.11			0.11	2.7
Emergency Diesel Generator	EMGEN	155.3	0.0063	0.0013		155.3	155.8
SF_6 Insulated Equipment	SF6FUG				0.00103	0.00103	23.4
Sitewide Emissions		2,060,603.9	40.5	3.8	0.00103	2,060,648.2	**2,062,780.2**

Simple Cycle Turbine Option

Name	EPN	CO_2 ton/yr	CH_4 ton/yr	N_2O ton/yr	SF_6 ton/yr	Total GHG Mass Emissions ton/yr	Total CO_2e ton/yr
Combustion Turbine 1 (Simple Cycle)	CBY51	864,836.6	16.0	1.6		864,854.2	865,715.7
Gas Heater	GAS-HTR	4,966.1	0.1	0.009		4,966.2	4,971.2
Natural Gas Component Fugitives	FUG-NGAS	0.005	2.2			2.2	55.2
Planned Maintenance Activities Fugitives	FUG-MSS	0.0002	0.11			0.11	2.7
Emergency Diesel Generator	EMGEN	61.1	0.0030	0.0005		61.1	61.3
SF_6 Insulated Equipment	SF6FUG				0.00103	0.00103	23.4
Sitewide Emissions		869,863.8	18.5	1.6	0.00103	869,883.9	**870,829.5**

Table B-2

GHG Annual Emission Calculations - M501JAC Combined Cycle Combustion Turbine

Cedar Bayou Electric Generating Station

NRG Cedar Bayou 5 LLC

EPN	Average Heat Input MMBtu/hr	Hours Per Year	Annual Heat Input MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[4]	GHG Mass Emissions[5] ton/yr	Global Warming Potential[6]	CO_2e ton/yr
CBY51[1] (Duct Burner Firing)	4,423	1,910	8,447,872	CO_2	118.86	502,045.0	1	502,045.0
				CH_4	2.2E-03	9.3	25	232.8
				N_2O	2.2E-04	0.9	298	277.5
CBY51[2] (No Duct Burner Firing)	3797.1	6,819.9	25,895,837	CO_2	118.86	1,538,952.6	1	1,538,952.6
				CH_4	2.2E-03	28.5	25	713.6
				N_2O	2.2E-04	2.9	298	850.6
CBY51[3] (Startup/Shutdown)	2274.1	30.1	68,489	CO_2	118.86	4,070.2	1	4,070.2
				CH_4	2.2E-03	0.1	25	1.9
				N_2O	2.2E-04	0.01	298	2.2
CBY51 Total		8,760	34,412,198	CO_2		2,045,067.8	1	2,045,067.8
				CH_4		37.9	25	948.3
				N_2O		3.8	298	1,130.4
					TOTAL	**2,045,109.5**		**2,047,146.5**

Notes:

1. The average heat input for the M501JAC duct burner firing scenario is based on the HHV heat input at 100% load, with duct burner firing, at 59°F ambient temperature (Operating Case 13).
2. The average heat input for the M501JAC non-duct burner firing scenario is based on the HHV heat input at 100% load, with no duct burner firing, at 59°F ambient temperature (Operating Case 14).
3. The average heat input for the M501JAC startup-shutdown scenario is based on the HHV heat input at 50% load, with no duct burner firing, at 59°F ambient temperature (Operating Case 17).
4. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
5. CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4

W_{CO2} = (F_c x H x U_f X MW_{CO2})/2000

W_{CO2} = CO_2 emitted from combustion, tons/yr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/yr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68°F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

6. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Table B-3
GHG Annual Emission Calculations - M501JAC Simple Cycle Combustion Turbine
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Average Heat Input[1] MMBtu/hr	Annual Heat Input[2] MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[3]	GHG Mass Emissions[4] ton/yr	Global Warming Potential[5]	CO_2e ton/yr
CBY51	3,780	14,552,539	CO_2	118.86	864,836.6	1	864,836.6
			CH_4	2.2E-03	16.0	25	401.0
			N_2O	2.2E-04	1.6	298	478.0
				TOTAL	**864,854.2**		**865,715.7**

Notes:

1. The average heat input for the M501JAC scenario is based on the HHV heat input at 100% load, duct firing, evaporator on, at 59°F ambient temperature (Operating Case 13)
2. Annual heat input based on 3,850 hours per year
3. CH_4 and N_2O GHG factors based on Table C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
4. CO_2 emissions based on 40 CFR Part 75, Appendix G, Equation G-4

$W_{CO2} = (F_c \times H \times U_f \times MW_{CO2})/2000$

W_{CO2} = CO_2 emitted from combustion, tons/yr

F_c = Carbon based F-factor,1040 scf/MMBtu

H = Heat Input (MMBtu/yr)

U_f = 1/385 scf CO_2/lbmole at 14.7 psia and 68°F

MW_{CO2} = Molecule weight of CO_2, 44.0 lb/lb-mole

5. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Table B-4
GHG Emission Calculations - Auxiliary Boiler
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Maximum Heat Input[1] MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[2]	GHG Mass Emissions ton/yr	Global Warming Potential[3]	CO_2e ton/yr
AUX-BLR	178,200	CO_2	116.89	10,414.7	1	10,414.7
		CH_4	2.2E-03	0.20	25	4.9
		N_2O	2.2E-04	0.020	298	5.9
		TOTAL		**10,414.9**		**10,425.5**

Notes:

1. Annual fuel use and heating value of natural gas from Table A-9 State/PSD air permit application.
2. Factors based on Table C-1 and C-2 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Table B-5
GHG Emission Calculations - Natural Gas Heater
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Maximum Heat Input[1] MMBtu/yr	Pollutant	Emission Factor lb/MMBtu[2]	GHG Mass Emissions ton/yr	Global Warming Potential[3]	CO_2e ton/yr
GAS-HTR	84,972	CO_2	116.89	4,966.1	1	4,966.1
		CH_4	2.2E-03	0.09	25	2.3
		N_2O	2.2E-04	0.009	298	2.8
			Total:	**4,966.2**		**4,971.2**

Notes:

1. Annual fuel use and heating value of natural gas from Table A-9 State/PSD air permit application.
2. Factors based on Table C-1 and C-2 of 40 CFR Part 98, Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Table B-6
GHG Emission Calculations - Natural Gas Piping Fugitives
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

EPN	Source Type	Fluid State	Count	Emission Factor[1] scf/hr/comp	CO_2[2] ton/yr	Methane[3] ton/yr	Total ton/yr
FUG-NGAS	Valves	Gas/Vapor	70	0.121	0.003	1.507	
	Flanges	Gas/Vapor	175	0.017	0.001	0.529	
	Relief Valves	Gas/Vapor	5	0.193	0.000	0.172	
GHG Mass-Based Emissions					0.005	2.21	**2.2**
Global Warming Potential[4]					1	25	
CO_2e Emissions					0.005	55.21	**55.2**

Notes:

1. Emission factors from Table W-1A of 40 CFR 98 Mandatory Greenhouse Gas Reporting Rules
2. CO_2 emissions based on vol% of CO_2 in natural gas: 0.08% from natural gas analysis
3. CH_4 emissions based on vol% of CH_4 in natural gas: 97.51% from natural gas analysis
4. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

70 valves	0.121 scf gas	0.0008 scf CO2	lbmole	44 lb CO_2	8760 hr	ton =	0.003	ton/yr
	hr * valve	scf gas	385 scf	lbmole	yr	2000 lb		

Table B-7
Gaseous Fuel Venting During Turbine Shutdown/Maintenance and Small Equipment and Fugitive Component Repair/Replacement
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Location	Initial Conditions			Final Conditions			Annual Emissions		Total
	Volume[1]	Press.	Temp.	Press.	Temp.	Volume[2]	CO_2[3]	CH_4[4]	Total
	ft^3	psig	°F	psig	°F	scf	ton/yr	ton/yr	ton/yr
Turbine Fuel Line Shutdown/Maintenance	1,146	50	50	0	68	5,275	0.0002	0.11	
Small Equipment/Fugitive Component Repair/Replacement	6.7	50	50	0	68	31	0.00000	0.00062	
GHG Mass-Based Emissions							0.0002	0.1075	**0.11**
Global Warming Potential[5]							1	25	
CO_2e Emissions							0.0002	2.7	**2.7**

Notes:

1. Initial volume is calculated by multiplying the crossectional area by the length of pipe using the following formula:

$$V_i = pi * [(\text{diameter in inches}/12)/2]^2 * \text{length in feet} = ft^3$$

2. Final volume calculated using ideal gas law $[(PV/ZT)_i = (PV/ZT)_f]$. $V_f = V_i\ (P_i/P_f)\ (T_f/T_i)\ (Z_f/Z_i)$, where Z is estimated using the following equation: $Z = 0.9994 - 0.0002P + 3E\text{-}08P^2$.
3. CO_2 emissions based on vol% of CO_2 in natural gas: 0.08% from natural gas analysis
4. CH_4 emissions based on vol% of CH_4 in natural gas: 97.5% from natural gas analysis
5. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

5,275 scf Nat Gas	0.001 scf CO2	lbmole	44 lb CO_2	ton =	=	0.0002	ton/yr CO_2
yr	scf Nat Gas	385 scf	lbmole	2000 lb			

Table B-8A
GHG Emission Calculations - Diesel Combustion in Emergency Engines (Combined Cycle Option)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Annual Operating Schedule:	100	hours/year
Power Rating:	2,937	hp
Max Hourly Fuel Use:	138.0	gal/hr
Heating Value of No. 2 Fuel Oil:	0.138	MMBtu/gal
Max Hourly Heat Input:	19.0	MMBtu/hr
Annual Heat Input:	1,904.4	MMBtu/yr

EPN	Heat Input (MMBtu/yr)	Pollutant	Emission Factor (kg/MMBtu)[2]	GHG Mass Emissions (tpy)	Global Warming Potential[3]	CO_2e (tpy)
EMGEN	1904.4	CO_2	73.96	155.3	1	155.3
		CH_4	3.0E-03	0.0063	25	0.2
		N_2O	6.0E-04	0.0013	298	0.4
			Total:	**155.26**		**155.8**

Notes:

1. Default high heat value based on Table C-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
2. GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

Annual Emission Rate = Annual Heat Input X Emission Factor X 2.2 lbs/kg X Global Warming Potential / 2,000 lbs/ton

Table B-8B
GHG Emission Calculations - Diesel Combustion in Emergency Engines (Simple Cycle Option)
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Annual Operating Schedule:	100	hours/year
Power Rating:	1,112	hp
Max Hourly Fuel Use:	54.3	gal/hr
Heating Value of No. 2 Fuel Oil:	0.138	MMBtu/gal
Max Hourly Heat Input:	7.5	MMBtu/hr
Annual Heat Input:	749.3	MMBtu/yr

EPN	Heat Input (MMBtu/yr)	Pollutant	Emission Factor (kg/MMBtu)[2]	GHG Mass Emissions (tpy)	Global Warming Potential[3]	CO_2e (tpy)
EMGEN	749.3	CO_2	73.96	61.1	1	61.1
		CH_4	3.0E-03	0.0025	25	0.1
		N_2O	6.0E-04	0.0005	298	0.1
			Total:	**61.09**		**61.3**

Notes:

1. Default high heat value based on Table C-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
2. GHG factors based on Tables C-1 and C-2 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.
3. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

Sample Calculation:

Annual Emission Rate = Annual Heat Input X Emission Factor X 2.2 lbs/kg X Global Warming Potential / 2,000 lbs/ton

Table B-9
GHG Emission Calculations - Electrical Equipment Insulated With SF_6
Cedar Bayou Electric Generating Station
NRG Cedar Bayou 5 LLC

Assumptions:

Insulated circuit breaker SF_6 capacity:	410	lb
Estimated annual SF_6 leak rate:	0.5%	by weight
Estimated annual SF_6 mass emission rate:	0.0010	ton/yr
Global Warming Potential[1]:	22,800	
Estimated annual CO_2e emission rate:	23.4	ton/yr

Notes:

1. Global Warming Potential factors based on Table A-1 of 40 CFR 98 Mandatory Greenhouse Gas Reporting.

APPENDIX C FEDERAL APPLICABILITY TABLES

TABLE 1F
AIR QUALITY APPLICATION SUPPLEMENT

Permit No.: TBD		Application Submittal Date: 03/18/2020	
Company	NRG Cedar Bayou 5 LLC		
RN:	RN100825371	Facility Location:	7705 West Bay Road
City	Baytown	County:	Chambers
Permit Unit I.D.:	CBY51	Permit Name:	Cedar Bayou Electric Generating Station
Permit Activity:	☐ New Major Source	☑ Modification	
Project or Process Description: Addition of one combined cycle turbine			

Complete for all pollutants with a project emission increase.	POLLUTANTS								
	Ozone		CO	PM	PM_{10}	$PM_{2.5}$	SO_2	H_2SO_4	CO_2e
	VOC	NOx							
Nonattainment? (yes or no)	Yes	Yes	No	No	No	No	No	No	No
Existing site PTE (tpy)									
Proposed project increases (tpy from 2F)[3]	24.99	126.38	155.33	200.19	94.50	94.16	24.17	16.17	2,062,780
Is the existing site a major source?[2]	No								
If not, is the project a major source by itself? (yes or no)	Yes								
If site is major, is project increase significant? (yes or no)	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes
If netting required, estimated start of construction:	12/31/20								
5 years prior to start of construction:	12/31/15	Contemporaneous							
Estimated start of operation:	6/1/22	Period							
Net contemporaneous change, including proposed project, from Table 3F (tpy)	24.99	126.38	155.33	200.19	94.50	94.16	24.17	16.17	2,062,780.25
FNSR applicable? (yes or no)	No	No (within PAL limit)	Yes	Yes	Yes	Yes	No	Yes	Yes

1. Other PSD pollutants
2. Nonattainment major source is defined in Table 1 in 30 TAC 116.12(11) by pollutant and county. PSD thresholds are found in 40 CFR §51.166(b)(1).

3. Sum of proposed emissions minus baseline emissions, increases only. Nonattainment thresholds are found in Table 1 in 30 TAC 116.12(11) and PSD thresholds in 40 CFR §51.166(b)(23).

The presentations made above and on the accompanying tables are true and correct to the best of my knowledge.

C. R. E[illegible] 17 March 2020 Sr. Director

Signature Title Date

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	VOC	Permit:	TBD
Baseline Period:	N/A to		

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	B Baseline Emissions[4]	Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A)[6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			24.28		24.28		24.28
2	AUX-BLR	AUX-BLR	TBD			0.48		0.48		0.48
3	GAS-HTR	GAS-HTR	TBD			0.14		0.14		0.14
4	EMGEN	EMGEN	TBD			0.05		0.05		0.05
5	DSL-TNK	DSL-TNK	TBD			0.0001		0.0001		0.0001
6	FUG-NGAS	FUG-NGAS	TBD			0.01		0.01		0.01
7	CBY51-LOV	CBY51-LOV	TBD			0.01		0.013		0.013
8	CBYST1-LOV	CBYST1-LOV	TBD			0.01		0.01		0.01
9	FUG-MSS	FUG-MSS	TBD			0.003		0.003		0.003
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			24.99

TCEQ

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	NOx	**Permit:**	TBD
Baseline Period:	N/A **to**		

				A	B				
	Affected or Modified Facilities[2] FIN	EPN	**Permit No.**	**Actual Emissions[3]**	**Baseline Emissions[4]**	**Proposed Emissions[5]**	**Projected Actual Emissions**	**Difference (B - A) [6]**	**Correction[7]**	**Project Increase[8]**
1	CBY51	CBY51	TBD			122.86		122.86		122.86
2	AUX-BLR	AUX-BLR	TBD			0.89		0.89		0.89
3	GAS-HTR	GAS-HTR	TBD			0.51		0.51		0.51
4	EMGEN	EMGEN	TBD			2.12		2.12		2.12
5	FUG-MSS	FUG-MSS	TBD			0.000001		0.000001		0.000001
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			126.38

TCEQ

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	CO	**Permit:**	TBD
Baseline Period:	N/A	**to**	

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	Actual Emissions[3]	A Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A)[6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			150.29		150.29		150.29
2	AUX-BLR	AUX-BLR	TBD			3.29		3.29		3.29
3	GAS-HTR	GAS-HTR	TBD			1.57		1.57		1.57
4	EMGEN	EMGEN	TBD			0.17		0.17		0.17
5	FUG-MSS	FUG-MSS	TBD			0.000001		0.000001		0.000001
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			155.33

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	PM	**Permit:**	TBD
Baseline Period:	N/A	**to**	

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	Actual Emissions[3]	A Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			93.25		93.25		93.25
2	C-TOWER1	C-TOWER1	TBD			106.03		106.03		106.03
3	AUX-BLR	AUX-BLR	TBD			0.66		0.66		0.66
4	GAS-HTR	GAS-HTR	TBD			0.21		0.21		0.21
5	EMGEN	EMGEN	TBD			0.01		0.01		0.01
6	CBY51-LOV	CBY51-LOV	TBD			0.01		0.01		0.01
7	CBYST1-LOV	CBYST1-LOV	TBD			0.01		0.01		0.01
8	FUG-MSS	FUG-MSS	TBD			0.001		0.001		0.001
9										
10										
11										
12										
13										
14										
15										
16										
							Page Subtotal[9]			200.19

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]: PM_{10}	**Permit:** TBD
Baseline Period: N/A **to**	

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			93.25		93.25		93.25
2	C-TOWER1	C-TOWER1	TBD			0.33		0.33		0.33
3	AUX-BLR	AUX-BLR	TBD			0.66		0.66		0.66
4	GAS-HTR	GAS-HTR	TBD			0.21		0.21		0.21
5	EMGEN	EMGEN	TBD			0.013		0.013		0.013
6	CBY51-LOV	CBY51-LOV	TBD			0.01		0.01		0.01
7	CBYST1-LOV	CBYST1-LOV	TBD			0.01		0.01		0.01
8	FUG-MSS	FUG-MSS	TBD			0.001		0.001		0.001
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			94.50

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	$PM_{2.5}$	**Permit:**	TBD
Baseline Period:	N/A	**to**	

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	B Baseline Emissions[4]	Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A)[6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			93.25		93.25		93.25
2	C-TOWER1	C-TOWER1	TBD			0.001		0.001		0.001
3	AUX-BLR	AUX-BLR	TBD			0.66		0.66		0.66
4	GAS-HTR	GAS-HTR	TBD			0.21		0.21		0.21
5	EMGEN	EMGEN	TBD			0.013		0.013		0.013
6	CBY51-LOV	CBY51-LOV	TBD			0.01		0.01		0.01
7	CBYST1-LOV	CBYST1-LOV	TBD			0.01		0.01		0.01
8	FUG-MSS	FUG-MSS	TBD			0.001		0.001		0.001
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			94.16

TCEQ

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	SO_2	**Permit:**	TBD
Baseline Period:	N/A **to**		

					A	B				
Affected or Modified Facilities[2]	**FIN**	**EPN**	**Permit No.**	**Actual Emissions[3]**	**Baseline Emissions[4]**	**Proposed Emissions[5]**	**Projected Actual Emissions**	**Difference (B - A) [6]**	**Correction[7]**	**Project Increase[8]**
1	CBY51	CBY51	TBD			23.98		23.98		23.98
2	AUX-BLR	AUX-BLR	TBD			0.12		0.12		0.12
3	GAS-HTR	GAS-HTR	TBD			0.06		0.06		0.06
4	EMGEN	EMGEN	TBD			0.0016		0.0016		0.0016
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			24.17

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	H_2SO_4	Permit:	TBD
Baseline Period:	N/A to		

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	B Baseline Emissions[4]	Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A)[6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			16.17		16.17		16.17
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			16.17

TABLE 2F
PROJECT EMISSION INCREASE
COMBINED CYCLE OPTION

Pollutant[1]:	CO_2e	**Permit:**	TBD
Baseline Period:	N/A **to**		

Affected or Modified Facilities[2]	FIN	EPN	Permit No.	Actual Emissions[3]	A Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			2,047,146		2,047,146		2,047,146
2	AUX-BLR	AUX-BLR	TBD			10,425		10,425		10,425
3	GAS-HTR	GAS-HTR	TBD			4,971.23		4,971.23		4,971.23
4	EMGEN	EMGEN	TBD			155.79		155.79		155.79
5	FUG-NGAS	FUG-NGAS	TBD			55.21		55.21		55.21
6	FUG-MSS	FUG-MSS	TBD			2.69		2.69		2.69
7	SF6FUG	SF6FUG	TBD			23.37		23.37		23.37
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			2,062,780

TABLE 1F
AIR QUALITY APPLICATION SUPPLEMENT

Permit No.:	TBD	Application Submittal Date:	03/18/2020
Company	NRG Cedar Bayou 5 LLC		
RN:	RN100825371	Facility Location:	7705 West Bay Road
City	Baytown	County:	Chambers
Permit Unit I.D.:	CBY51	Permit Name:	Cedar Bayou Electric Generating Station
Permit Activity:	☐ New Major Source	☑ Modification	
Project or Process Description: Addition of one simple cycle turbine			

Complete for all pollutants with a project emission increase.	POLLUTANTS								
	Ozone		CO	PM	PM_{10}	$PM_{2.5}$	SO_2	H_2SO_4	CO_2e
	VOC	NOx							
Nonattainment? (yes or no)	Yes	Yes	No	No	No	No	No	No	No
Existing site PTE (tpy)									
Proposed project increases (tpy from 2F)[3]	24.52	66.36	115.15	27.72	27.72	27.72	10.22	6.69	870,829
Is the existing site a major source?[2]	No								
If not, is the project a major source by itself? (yes or no)	Yes								
If site is major, is project increase significant? (yes or no)	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
If netting required, estimated start of construction:	12/31/20								
5 years prior to start of construction:	12/31/15	Contemporaneous							
Estimated start of operation:	6/1/22	Period							
Net contemporaneous change, including proposed project, from Table 3F (tpy)	24.52	66.36	115.15	27.72	27.72	27.72	10.22	6.69	870,829
FNSR applicable? (yes or no)	No	No (within PAL limit)	Yes	Yes	Yes	Yes	No	No	Yes

1. Other PSD pollutants
2. Nonattainment major source is defined in Table 1 in 30 TAC 116.12(11) by pollutant and county. PSD thresholds are found in 40 CFR §51.166(b)(1).

3. Sum of proposed emissions minus baseline emissions, increases only. Nonattainment thresholds are found in Table 1 in 30 TAC 116.12(11) and PSD thresholds in 40 CFR §51.166(b)(23).

The presentations made above and on the accompanying tables are true and correct to the best of my knowledge.

C. R. [signature] — Signature | Sr. Director — Title | 17 March 2020 — Date

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	VOC	**Permit:**	TBD
Baseline Period:	N/A **to**		

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	B Baseline Emissions[4]	Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			24.33		24.33		24.33
2	GAS-HTR	GAS-HTR	TBD			0.14		0.14		0.14
3	EMGEN	EMGEN	TBD			0.01		0.01		0.01
4	DSL-TNK	DSL-TNK	TBD			0.0001		0.0001		0.0001
5	FUG-NGAS	FUG-NGAS	TBD			0.01		0.01		0.01
6	CBY51-LOV	CBY51-LOV	TBD			0.01		0.013		0.013
7	FUG-MSS	FUG-MSS	TBD			0.003		0.003		0.003
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			24.52

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	NOx	**Permit:**	TBD
Baseline Period:	N/A **to**		

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	B Baseline Emissions[4]	Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A)[6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			65.14		65.14		65.14
3	GAS-HTR	GAS-HTR	TBD			0.51		0.51		0.51
4	EMGEN	EMGEN	TBD			0.72		0.72		0.72
5	FUG-MSS	FUG-MSS	TBD			0.000001		0.000001		0.000001
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			66.36

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	CO	**Permit:**	TBD
Baseline Period:	N/A **to**		

				A	B				
	Affected or Modified Facilities[2] FIN	EPN	**Permit No.**	**Actual Emissions[3]**	**Baseline Emissions[4]**	**Proposed Emissions[5]**	**Projected Actual Emissions**	**Difference (B - A)[6]**	**Correction[7]**	**Project Increase[8]**
1	CBY51	CBY51	TBD			113.53		113.53		113.53
3	GAS-HTR	GAS-HTR	TBD			1.57		1.57		1.57
4	EMGEN	EMGEN	TBD			0.05		0.05		0.05
5	FUG-MSS	FUG-MSS	TBD			0.000001		0.000001		0.000001
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			115.15

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	PM	**Permit:**	TBD
Baseline Period:	N/A	**to**	

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A)[6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			27.49		27.49		27.49
4	GAS-HTR	GAS-HTR	TBD			0.21		0.21		0.21
5	EMGEN	EMGEN	TBD			0.007		0.007		0.007
6	CBY51-LOV	CBY51-LOV	TBD			0.01		0.01		0.01
8	FUG-MSS	FUG-MSS	TBD			0.001		0.001		0.001
9										
10										
11										
12										
13										
14										
15										
16										
							Page Subtotal[9]			27.72

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	PM_{10}	**Permit:**	TBD
Baseline Period:	N/A	**to**	

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	A Actual Emissions[3]	B Baseline Emissions[4]	Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			27.49		27.49		27.49
2	GAS-HTR	GAS-HTR	TBD			0.21		0.21		0.21
3	EMGEN	EMGEN	TBD			0.007		0.007		0.007
4	CBY51-LOV	CBY51-LOV	TBD			0.01		0.01		0.01
5	FUG-MSS	FUG-MSS	TBD			0.001		0.001		0.001
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			27.72

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	$PM_{2.5}$	**Permit:**	TBD
Baseline Period:	N/A **to**		

	Affected or Modified Facilities[2] FIN	EPN	Permit No.	Actual Emissions[3]	A Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
1	CBY51	CBY51	TBD			27.49		27.49		27.49
2	GAS-HTR	GAS-HTR	TBD			0.21		0.21		0.21
3	EMGEN	EMGEN	TBD			0.007		0.007		0.007
4	CBY51-LOV	CBY51-LOV	TBD			0.01		0.01		0.01
5	FUG-MSS	FUG-MSS	TBD			0.001		0.001		0.001
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			27.72

TCEQ

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]:	SO_2	**Permit:**	TBD
Baseline Period:	N/A **to**		

				A	B				
Affected or Modified Facilities[2]			**Permit No.**	**Actual Emissions[3]**	**Baseline Emissions[4]**	**Proposed Emissions[5]**	**Projected Actual Emissions**	**Difference (B - A) [6]**	**Correction[7]**	**Project Increase[8]**
	FIN	**EPN**								
1	CBY51	CBY51	TBD			10.16		10.16		10.16
3	GAS-HTR	GAS-HTR	TBD			0.06		0.06		0.06
4	EMGEN	EMGEN	TBD			0.0006		0.0006		0.0006
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			10.22

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[1]: H_2SO_4	**Permit:** TBD
Baseline Period: N/A **to**	

Affected or Modified Facilities[2]			Permit No.	Actual Emissions[3]	A Baseline Emissions[4]	B Proposed Emissions[5]	Projected Actual Emissions	Difference (B - A) [6]	Correction[7]	Project Increase[8]
	FIN	EPN								
1	CBY51	CBY51	TBD			6.69		6.69		6.69
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[9]			6.69

TABLE 2F
PROJECT EMISSION INCREASE
SIMPLE CYCLE OPTION

Pollutant[(1)]:	CO_2e	**Permit:**	TBD
Baseline Period:	N/A	**to**	

	Affected or Modified Facilities[(2)] FIN	EPN	Permit No.	A: Actual Emissions[(3)]	B: Baseline Emissions[(4)]	Proposed Emissions[(5)]	Projected Actual Emissions	Difference (B - A)[(6)]	Correction[(7)]	Project Increase[(8)]
1	CBY51	CBY51	TBD			865,716		865,716		865,716
3	GAS-HTR	GAS-HTR	TBD			4,971.23		4,971.23		4,971.23
4	EMGEN	EMGEN	TBD			61.30		61.30		61.30
5	FUG-NGAS	FUG-NGAS	TBD			55.21		55.21		55.21
6	FUG-MSS	FUG-MSS	TBD			2.69		2.69		2.69
7	SF6FUG	SF6FUG	TBD			23.37		23.37		23.37
8										
9										
10										
11										
12										
13										
14										
15										
							Page Subtotal[(9)]			870,829

APPENDIX D TCEQ EQUIPMENT TABLES

TABLE 6
BOILERS AND HEATERS

Type of Device:	HRSG	Manufacturer:	TBD	
Number from flow diagram:	CBY51	Model Number:	TBD	

CHARACTERISTICS OF INPUT

Type Fuel	Chemical composition (% by weight)	Inlet Air Temp °F (after preheat)	Fuel Flow Rate (scf/hr)	
			Average	Design Maximum
Natural Gas	See Fuel Analysis in Appendix A, Table A-2		0	659,596
		Gross Heating Value of Fuel	Total Air Supplied and Excess Air	
		(specify units)	Average	Design Maximum
			______ scfm*	______ scfm*
		1022 Btu/scf HHV	______ excess (vol.)	______ excess (vol.)

HEAT TRANSFER MEDIUM

Type Transfer Medium	Temperature °F		Pressure (psia)		Flow Rate (specify units)	
Water, oil, etc.	Input	Output	Input	Output	Average	Design Maximum
Water/Steam						

OPERATING CHARACTERISTICS

Ave. Fire Box Temp. at max. firing rate	Fire Box Volume (ft.3), (from drawing)	Gas Velocity in Fire Box (ft/sec) at max. firing rate	Residence Time in Fire Box at max. firing rate (sec)

STACK PARAMETERS

Stack Diameter	Stack Height	Stack Gas Velocity (ft/sec)		Stack Gas	Exhaust
		Rate)	(@ Max. Fuel Flow Rate)	Temp °F	acfm
23	200		65.6	177	1,635,829

CHARACTERISTICS OF OUTPUT

Material	Chemical Composition of Exit Gas Released (% by Volume)
	Combustion Products - See Table 1(a)

Attach an explanation on how temperature, air flow rate, excess air or other operating variables are controlled.

Also supply an assembly drawing, dimensioned and to scale, in plan, elevation and as many sections as are needed to show clearly the operation of the combustion unit. Show interior dimensions and features of the equipment necessary to calculate in performance

* Standard Conditions: 70°F, 14.7 psia

TABLE 6
BOILERS AND HEATERS

Type of Device:	Auxiliary Boiler	Manufacturer:	TBD
Number from flow diagram:	AUX-BLR	Model Number:	TBD

CHARACTERISTICS OF INPUT

Type Fuel	Chemical composition (% by weight)	Inlet Air Temp °F (after preheat)	Fuel Flow Rate (scf/hr)	
			Average	Design Maximum
Natural Gas	90% Methane 5% Ethane 5% Nitrogen			87,087
		Gross Heating Value of Fuel	Total Air Supplied and Excess Air	
		(specify units)	Average	Design Maximum
		1023 Btu/scf (HHV)	______ scfm* ______ excess ______ (vol.)	______ scfm* ______ excess ______ (vol.)

HEAT TRANSFER MEDIUM

Type Transfer Medium	Temperature °F		Pressure (psia)		Flow Rate (specify units)	
Water, oil, etc.	Input	Output	Input	Output	Average	Design Maximum
Water/Steam						

OPERATING CHARACTERISTICS

Ave. Fire Box Temp. at max. firing rate	Fire Box Volume (ft.3), (from drawing)	Gas Velocity in Fire Box (ft/sec) at max. firing rate	Residence Time in Fire Box at max. firing rate (sec)

STACK PARAMETERS

Stack Diameter	Stack Height	Stack Gas Velocity (ft/sec)		Stack Gas	Exhaust
		Rate)	(@ Max. Fuel Flow Rate)	Temp °F	acfm
4.0	50		36.0	299	27,158

CHARACTERISTICS OF OUTPUT

Material	Chemical Composition of Exit Gas Released (% by Volume)
	Combustion Products - See Table 1(a)

Attach an explanation on how temperature, air flow rate, excess air or other operating variables are controlled.

Also supply an assembly drawing, dimensioned and to scale, in plan, elevation and as many sections as are needed to show clearly the operation of the combustion unit. Show interior dimensions and features of the equipment necessary to calculate in performance

* Standard Conditions: 70°F, 14.7 psia

Table 29
RECIPROCATING ENGINES

ENGINE DATA

Emission Point Number from Table 1(a)	EMGEN	Manufacturer	TBD
APPLICATION		Model No.	TBD
___ Gas Compression		Serial No.	___
X Electric Generation		Orig. Mfr. Date	___
___ Refrigeration		Rebuild Date(s)	___
___ Other (Specify):		No. of Cylinders	___
	___	Compression Ratio	___

___ 4 Stroke Cycle	___ Carburetted	___ Spark Ignited	___ Dual Fuel
___ 2 Stroke Cycle	___ Fuel Injected	X Diesel	

___ Naturally Aspirated	___ Blower/Pump Scavenged	___ Turbocharged and I.C.
___ Turbocharged	___ Intercooled (I.C.)	___ I.C. Water Temperature

Ignition/Injection Timing: ___ Fixed ___ Variable

	Mfg. Rating	Proposed Operating Range
Horsepower	2,937	
Speed (rpm)		

FUEL DATA

___ Field Gas	___ Landfill Gas	___ LP Gas	___ Other
___ Natural Gas	___ Digester Gas	X Diesel	

Engine Fuel Consumption	6,484.17	BTU/bhp-hr
Heat Value (specify units)	0.138 MMBtu/gal	(HHV)
Fuel Sulfur Content	0.0015%	(weight percent)

FULL LOAD EMISSIONS DATA
(See emission calculations for emissions data)

NOx	___	lb/bhp-hr	CO	___	lb/bhp-hr
	___	ppmv		___	ppmv
VOC (C3+)	___	lb/bhp-hr	PM/PM10	___	lb/bhp-hr
	___	ppmv		___	ppmv

Attach information showing emissions versus engine speed and load.

Method of Emissions Control:

___ Lean Operation	___ Parameter Adjustment	___ SCR Catalyst
___ Stratified Charge	___ NSCR Catalyst	___ Other Specify: ___

ADDITIONAL INFORMATION

On separate sheets attach the following:

A. A copy of engine manufacturer's site rating or general rating specification for the engine model.
B. Typical fuel analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
C. Description of air/fuel ratio control system (manufacturer's information acceptable).

D. Details regarding principle of operation of emissions controls. If add-on equipment is used, provide make and model and manufacturer's information.
E. Exhaust parameter information on Table 1(a).

Note: All values are approximate and used as appropriate to calculate emission limits.

Table 29
RECIPROCATING ENGINES

ENGINE DATA

Emission Point Number from Table 1(a)	EMGEN	Manufacturer	TBD
APPLICATION		Model No.	TBD
____ Gas Compression		Serial No.	
X Electric Generation		Orig. Mfr. Date	
____ Refrigeration		Rebuild Date(s)	
____ Other (Specify):		No. of Cylinders	
		Compression Ratio	

____ 4 Stroke Cycle	____ Carburetted	____ Spark Ignited	____ Dual Fuel
____ 2 Stroke Cycle	____ Fuel Injected	X Diesel	

____ Naturally Aspirated	____ Blower/Pump Scavenged	____ Turbocharged and I.C.
____ Turbocharged	____ Intercooled (I.C.)	____ I.C. Water Temperature

Ignition/Injection Timing: ____ Fixed ____ Variable

	Mfg. Rating	Proposed Operating Range
Horsepower	1,112	
Speed (rpm)		

FUEL DATA

____ Field Gas	____ Landfill Gas	____ LP Gas	____ Other
____ Natural Gas	____ Digester Gas	X Diesel	

Engine Fuel Consumption	6,738.67	BTU/bhp-hr
Heat Value (specify units)	0.138 MMBtu/gal	(HHV)
Fuel Sulfur Content	0.0015%	(weight percent)

FULL LOAD EMISSIONS DATA
(See emission calculations for emissions data)

NOx		lb/bhp-hr	CO		lb/bhp-hr
		ppmv			ppmv
VOC (C3+)		lb/bhp-hr	PM/PM10		lb/bhp-hr
		ppmv			ppmv

Attach information showing emissions versus engine speed and load.

Method of Emissions Control:

____ Lean Operation	____ Parameter Adjustment	____ SCR Catalyst
____ Stratified Charge	____ NSCR Catalyst	____ Other Specify: ____

ADDITIONAL INFORMATION

On separate sheets attach the following:

A. A copy of engine manufacturer's site rating or general rating specification for the engine model.
B. Typical fuel analysis, including sulfur content and heating value. For gaseous fuels, provide mole percent of constituents.
C. Description of air/fuel ratio control system (manufacturer's information acceptable).

D. Details regarding principle of operation of emissions controls. If add-on equipment is used, provide make and model and manufacturer's information.
E. Exhaust parameter information on Table 1(a).

Note: All values are approximate and used as appropriate to calculate emission limits.

Table 31
COMBUSTION TURBINES

TURBINE DATA

Emission Point Number from Table 1(a) CBY51

X	Electric Generation		Simple Cycle
X	Base Load	Peaking		Regenerative Cycle
	Gas Compressions		Cogeneration
	Other (Specify)	X	Combined Cycle

Manufacturer	Mitsubishi	Model represented is based on:
Model No.	M501JAC	X Preliminary Design ___ Contract Award
Serial No.		___ Other (Specify) ___

See TCEQ Reg VI, 116.11(a)

Manufacturer's Rated Output at Baseload, ISO	349.4	(MW)
Proposed Site Operating Range		(MW)
Manufacturer's Rated Heat Rate at Baseload, ISO		(Btu/k W-hr)

FUEL DATA

Primary Fuels:

X	Natural Gas		Process Offgas		Landfill/Digester Gas
	Fuel Oil		Refinery Gas		Other

Backup Fuels:

X	Not Provided		Process Offgas		Ethane
	Fuel Oil		Refinery Gas		Other (specify

EMISSIONS DATA

Attach manufacturer's information showing emissions of NOx, CO, VOC and PM for each proposed fuel at turbine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM, parts per million by volume at actual conditions and corrected to dry, 15% oxygen conditions.

Method of Emissions Control:

X	Lean Premix Combustors	X	Oxidation Catalyst		Water Injection
	Other Low-NOx Combustc	X	SCR Catalyst		Steam Injection
					Other (specify)

ADDITIONAL INFORMATION

On separate sheets attach the following:

A. Details regarding principle of operation of emission controls. If add-on equipment is used, provide make and model and manufacturer's information. Example details include: controller input variables and operational algorithms for water or ammonia injection systems, combustion mode versus turbine load for variable mode combustors, etc.
B. Exhaust parameter information on Table 1(a).
C. If fired duct burners are used, information required on Table 6.

Table 31
COMBUSTION TURBINES

TURBINE DATA

Emission Point Number from Table 1(a) CBY51

X	Electric Generation	X	Simple Cycle
	Base Load — X Peaking		Regenerative Cycle
	Gas Compressions		Cogeneration
	Other (Specify)		Combined Cycle

Manufacturer	Mitsubishi	Model represented is based on:
Model No.	M501JAC	X Preliminary Design ___ Contract Award
Serial No.		___ Other (Specify)

See TCEQ Reg VI, 116.11(a)

Manufacturer's Rated Output at Baseload, ISO	419.6	(MW)
Proposed Site Operating Range		(MW)
Manufacturer's Rated Heat Rate at Baseload, ISO		(Btu/k W-hr)

FUEL DATA

Primary Fuels:

X	Natural Gas		Process Offgas		Landfill/Digester Gas
	Fuel Oil		Refinery Gas		Other

Backup Fuels:

X	Not Provided		Process Offgas		Ethane
	Fuel Oil		Refinery Gas		Other (specify

EMISSIONS DATA

Attach manufacturer's information showing emissions of NOx, CO, VOC and PM for each proposed fuel at turbine loads and site ambient temperatures representative of the range of proposed operation. The information must be sufficient to determine maximum hourly and annual emission rates. Annual emissions may be based on a conservatively low approximation of site annual average temperature. Provide emissions in pounds per hour and except for PM, parts per million by volume at actual conditions and corrected to dry, 15% oxygen conditions.

Method of Emissions Control:

X	Lean Premix Combustors	X	Oxidation Catalyst		Water Injection
	Other Low-NOx Combustc	X	SCR Catalyst		Steam Injection
					Other (specify)

ADDITIONAL INFORMATION

On separate sheets attach the following:

A. Details regarding principle of operation of emission controls. If add-on equipment is used, provide make and model and manufacturer's information. Example details include: controller input variables and operational algorithms for water or ammonia injection systems, combustion mode versus turbine load for variable mode combustors, etc.

B. Exhaust parameter information on Table 1(a).

C. If fired duct burners are used, information required on Table 6.

APPENDIX E RACT/BACT/LAER CLEARINGHOUSE SUMMARIES

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR NOX EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0439	Consumers Energy Company - Jackson Generating Station	FGLMDB1-6 (6 combined cycle natural gas fired CTG each equipped with a HRSG)	Jackson	MI	118-18	04/02/2019	Nitrogen Oxides (NOx)	25	PPM	At 15% O2; 30 Day Rolling Avg; Each Unit	22	PPM	At 15%O2; 12-Mo Roll Avg; All Units Combined	BACT-PSD	Steam injection, good combustion practices and only combust natural gas.	Emission limit 1 = 25 ppmv at 15% O2 on a dry gas basis for each unit during periods with no duct firing. The limit does not apply during startup and shutdown. Emission limit 2 = 22 ppmv at 15% O2 on a dry gas basis excluding periods for each turbine when it operates in conjunction with its respective duct burner. This limit is for all units combined and does not apply during periods of startup and shutdown. Emission limit 3 = 54.0 lb/hr (equates to approximately 0.09 lb/MMBTU) when the turbine operates alone and when the turbine operates in conjunction with its respective duct burner on a 30-day rolling average. These limits apply during periods of startup and shutdown.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG2--A 667 MMBTU/H natural gas fired CTG with a HRSG.	Eaton	MI	74-18	12/21/2018	Nitrogen Oxides (NOx)	3	PPM	Ppmvd@15%O2; 24-H Avg; See Notes	25	PPM	ppmvd@15%O2; 4-H Avg; See Notes	BACT-PSD	Dry low NOx burners and selective catalytic reduction for NOx control.	Emission limit 1 is 3.0 ppmvd at 15% O2 based on a 24-hour rolling average, except during startup and shutdown. Emission limit 2 is 25 ppmvd at 15% O2 based on a 4-hour rolling average, except during operation less than 75% peak load. This limit is when the unit is in HRSG bypass mode. Emission limit 3 is 60.0 lb/h when the unit is in combined cycle mode. It is hourly including startup or shutdown. Emission limit 4 is 60.0 lb/h when the unit is in HRSG bypass mode. It is based on a 24-hour rolling average.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG1--A 667 MMBTU/H NG fired combustion turbine generator coupled with a heat recovery steam generator (HRSG)	Eaton	MI	74-18	12/21/2018	Nitrogen Oxides (NOx)	3	PPM	Ppmvd@15%O2; 24-H Roll Avg; See Notes	25	PPM	ppmvd@15%O2; 4-Hr Roll Avg; See Notes	BACT-PSD	Dry low NOx burners and selective catalytic reduction for NOx control.	NOx emission limit 1 is 3.0 ppmvd at 15%O2 based on a 24-hour rolling average, except during startup and shutdown. NOx emission limit 2 is 25 ppmvd at 15%O2 based on a 4-hour rolling average, except during operation less than 75% of peak load. The limit applies to the unit in HRSG bypass mode. NOx emission limit 3 is 60.0 lb/h when the unit is in combined cycle mode. The limit is hourly including startup or shutdown. NOx emission limit 4 is 60.0 lb/h when the unit is in HRSG bypass mode. The limit is based on a 24-hour rolling average as determined each operating hour.
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	Nitrogen Oxides (NOx)	2.5	PPMV	30 Day Rolling Average				BACT-PSD	Low NOx Burners, SCR, and Good Combustion Practices	Units are in ppmv @ 15% O2; Averaging time is 30 Day Rolling Average during Normal Operations.
*WV-0032	ESC Brooke County Power I, LLC - Brooke County Power Plant	GE 7HA.01 Turbine	Brooke	WV	R14-0035	09/18/2018	Nitrogen Oxides (NOx)	23.2	LB/HR					BACT-PSD	Dry-Low NOx Burners, SCR	
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	Nitrogen Oxides (NOx)	2	PPMVD	At 15%O2; Each Indiv. Ct/Hrsg Train	22.4	LB/H	Each Indiv. CT/HRSG Train; 24-H Roll Avg	BACT-PSD	Good combustion practices, DLN burners and SCR.	Each emission limit is per each individual CT/HRSG train in FG-TURB/DB1-3. The emission limits above DO NOT include startup/shutdown. There are 4 NOx emission limits, including an NSPS limit. They are all as follows: Em. Limit 1 = 2.0 ppmvd at 15%O2 based on a 24-hour rolling average. Em. Limit 2 = 22.4 lb/h based on a 24-hour rolling average. Em Limit 3 = 15 ppmvd at 15%O2 based on a 30-day rolling average. Em Limit 4 = 116 ton/yr based on a 12-month rolling time period as determined at the end of each calendar month.
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3--Startup/Shutdown Operations	Van Buren	MI	186-17	07/30/2018	Nitrogen Oxides (NOx)	249	LB/H	Each Ct/Hrsg Train; SU/SD				BACT-PSD	Good combustion practices, DLN burners and SCR.	

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*FL-0367	Shady Hills Energy Center, LLC - Shady Hills Combined Cycle Facility	1-on-1 combined cycle unit (GE 7HA)	Pasco	FL	1010524-001-AC	07/27/2018	Nitrogen Oxides (NOx)	2	PPMVD AT 15% O2	24-Hour Block Average Basis (Bact)	15	PPMVD AT 15% O2	30-Operating-Day Rolling Avg. (NSPS)	BACT-PSD	Dry low-NOX combustors and Selective Catalytic Reduction (SCR)	2nd Limit of 15 ppmvd @ 15% O2 (for turbine loads > 75%) 3rd Limit: 96 ppmvd @15% O2 (for turbine loads < 75%)
MI-0435	Dte Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	Nitrogen Oxides (NOx)	2	PPMVD	At 15%O2; 24-H Roll Avg; Each Unit;	28.9	LB/H	24-H Roll Avg; Each Unit; Not S.S.	BACT-PSD	SCR with DLNB (Selective catalytic reduction with dry low NOx burners).; 80-90%	Emission limit 1 = 2 ppmvd at 15% O2 based on a 24-hour rolling average, except during startup and shutdown (S.S.). The limit applies to each unit. Emission limit 2 = 28.90 LB/H based on a 24-hour rolling average, except during startup and shutdown (S.S.). The limit applies to each unit. Emission limit 3 = 15 ppmvd at 15% O2 based on a 30-day rolling average. The limit applies to each unit. Emission limit 4 = 262.4 LB/H each operating hour during startup or shutdown (S.S.). The limit applies to each unit.
MI-0435	Dte Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)--Startup & Shutdown	St. Clair	MI	19-18	07/16/2018	Nitrogen Oxides (NOx)	262.4	LB/H	Each Unit; Operating Hour During SU/SD				BACT-PSD	SCR with DLNB (Selective catalytic reduction with dry low NOx burners).; 80%	
MI-0433	Marshall Energy Center LLC - Mec North, LLC And Mec South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Nitrogen Oxides (NOx)	2	PPMV	At 15%O2; 24-Hr Roll Avg Not SU/SD	29.7	LB/H	24-H Roll Avg Not S.S.	BACT-PSD	SCR with DLNB (Selective catalytic reduction with dry low NOx burners).; 80-90%	Emission Limit 1 = 2 ppmvd at 15%O2 based on a 24-hour rolling average, except during startup and shutdown (S.S.). Emission limit 2 - 15 ppmvd at 15%O2 based on a 30-day rolling average (not including startup and shutdown). Emission limit 3 = 29.7 LB/H based on a 24-hour rolling average, except during startup and shutdown. Emission limit 4 = 126.5 LB/H based on each operating hour during startup or shutdown. Startup and Shutdown hours are limited to 300 hours per 12 month rolling time period.
MI-0433	Marshall Energy Center LLC - Mec North, LLC And Mec South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Nitrogen Oxides (NOx)	2	PPMVD	At 15%O2; 24-H Roll Avg; Not SU/SD	29.7	LB/H	24-H Roll Avg; Not Startup/Shutdown (SS)	BACT-PSD	SCR with DLNB (Selective catalytic reduction with Dry Low NOx burners).; 80-90%	Emission limit 1 = 2 ppmvd at 15%O2 based on a 24-hour rolling average as determined each operating hour except during startup and shutdown. Emission Limit 2 = 29.7 lb/h based on a 24-hour rolling average as determined each operating hour except during startup and shutdown. Emission Limit 3 = 15 ppmvd at 15%O2 based on a 30-day rolling average as determined each operating day. Emission limit 4 = 126.5 lb/h each operating hour during startup or shutdown. Startup and shutdown hours are limited to 300 hours per 12-month rolling time period.
MI-0431	Indeck Niles LLC - Indeck Niles LLC	FGCTGHRSG (2 Combined Cycle CTG with HRSGs)	Cass	MI	75-16A	06/26/2018	Nitrogen Oxides (NOx)	2	PPM	At 15%O2; 24-Hr Roll Avg	38.1	LB/H	24-Hr Roll Avg.	BACT-PSD	SCR with DLNB (Selective Catalytic Reduction with Dry Low NOx Burners); 80%	The concentration-based NOx emission limit above is the only BACT limit changed in PTI 75-16A. All other BACT limits remain as in RBLC ID MI 0423. Emission Limit 1 above is 2 ppmvd at 15% O2 based on a 24-hour rolling average, except during startup and shutdown. The limit is for EACH CTGHRSG. Emission Limit 2 above is 38.1 lb/hour and is based on a 24-hour rolling average, except during startup and shutdown. The limit is for EACH CTGHRSG. The permit contains two additional NOx emission limits that apply to EACH CTGHRSG-- 1. 15 ppmvd at 15%O2 based on a 30-day rolling average. 2. 286 lb/hour during startup or shutdown. This is also a BACT emission limit.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	Usa	VA	52588	04/26/2018	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	1 H Av	141.3	T/YR	12 Mo Rolling Total	BACT-PSD	dry, low NOx burners and selective catalytic reduction	Alternative emission limits apply during tuning, water washing, startup and shutdown.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR NOX EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	Usa	VA	52588	04/26/2018	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	1 H Av	141.4	T/YR	12 Mo Rolling Total	BACT-PSD	Dry, Low NOx Burners & SCR	Alternative emission limits apply during tuning, water washing, startup and shutdown.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Tuning Water Washing	Usa	VA	52588	04/26/2018	Nitrogen Oxides (NOx)	638	LB/TURBINE/CAL DAY	24 Hr Av				BACT-PSD	dry, low NOx burners and SCR	This limit applies during tuning (limited to 18 hours/event) and water washing (limited to 60 minutes/event).
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Startup and Shutdown	Usa	VA	52588	04/26/2018	Nitrogen Oxides (NOx)	273	LB/TURBINE/EVENT	Cold Start 60 Min Or Less	163	LB/TURBINE/ EVENT	Warm Start 50 Min Or Less	BACT-PSD	Dry, low NOx burners and SCR	105 lb/turbine/event hot start - 30 minutes or less 18 lb/turbine/event shut down - 30 minutes or less These limits apply during startup and shutdown.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combustion Turbine - Tuning & Water Washing	Usa	VA	52588	04/26/2018	Nitrogen Oxides (NOx)	564	LB/TURBINE CAL DAY	24 Hr Av				BACT-PSD	dry, low NOx burners and SCR	This limit applies during tuning (limited to 18 hours/event) and water washing (limited to 60 minutes/event).
VA-0328	Novi Energy - C4GT, LLC	Siemens Combustion Turbine - Startup & Shutdown	Usa	VA	52588	04/26/2018	Nitrogen Oxides (NOx)	95	LB/TURBINE/EVENT	Cold Start 55 Min Or Less	117	LB/TURBINE/ EVENT	Warm Start 55 Min Or Less	BACT-PSD	dry, low NOx burners and SCR	8 lb/turbine/event hot start - 50 minutes or less 51 lb/turbine/event shut down - 38 minutes or less These limits apply during startup and shutdown.
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	Nitrogen Oxides (NOx)	29.5	LB/H	With Duct Burner. See Notes.	139	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx burners and an SCR system	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen on a 24-hr block averaging period. 29.5 lb/h with duct burner, except startup and shutdown. 25.1 lb/h without duct burner, except startup and shutdown. 12.99 tons per rolling 12 month period for startup and shutdown periods.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	Nitrogen Oxides (NOx)	28	LB/H	With Duct Burner. See Notes.	124	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx burners and an SCR system	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen on a 24-hr block averaging period. 28 lb/h with duct burner, except startup and shutdown. 26.7 lb/h without duct burner, except startup and shutdown. 3.22 tons per rolling 12 month period for startup and shutdown periods.
*WV-0029	ESC Harrison County Power, LLC - Harrison County Power Plant	GE 7HA.02 Turbine	Harrison	WV	R14-0036	03/27/2018	Nitrogen Oxides (NOx)	32.9	LB/HR	1-Hour Average	156.2	TONS/YEAR		BACT-PSD	Dry-Low NOx Burners, SCR	
*TN-0164	Tennessee Valley Authority - TVA - Johnsonville Cogeneration	Dual-fuel CT and HRSG with duct burner	Humphreys	TN	972969	02/01/2018	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	30-Day Avg When Burning Natural Gas	8	PPMVD @ 15% O2	30-Day Avg When Burning #2 Oil	BACT-PSD	SCR, good combustion design & practices	BACT limits exclude startup and shutdown. NSPS KKKK limits apply to NOX emissions during startup and shutdown
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Combined cycle CTG with unfired HRSG)	Manistee	MI	66-17	11/17/2017	Nitrogen Oxides (NOx)	3	PPM	24-H Roll.Avg., Except Startup/Shutdown	21.4	LB/H	24-H Roll.Avg., Except Startup/Shutdown	BACT-PSD	SCR with DLNB (Selective catalytic reduction with dry low NOx burners).	Emission limit 1 above is 3 ppmvd at 15% O2 based on a 24-hour rolling average and does not include startup/shutdown. Emission Limit 2 above is 21.4 LB/H based on a 24-hour rolling average, except startup/shutdown. There is a third emission limit, which is 15 ppm at 15% O2 and is based on a 30-day rolling average.
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Startup/Shutdown)	Manistee	MI	66-17	11/17/2017	Nitrogen Oxides (NOx)	32	POUNDS	Per Event				BACT-PSD	SCR with DLNB (Selective catalytic reduction with dry low NOx burners).	The emission limit is 32 pounds per event and applies at each startup or shutdown event.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	Nitrogen Oxides (NOx)	26.1	LB/H	Except Startup And Shutdown. See Notes	125.8	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx burners and an SCR system	2.0 ppmvd at 15% oxygen (O2) and 26.1 pounds per hour, excluding periods of startup and shutdown. 164.5 lb/h during cold startup, 109.7 lb/h during hot startup, 87.4 lb/h during warm startup, and 27.9 lb/h during shutdown.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	Nitrogen Oxides (NOx)	25.1	LB/H	With Duct Burner. See Notes.	119.4	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx burners and an SCR system	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 25.10 lb/h with duct burner (except startup and shutdown). 26.4 lb/h without duct burner (except startup and shutdown). 68.1 lb/h during cold startup, 55.4 lb/h during warm startup, 34.6 lb/h during hot startup, and 37.9 lb/h during shutdown.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	Nitrogen Oxides (NOx)	27.1	LB/H	With Duct Burner. See Notes.	128.8	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx burners and an SCR system	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 27.10 lb/h with duct burner (except startup and shutdown). 22.4 lb/h without duct burner (except startup and shutdown). 72.7 lb/h during cold startup, 87.1 lb/h during warm startup, 77.7 lb/h during hot startup, and 44.8 lb/h during shutdown.

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	Nitrogen Oxides (NOx)	33.85	LB/H	With Duct Burner. See Notes.	26.37	LB/H	Without Duct Burners. See Notes.	BACT-PSD	dry low NOx burners and SCR	2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen turbine with duct burners and turbine only, both excluding startup and shutdown. Limits are for single turbine except as noted. 26.37 lb/h without duct burners. 33.85 lb/h with duct burners. Both excluding startup and shutdown 266.7 lb/cold startup, 140.7 lb/hot startup, 88.4 lb/warm startup and 32.7 lb/shutdown. 422.19 t/yr per rolling 12 month period total for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	Nitrogen Oxides (NOx)	25.3	LB/H	With Duct Burner. See Notes.	118.02	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	Dry low NOX combustors and selective catalytic reduction (SCR)	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 25.3 lb/h with duct burner (except startup and shutdown). 23.8 lb/h without duct burner (except startup and shutdown). 118.02 t/yr per rolling 12 month period for all operating modes, including startup. 162 lb/h during cold startup, 78.7 lb/h during hot startup, 113 lb/h during warm startup, and 57.3 lb/h during shutdown.
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	Nitrogen Oxides (NOx)	25.3	LB/H	With Duct Burner. See Notes.	117.6	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx combustors (DLN) and selective catalytic reduction (SCR)	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen, 25.3 lb/h with duct burner, 23.8 lb/h without duct burner (each limit except startup and shutdown). 162.0 lb/h during cold startup, 78.7 lb/h during hot startup, 113.0 lb/h during warm startup, and 72.7 lb/h during shutdown.
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Nitrogen Oxides (NOx)	2	PPMVD	15% O2 3-H Avg				BACT-PSD	Selective Catalytic Reduction (SCR) and Dry Low NOx burners	
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Flue Gas Heater	Greene	PA	30-00233B	04/12/2017	Nitrogen Oxides (NOx)	0.011	LB	Mmbtu					good combustion and operating practices	
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	Nitrogen Oxides (NOx)	38.1	LB/H	24-H Rolling Average	286	LB/H	Operating Hr During Startup Or Shutdown	BACT-PSD	SCR with DLNB (selective catalytic reduction with dry low NOx burners); 80-90%	Emission Limit 1 = 3 ppmvd at 15%O2 based on a 24-H rolling avg, except during startup and shutdown. Emission Limit 2 = 15 ppmvd at 15%O2 based on a 30-day rolling avg. Emission Limit 3 = 38.1 LB/H based on a 24-H rolling avg, except during startup and shutdown. Emission Limit 4 = 286 LB/H based on an operating hour during startup or shutdown.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG (2 Combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	Nitrogen Oxides (NOx)	3	PPM AT 15% O2	24-H Rolling Avg; Each Unit	8.18	LB/H	24-H Rolling Avg; Each EU	BACT-PSD	Selective catalytic reduction with dry low NOx burners (SCR with DLNB).; 95%	1) 3 ppmvd at 15% O2 based on a 24-hour rolling average, except during startup and shutdown. 2) 8.18 LB/H based on a 24-hour rolling average, except during startup and shutdown.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG--Startup/Shutdown (2 combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	Nitrogen Oxides (NOx)	43.7	LB/H	Operating Hour During Startup; Each EU	43.1	LB/H	Operating Hour During Shutdown; Each EU	BACT-PSD	Selective catalytic reduction with dry low NOx burners (SCR with DLNB).; 95%	The emission limits above are for each emission unit during startup/shutdown.
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	Nitrogen Oxides (NOx)	30.51	LB/H	With Duct Burner. See Notes.	151.3	T/YR	Per Rolling 12 Month Period	BACT-PSD	Dry low NOx (DLN) burners for natural gas firing, wet injection when firing ultra low sulfur diesel, and selective catalytic reduction (SCR) for both natural gas and ultra low sulfur diesel.	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen, hourly average, natural gas, with and without duct burner. 5.0 ppm by volume dry basis (ppmvd) at 15% oxygen, hourly average, ultra low sulfur diesel. 30.51 lb/h with duct burner (except startup and shutdown). 24.92 lb/h without duct burner (except startup and shutdown). 66.32 lb/h for ultra low sulfur diesel (except startup and shutdown). When firing natural gas, 231.4 lb/h during startup and 26.5 lb/h during shutdown. When firing ultra low sulfur diesel, 181.3 lb/h during startup and 85.4 lb/h during shutdown.
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016	Nitrogen Oxides (NOx)	26.91	LB/H	Hourly Maximum	109.51	T/YR	Annual Maximum	BACT-PSD	Selective Catalytic Reduction (SCR) with Dry Low NOx Burners (DLNB) during normal operations; Good Combustion Practices during Startup/Shutdown operations.	2.0 PPM@15% O2 (24-hour rolling average)

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR NOX EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016	Nitrogen Oxides (NOx)	26.91	LB/H	Hourly Maximum	109.51	T/YR	Annual Maximum	BACT-PSD	Selective Catalytic Reduction (SCR) with Dry Low NOx Burners (DLNB) during normal operations, and good combustion practices during startup/shutdown operations.	2.0 PPM@15% O2 (24-hour rolling average)
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion turbine generator with duct-fired heat recovery steam generators (3)	Greensville	VA	52525	06/17/2016	Nitrogen Oxides (NOx)	2	PPMVD	1 Hr Avg				N/A	SCR	2.0 ppmvd @ 15% O2 (1-hour average)
TN-0162	Tennessee Valley Authority - Johnsonville Cogeneration	Natural Gas-Fired Combustion Turbine with HRSG	Humphreys	TN	970816F	04/19/2016	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	30 Unit-Operating-Day Moving Average	8	PPMVD @ 15% O2	15 Unit-Operating-Day Moving Average	BACT-PSD	Good combustion design and practices, selective catalytic reduction (SCR); 90%	Emission limit #1 is for natural gas combustion, emission limit #2 is for No. 2 oil combustion.
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Nitrogen Oxides (NOx)	2	PPM					BACT-PSD	Selective Catalytic Reduction	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	Nitrogen Oxides (NOx)	2	PPMVD@15% O2	Gas, 24-Hr Block, Excluding Ssm	8	PPMVD@15% O2	ULSD, 24-Hr Block, Excluding Ssm	BACT-PSD	Selective catalytic reduction; dry low-NOx; and wet injection	
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	Nitrogen Oxides (NOx)	2	PPM					BACT-PSD	Selective Catalytic Reduction	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Nitrogen Oxides (NOx)	9	PPM	Rolling 24-Hr Average				BACT-PSD	Dry low NOx burners and good combustion practices	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Nitrogen Oxides (NOx)	5	PPM	Rolling 24-Hr Average				BACT-PSD	Selective Catalytic Reduction	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - cold startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Nitrogen Oxides (NOx)	153	LB/EVENT	Cold Startup				BACT-PSD	Good Combustion Practices, Dry Low-Nox Combustor Design And Selective Catalytic Reduction (SCR)	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	3-Hour Block Average (Excluding Su/Sd)	42	PPM @ 15% O2	3-Hour Block Average	BACT-PSD	Good Combustion Practices, Dry Low-Nox Combustor Design And Selective Catalytic Reduction (SCR)	With and without duct firing
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - warm startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Nitrogen Oxides (NOx)	132	LB/EVENT	Warm Startup				BACT-PSD	Good Combustion Practices, Dry Low-Nox Combustor Design And Selective Catalytic Reduction (SCR)	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - hot startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Nitrogen Oxides (NOx)	105	LB/EVENT	Hot Startup				BACT-PSD	Good Combustion Practices, Dry Low-Nox Combustor Design And Selective Catalytic Reduction (SCR)	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - shutdown	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Nitrogen Oxides (NOx)	23	LB/EVENT	Shut Down				BACT-PSD	Dry Low-Nox Combustor Design, Good Combustion Practices And Selective Catalytic Reduction (SCR)	
TX-0773	FGE Eagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (GT 25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	Nitrogen Oxides (NOx)	2	PPM	24-Hr Average				BACT-PSD	Selective Catalytic Reduction	
OK-0169	Public Service Company Of Oklahoma - Pso Comanche Power Station	Combined cycle combustion turbine	Comanche	OK	2010-496-C(M-2)PSD	10/08/2015	Nitrogen Oxides (NOx)	0.15	LB/MMBTU	30-Day Rolling Avg	187.5	LB/HR	3-Hr Avg	BART	Use of Dry Low NOx Burners	
TX-0767	Lon C. Hill, L.P. - Lon C. Hill Power Station	Combined Cycle Turbines (GT 25 MW)	Nueces	TX	114911 AND PSDTX1380	10/02/2015	Nitrogen Oxides (NOx)	2	PPM	Rolling 24-Hr Average				BACT-PSD	Selective Catalytic Reduction	
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	Nitrogen Oxides (NOx)	23.5	LB/H	With Duct Burner. See Notes.	107.2	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry low NOx combustors, selective catalytic reduction (SCR)	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 23.5 lb/h with duct burner (except startup and shutdown). 22.3 lb/h without duct burner (except startup and shutdown). 162.1 lb/h during cold startup, 78.7 lb/h during hot startup, 112.8 lb/h during warm startup, and 57.3 lb/h during shutdown.
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	Nitrogen Oxides (NOx)	14.7	LB/H	Without Duct Burners. See Notes.	435.3	T/YR	Per Rolling 12 Month Period	BACT-PSD	dry-low NOx (DLN) burner and selective catalytic reduction (SCR)	2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, with and without duct burners. Limits are for single turbine except as noted. 635.30 t/yr per rolling 12 month period total for all 4 turbines.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR NOX EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	Nitrogen Oxides (NOx)	15.6	LB/H	Without Duct Burners. See Notes.	449.31	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	dry-low NOx (DLN) burner and selective catalytic reduction (SCR)	2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, with and without duct burners. Limits are for single turbine except as noted. 15.6 lb/h, 3-hour average, turbine only without duct burners. 19.60 3.1 lb/h, 3-hour average, turbine with duct burners. 324 lb/cold startup, 192 lb/hot startup, 257 lb/warm startup and 82 lb/shutdown. 449.31 t/yr per rolling 12 month period total for all 4 turbines.
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX112	04/01/2015	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	24-Hr Average				BACT-PSD	SCR and oxidation catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*IL-0130	Jackson Generation, LLC - Jackson Energy Center	Combined-Cycle Combustion Turbine	Will	IL	17040013	12/31/2018	2	PPMV	3 Operating Hour Average @ 15% O2	211.5	PPMV	3 Operating Hour Average @ 15% O2	BACT-PSD	Oxidation catalyst	Emission Limits 1 is applicable when operating with duct burner. Emission Limit 2 is applicable without the duct burner, after 36 months from initial operation. Pounds/hour limit without duct burner is 30.5, 3-hour average. Pounds/hour limit with duct burner is 33,9, 3-hour average. Emission Limits 1 and 2 and pounds/hour limits do not apply during startup/shutdown/commissioning and tuning. Pounds/hour limit for startup/shutdown/commissioning is 483.5. Pounds/hour limit for tuning is 239. Pounds/hour limit for period of very low load is 20.6
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG2--A 667 MMBTU/H natural gas fired CTG with a HRSG.	Eaton	MI	74-18	12/21/2018	4	PPM	Ppmvd@15%O2; 24-H Avg; See Notes		LB/H	Hourly Except Startup/Shutdown; See Note	BACT-PSD	An oxidation catalyst for CO control for each CTG/HRSG unit, good combustion practices.	Emission limit 1 is 4 ppmvd at 15%O2 based on a 24-hour rolling average, except during startup and shutdown. The limit applies when the unit is in combined cycle mode. Emission limit 2 is 9 lb/h, except during startup and shutdown. The limit applies when the unit is in HRSG bypass mode. Emission limit 3 is 289 lb/h, including startup and shutdown. The limit applies when the unit is in combined cycle mode.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG1--A 667 MMBTU/H NG fired combustion turbine generator coupled with a heat recovery steam generator (HRSG)	Eaton	MI	74-18	12/21/2018	4	PPM	Ppmvd@15%O2;24-H Roll Avg; See Notes	9	LB/H	Hourly Except Startup/Shutdown; See Note	BACT-PSD	An oxidation catalyst for CO control for each CTG/HRSG unit; good combustion practices.	Emission limit 1 is 4 ppmvd at 15%O2 based on a 24-hour rolling average, except during startup and shutdown. Applies when the unit is in combined cycle mode. Emission limit 2 is 9 lb/h when the unit is in HRSG bypass mode. The limit is hourly except during startup and shutdown. Emission limit 3 is 289 lb/h when the unit is in combined cycle mode and is hourly including startup and shutdown. Thermal oxidation and NSCR were considered not technically feasible for these applications.
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	5	PPMV	30 Day Rolling Average				BACT-PSD	Oxidation Catalyst, Proper Design, Good Combustion Practices.	Units are ppmv @15% O2; Averaging time is 30 Day Rolling Average During Normal Operations.
*WV-0032	ESC Brooke County Power I, LLC - Brooke County Power Plant	GE 7HA.01 Turbine	Brooke	WV	R14-0035	09/18/2018	14.1	LB/HR					BACT-PSD	Oxidation Catalyst, Good Combustion Practices	
*PA-0319	APV Renaissance Partners - Renaissance Energy Center	Combustion Turbine unit w/o duct burners unit	Greene	PA	30-00235A	08/27/2018	2	PPPDV	@15% O2	187.44	TPY		BACT-PSD	Oxidation Catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
IL-0129	CPV Three Rivers, LLC - CPV Three Rivers Energy Center	Combined Cycle Combustion Turbines	Grundy	IL	16060032	07/30/2018	2	PPMV @ 15 % O2	3 Operating-Hour, Rolled Hourly, Average				BACT-PSD	Oxidation catalyst	Emission Limit 1 is not applicable during periods of startup, shutdown, tuning and commissioning. Permit limits are as follows, applicable on a per-turbine basis (3-hr avg.): For natural gas: Without duct burner: 15.4 lb/hr With duct burner: 19.0 lb/hr For ULSD: 17.0 lb/hr For periods of startup, shutdown and commissioning: Extended startups using natural gas: 1522 lb/hr Commissioning and other than extended startups using natural gas: 204 lb/hr ULSD: 231 lb/hr For periods of tuning: Natural Gas: 204 lb/hr ULSD: 231 lb/hr
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	2	PPMVD	Each CT/HRSG Train; 24-Hr Roll Avg	357	T/YR	Each CT/HRSG Train; 12-Mo Roll Time Per.	BACT-PSD	Oxidation catalyst technology and good combustion practices.	Emission limits above are for each individual CT/HRSG train in FG-TURB/DB1-3. Startup/shutdown emissions are not included. Emission limit 1 above is 2.0 ppmvd at 15%O2 based on a 24-hour rolling average as determined each operating hour except during startup and shutdown.
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3--Startup/Shutdown Operations	Van Buren	MI	186-17	07/30/2018	1164	LB/H	Each CT/HRSG Train; Startup/Shutdown				BACT-PSD	Oxidation catalyst technology and good combustion practices.	Emission limit 1 above is 1164 lb/hr during startup or shutdown for each individual CT/HRSG train in the flexible group.
*FL-0367	Shady Hills Energy Center, LLC - Shady Hills Combined Cycle Facility	1-on-1 combined cycle unit (GE 7HA)	Pasco	FL	1010524-001-AC	07/27/2018	4.3	PPMVD @15% O2	(Turbine Loads 90%); Three 1-Hr Runs	7.1	PPMVD @15% O2	(Turbine Loads < 90%); Three 1-Hr Runs	BACT-PSD	Clean burning fuel with good combustion practices	
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	0.0045	LB/MMBTU	Each Unit; 24-H Roll Avg; Not S.S.	17.59	LB/H	Each Unit; 24-H Roll Avg; Not S.S.	BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85-90%	Emission limit 1 = 0.0045 LB/MMBTU based on a 24-hour rolling average, except during startup and shutdown (S.S.). The limit applies to each unit. Emission limit 2 = 17.59 LB/H based on a 24-hour rolling average, except during startup and shutdown (S.S.). The limit applies to each unit. Emission limit 3 = 791.5 LB/H during startup or shutdown.
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)--Startup & Shutdown	St. Clair	MI	19-18	07/16/2018	791.5	LB/H	Each Unit; Operating Hour During S.S.				BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85%	The emission limit is 791.5 LB/H, per operating hour during startup or shutdown. The limit applies to each unit.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0433	Marshall Energy Center LLC - Mec North, LLC And Mec South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	4	PPMV	At 15%O2; 240Hr Roll Avg; Not S.S.	788.6	LB/H	Operating Hr During Startup Or Shutdown	BACT-PSD	Oxidation catalyst technology and good combustion practices.	The first emission limit above is 4 PPMVD at 15%O2 based on a 24-hour rolling average, except during startup and shutdown. Emission limit 2 above is 788.6 LB/H during startup or shutdown (S.S.).
MI-0433	Marshall Energy Center LLC - Mec North, LLC And Mec South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	4	PPMVD	At 15%O2; 24-H Roll Avg; Not Incl ST/SH	788.6	LB/H	Operating Hr During Startup Or Shutdown	BACT-PSD	Oxidation catalyst technology and good combustion practices.	Emission limit 1 = 4 ppmvd at 15%O2 based on a 24-hr rolling average, except during startup or shutdown. Emission limit 2 = 788.6 lb/h each operating hour during startup or shutdown.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	Usa	VA	52588	04/26/2018	1	PPMVD@ 15% O2	3 Hr Av/Without Db	1.6	PPMVD@ 15% O2	3 Hr Av/With DB	BACT-PSD	Oxidation catalyst and good combustion practices	Alternative emission limits apply during startup and shutdown.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	Usa	VA	52588	04/26/2018	1.8	PPMVD @ 15% O2	3 H Av/With Or Without Db				BACT-PSD	Oxidation catalyst & good combustion practice	Alternative emission limits apply during tuning, water washing, startup and shutdown.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Tuning & Water Washing	Usa	VA	52588	04/26/2018	194	LB/TURBINE/DAY	24 Hr Av				BACT-PSD	Oxidation catalyst and good combustion practices	This limit applies during tuning (limited to 18 hours/event) and water washing (limited to 60 minutes/event).
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Startup and Shutdown	Usa	VA	52588	04/26/2018	840	LB/TURBINE/EVENT	Cold Start 60 Min Or Less	188	LB/TURBINE /EVENT	Warm Start 50 Min Or Less	BACT-PSD	Oxidation catalyst and good combustion practice	These limits apply during startup and shutdown.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combustion Turbine - Tuning & Water Washing	Usa	VA	52588	04/26/2018	309	LB/TURBINE/DAY	24 Hr Av				BACT-PSD	Oxidation catalyst and good combustion practices	This limit applies during tuning (limited to 18 hours/event) and water washing (limited to 60 minutes/event).
VA-0328	Novi Energy - C4GT, LLC	Siemens Combustion Turbine - Startup & Shutdown	Usa	VA	52588	04/26/2018	434	LB/TURBINE/EVENT	Cold Start 55 Min Or Less	397	LB/TURBINE /EVENT	Warm Start 55 Min Or Less	BACT-PSD	Oxidation catalyst and good combustion practices	These limits apply during startup and shutdown.
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	17.9	LB/H	With Duct Burner. See Notes.	112.8	T/YR	Per Rolling 12 Month Period	BACT-PSD	Good combustion practices and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen on a 24-hr block averaging period. 17.9 lb/h with duct burner, except startup and shutdown. 15.3 lb/h without duct burner, except startup and shutdown. 35.85 tons per rolling 12 month period for startup and shutdown periods.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	17.1	LB/H	With Duct Burner. See Notes.	109.1	T/YR	Per Rolling 12 Month Period	BACT-PSD	Good combustion practices and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen on a 24-hr block averaging period. 17.1 lb/h with duct burner, except startup and shutdown. 16.3 lb/h without duct burner, except startup and shutdown. 109.1 tons per rolling 12 month period for all operating modes, including startup and shutdown.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0834	Entergy Texas Inc - Montgomery County Power Station	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX 1	03/30/2018	2	PPMVD	15% O2 3 Hour Average				BACT-PSD	Oxidation Catalyst	
TX-0834	Entergy Texas Inc - Montgomery County Power Station	Combined cycle turbine MSS reduced load	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX 1	03/30/2018	8000	LB/H					BACT-PSD	minimizing duration of startup / shutdown events and engaging the pollution control equipment as soon as practicable (based on vendor recommendations and guarantees)	
*WV-0029	ESC Harrison County Power, LLC - Harrison County Power Plant	GE 7HA.02 Turbine	Harrison	WV	R14-0036	03/27/2018	20	LB/HR	1-Hour Average	124	TONS/YEAR		BACT-PSD	Oxidation Catalyst, Good Combustion Practices	
*TN-0164	Tennessee Valley Authority - TVA - Johnsonville Cogeneration	Dual-fuel CT and HRSG with duct burner	Humphreys	TN	972969	02/01/2018	2	PPMVD @ 15% O2	30-Day Avg When Burning Natural Gas	10	PPMVD @ 15% O2	30-Day Avg When Burning #2 Oil	BACT-PSD	Oxidation catalyst, good combustion design & practice	Startup & Shutdown: 1,760 lb/startup and 22 lb/shutdown when firing natural gas; 3,000 lb/startup and 12.8 lb/shutdown when firing #2 oil
*FL-0363	Florida Power And Light Company - Dania Beach Energy Center	2-on-1 combined cycle unit (GE 7HA)	Broward	FL	0110037-017-AC	12/04/2017	4.3	PPMVD@15% O2	At Loads > 90%	7.2	PPMVD@15 % O2	For Loads < 90%	BACT-PSD	Clean burning fuel with lean pre-mix turbines	For oil, limit is 10.0 ppmvd @ 15% O2 for loads > 90%, and 14.6 ppmvd@15% O2 for loads < 90%.
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Combined cycle CTG with unfired HRSG)	Manistee	MI	66-17	11/17/2017	4	PPM	24-H Roll.Avg., Except Startup/Shutdown	17.4	LB/H	24-H Roll.Avg., Except Startup/Shutdown	BACT-PSD	Oxidation catalyst technology and good combustion practices.	Emission limit 1 above is 4 ppmvd at 15% O2. Also, each of the emission limits above are based on a 24-hour rolling average as determined each operating hour, except during startup and shutdown. There is a separate limit for each startup/shutdown event.
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Startup/Shutdown)	Manistee	MI	66-17	11/17/2017	1580	POUNDS	Pounds Per Event				BACT-PSD	Oxidation catalyst technology and good combustion practices.	The limit is 1,580 pounds per event and applies to each startup or shutdown event.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	15.9	LB/H	Except Startup And Shutdown. See Notes	123.8	T/YR	Per Rolling 12 Month Period	BACT-PSD	Oxidation catalyst and good combustion practices as recommended by the manufacturer.	2.0 ppmvd at 15% oxygen (O2) and 15.9 pounds per hour, excluding periods of startup and shutdown. 877.0 lb/h during cold startup, 145.3 lb/h during hot startup, 130.6 lb/h during warm startup, and 137.7 lb/h during shutdown.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	15.3	LB/H	With Duct Burner. See Notes.	121.2	T/YR	Per Rolling 12 Month Period	BACT-PSD	oxidation catalyst and shall operate the emissions unit in accordance with good combustion practices as recommended by the manufacturer	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 15.30 lb/h with duct burner (except startup and shutdown). 16.1 lb/h without duct burner (except startup and shutdown). 538.6 lb/h during cold startup, 449.4 lb/h during warm startup, 140.7 lb/h during hot startup, and 162.7 lb/h during shutdown.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	16.5	LB/H	With Duct Burner. See Notes.	142.6	T/YR	Per Rolling 12 Month Period.	BACT-PSD	oxidation catalyst and shall operate the emissions unit in accordance with good combustion practices as recommended by the manufacturer	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 16.5 lb/h with duct burner (except startup and shutdown). 13.6 lb/h without duct burner (except startup and shutdown). 447.9 lb/h during cold startup, 439.9 lb/h during warm startup, 370.3 lb/h during hot startup, and 118.5 lb/h during shutdown.
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	20.76	LB/H	With Duct Burner. See Notes.	16.17	LB/H	Without Duct Burners. See Notes.	BACT-PSD	oxidation catalyst and good combustion practices as recommended by the manufacturer	Limits are for single turbine except as noted. 2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen turbine with duct burners and turbine only, both excluding startup and shutdown. 16.17 lb/h without duct burners. 20.76 lb/h with duct burners. Both excluding startup and shutdown 791.6 lb/cold startup, 161.5 lb/hot startup, 133.0 lb/warm startup and 139.6 lb/shutdown. 300.61 t/yr per rolling 12 month period total for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	15.5	LB/H	With Duct Burner. See Notes.	135.19	T/YR	Per Rolling 12 Month Period	BACT-PSD	oxidation catalyst and good combustion control	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 15.5 lb/h with duct burner (except startup and shutdown). 14.6 lb/h without duct burner (except startup and shutdown). 526 lb/h during cold startup, 436 lb/h during hot startup, 496 lb/h during warm startup, and 150 lb/h during shutdown.
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	15.5	LB/H	With Duct Burner. See Notes.	135.2	T/YR	Per Rolling 12 Month Period	BACT-PSD	Good combustion controls and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 15.5 lb/h with duct burner. 14.6 lb/h without duct burner. Each limit except startup and shutdown). 526.0 lb/h during cold startup, 436.0 lb/h during hot startup, 496.0 lb/h during warm startup, and 159.0 lb/h during shutdown.
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	0.9	PPMVD @15% O2	1 Hour Block				BACT-PSD	Oxidation Catalyst	
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/Duct Firing	Windham	CT	089-0107	06/30/2017	1.7	LB/MMBTU	1 Hour Block				BACT-PSD	Oxidation Catalyst	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	2	PPMVD	15% O2 3-H Avg				BACT-PSD	Selective Catalytic Reduction (SCR) and Dry Low NOx burners	
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Flue Gas Heater	Greene	PA	30-00233B	04/12/2017	0.037	LB	MMBTU						
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Combustion Turbine without Duct Burner	Greene	PA	30-00233B	04/12/2017	2	PPMDV	Corrected To 15% O2				BACT-PSD	Oxidation Catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	24.7	LB/H	24-H Rolling Avg	3537	LB/H	Operating Hr. During Startup Or Shutdown	BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85-90%	Emission Limit 1 = 4 ppmvd at 15%O2 based on a 24-H rolling average, except during startup and shutdown. Emission Limit 2 = 24.7 LB/H based on a 24-H rolling average, except during startup and shutdown. Emission Limit 3 = 3537 LB/H based on an operating hour during startup or shutdown.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG (2 Combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	4	PPM	Each Eu; 24-H Roll Avg Except	5.31	LB/H	Each Eu; 24-H Roll Avg Except	BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85%	The emission limits above are for each CTG/HRSG and are as follows: 1) 4 ppmvd at 15% O2 based on a 24-hour rolling average, except during startup and shutdown. 2) 5.31 LB/H based on a 24-hour rolling average, except during startup and shutdown. There are separate limits for each of these emission units during startup and shutdown.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG--Startup/Shutdown (2 combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	247.3	LB/H	Operating Hour During Startup	551.3	LB/H	Operating Hour During Shutdown	BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85%	The emission limits above are during startup/shutdown.
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	18.57	LB/H	With Duct Burner. See Notes.	108.1	T/YR	Per Rolling 12 Month Period	BACT-PSD	Good combustion controls and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen, hourly average, all fuels, with and without duct burner. 18.57 lb/h with duct burner (except startup and shutdown). 15.17 lb/h without duct burner (except startup and shutdown). 16.15 lb/h for ultra low sulfur diesel (except startup and shutdown). When firing natural gas, 158.3 lb/h during startup and 160.1 lb/h during shutdown. When firing ultra low sulfur diesel, 356.6 lb/h during startup and 132.3 lb/h during shutdown.
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG with duct burner NG only	Cambria	PA	11-00536A	09/02/2016	2	PPMDV @ 15% O2		84.9	TONS	Year	BACT-PSD	Oxidation catalyst operated at all steady state operating loads and good combustion practices	
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016	125.21	LB/H	Hourly Maximum	388.55	T/YR	Annual Maximum	BACT-PSD	Catalytic Oxidation and good combustion practices during normal operations, and good combustion practices during startup/shutdown operations.	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016	125.21	LB/H	Hourly Maximum	388.55	T/YR	Annual Maximum	BACT-PSD	Catalytic oxidation and good combustion practices during normal operations, and good combustion practices during startup/shutdown operations.	BACT Limit = 2.0 PPM@15% O2 (24-hour rolling average)
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	2	PPMVD@15%O2	3 H Rolling Av Based On One H Block Av	18.1	LB/H	Av Of Three One H Stack Tests Every 5 Yr	BACT-PSD	Oxidation Catalyst and good combustion practices; 69%	
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	2	PPMVD@15% O2	3 H Rolling Av Based On One H Block Av	15.3	LB/H	Av Of Three One H Stack Tests Every 5 Yr	BACT-PSD	OXIDATION CATALYST AND GOOD COMBUSTION PRACTICES; 69%	
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion turbine generator with duct-fired heat recovery steam generators (3)	Greensville	VA	52525	06/17/2016	1.6	PPMVD	3 Hr Avg	286	TONS/YR	12 Mo Rolling Avg	N/A	Oxidation Catalyst	Emission Limit 1 turbine without DB: 1.0 ppmvd 3 hr avg
TN-0162	Tennessee Valley Authority - Johnsonville Cogeneration	Natural Gas-Fired Combustion Turbine with HRSG	Humphreys	TN	970816F	04/19/2016	2	PPMVD @ 15% O2	30 Unit-Operating-Day Moving Average	10	PPMVD @ 15% O2	15 Unit-Operating-Day Moving Average	BACT-PSD	Good combustion design and practices, oxidation catalyst; 90%	Emission limit #1 is for natural gas combustion, emission limit #2 is for No. 2 oil combustion.
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	4	PPM	Hourly	2	PPM	Annual Average	BACT-PSD	Oxidation Catalyst	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	4.3	PPMVD@15% O2	3-Hr Average, Natural Gas Operation	10	PPMVD@15% O2	3-Hr Average, Ulsd Operation	BACT-PSD	Clean burners that prevent CO formation	Also subject to limits of 7.1 ppmvd @15% O2 for gas and 13.6 ppmvd@15%O2 for ULSD, at low loads. The lowest loads at which the facility can demonstrate compliance with these low-load limits determines the minimum permitted operating load for the CT.
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	4	PPM					BACT-PSD	Oxidation Catalyst	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	25	PPM	Rolling 3-Hr Average				BACT-PSD	Dry low NOx burners and good combustion practices	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	9	PPM	Rolling 3-Hr Average				BACT-PSD	Oxidation Catalyst	
PA-0306	Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	Large combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	15.9	LB/HR	3 Hr Average	318.6	TPY	12 Month Rolling Basis	BACT-PSD	Oxidation Catalyst and good combustion practice	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine with duct burner	Lackawanna	PA	35-00069A	12/23/2015	2	PPMDV @ 15 % O2		84.9	TONS	Year	BACT-PSD	Oxidation catalyst, combustion controls, exclusive natural gas	
CT-0157	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0023	11/30/2015	0.9	PPMVD @15% O2	1 Hr Block	1.7	PPMVD @15% O2	1 Hr Block	BACT-PSD	Oxidation Catalyst	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
CT-0158	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0024	11/30/2015	0.9	PPMVD @15% O2	1 Hr Block	1.7	PPMVD @15% O2	1 Hr Block	BACT-PSD	Oxidation Catalyst	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-cycle combustion turbines - cold startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	1772	LB/EVENT	Cold Startup				BACT-PSD	Good Combustion Practices And Oxidation Catalyst	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-cycle combustion turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	2	PPMVD @ 15% O2	3-Hour Block Average (Excluding SU/SD)				BACT-PSD	Good Combustion Practices And Oxidation Catalyst	With And Without Duct Firing, Excluding SU/SD
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - warm startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	1461	LB/EVENT	Warm Startup				BACT-PSD	Good Combustion Practices And Oxidation Catalyst	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - hot startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	1216	LB/EVENT	Hot Startup				BACT-PSD	Good Combustion Practices And Oxidation Catalyst	
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 combined-cycle combustion turbines - shutdown	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	156	LB/EVENT	Shutdown				BACT-PSD	Good Combustion Practices And Oxidation Catalyst	
TX-0773	FGE Eagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (GT 25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	2	PPM	3-Hr Average				BACT-PSD	Oxidation Catalyst	
OK-0169	Public Service Company Of Oklahoma - PSO Comanche Power Station	Combined Cycle Combustion Turbine	Comanche	OK	2010-496-C(M-2)PSD	10/08/2015	0.0785	LB/MMBTU	3-Hr Avg Normal Operation	98.13	LB/HR	3-Hr Avg Normal Operation	BACT-PSD	Controlled Startup and Shutdown procedures with respect to Dry Low NOx Burners.	Startup limited to 9 hours and 1077 pounds, Shutdown limited to 3 hours and 364 pounds.
TX-0767	Lon C. Hill, L.P. - Lon C. Hill Power Station	Combined Cycle Turbines (GT 25 MW)	Nueces	TX	114911 AND PSDTX1380	10/02/2015	2	PPM	Rolling 24-Hr Average				BACT-PSD	Oxidation Catalyst	
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine With Duct Burner	Luzerne	PA	40-00129A	09/01/2015	2	PPMDV @ 15% O2		15.6	LB/HR		BACT-PSD	Oxidation catalyst and good combustion practices	105.1 tpy 12-month rolling basis
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine without Duct Burner	Luzerne	PA	40-00129A	09/01/2015	2	PPMDV @ 15% O2		14.7	LB/HR		BACT-PSD	Oxidation catalyst, good engineering practice	105.1 tpy on 12-month rolling basis

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	14.3	LB/H	With Duct Burner. See Notes.	128.5	T/YR	Per Rolling 12 Month Period	BACT-PSD	Good combustion controls and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen. 14.3 lb/h with duct burner (except startup and shutdown). 13.6 lb/h without duct burner (except startup and shutdown). 526.0 lb/h during cold startup, 436.1 lb/h during hot startup, 496.0 lb/h during warm startup, and 150.3 lb/h during shutdown.
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two Combine Cycle Combustion Turbine with Duct Burner	York	PA	67-05083D/F	06/15/2015	2	PPMDV @ 15% O2		1189.8	TONS	Yr	BACT-PSD	Oxidation catalyst and good combustion practices	Tons per year limit is for cumulative emissions from both CCCT in any 12-month period
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	10.4	LB/H	Without Duct Burners. See Notes.	5074.08	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	Oxidation catalyst	Limits are for single turbine except as noted. 2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, turbine with duct burners and turbine only. 10.4 lb/h per 3 hour average without duct burners. 12.95 lb/h per 3 hour average with duct burners. 10506 lb/cold startup, 4531 lb/hot startup, 7699 lb/warm startup and 2776 lb/shutdown. 5074.08 t/yr per rolling 12 month period total for all 4 turbines.
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	12	LB/H	With Duct Burner. See Notes.	5101.7	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	Oxidation catalyst	Limits are for single turbine except as noted. 2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, turbine with duct burners and turbine only. 12.0 lb/h per 3 hour average without duct burners. 14.9 lb/h per 3 hour average with duct burners. 10506 lb/cold startup, 4531 lb/hot startup, 7699 lb/warm startup and 2776 lb/shutdown. 5101.7 t/yr per rolling 12 month period total for all 4 turbines.
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX 112	04/01/2015	4	PPMVD @ 15% O2	3-Hr Average				BACT-PSD	SCR and oxidation catalyst	Permit requires downward adjustment to CO limits based on first 30 months of operation
TX-0727	NRG Texas Power LLC - Cedar Bayou Electric Generating Station	Combined cycle turbines	Chambers County	TX	80289 & PSDTX1082 M1	03/31/2015	15	PPMVD	15%O2				BACT-PSD	Oxidation catalysts	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG2--A 667 MMBTU/H natural gas fired CTG with a HRSG.	Eaton	MI	74-18	12/21/2018	3	PPM	Ppmvd@15% O2; Hourly; See Notes	5	LB/H	Hourly Except Startup/Shutdown; See Note	BACT-PSD	An oxidation catalyst for VOC control and good combustion practices.	Emission limit 1 is 3 ppmvd at 15% O2 and is an hourly limit except during startup and shutdown. The limit applies when the unit is in combined cycle mode. Emission limit 2 is 5 lb/h and is an hourly limit except during startup and shutdown. The limit applies when the unit is in HRSG bypass mode.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG1--A 667 MMBTU/H NG fired combustion turbine generator coupled with a heat recovery steam generator (HRSG)	Eaton	MI	74-18	12/21/2018	3	PPM	Ppmvd@15% O2; Hourly Exc.Start/Shut; Note	5	LB/H	Hourly Except Startup/Shutdown; See Note	BACT-PSD	An oxidation catalyst for VOC control for each CTG/HRSG unit, good combustion practices.	VOC Emission Limit 1 above is 3 ppmvd at 15%O2 when the unit is in combined cycle mode. The limit is hourly except during startup and shutdown. VOC Emission Limit 2 above is 5 lb/h when the unit is in HRSG bypass mode and is hourly except during startup and shutdown.
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass Lng Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	1.1	PPMV	3 Hour Average				BACT-PSD	Catalytic Oxidation, Proper Equipment Design and Good Combustion Practices.	Units are in ppmv @ 15% O2; Averaging Time 3-Hour Average During Normal Operations.
*WV-0032	ESC Brooke County Power I, LLC - Brooke County Power Plant	GE 7HA.01 Turbine	Brooke	WV	R14-0035	09/18/2018	8.1	LB/HR					BACT-PSD	Oxidation Catalyst, Good Combustion Practices	VOC BACT is different for no Duct Firing = 1 ppm
*PA-0319	APV Renaissance Partners - Renaissance Energy Center	Combustion Turbine Unit w/o Duct Burners Unit	Greene	PA	30-00235A	08/27/2018	1	PPMDV	@15% O2	55.24	TPY		LAER	Oxidation Catalyst	
*PA-0319	APV Renaissance Partners - Renaissance Energy Center	Combustion Turbine Unit with Duct Burners Unit	Greene	PA	30-00235A	08/27/2018	1.4	PPMDV	@15% O2				LAER		
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	1	PPMVD	Hourly; Each CT/HRSG Train	48	T/YR	Each CT/HRSG Train; 12-Mo Roll Time Per.	BACT-PSD	An oxidation catalyst and good combustion practices.	Emission limit 1 above does not include startup and shutdown. Emission limit 2 above is 48 ton/year based on a 12-month rolling time period.
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	0.0026	LB/MMBTU	Each Unit; Hourly Except S.S.	0.0013	LB/MMBTU	Each Unit W/O Duct Burner Firing; Not SS	BACT-PSD	Oxidation catalyst technology and good combustion practices.	The emission limits above are described further below: Emission limit 1 applies to each unit and is 0.0026 LB/MMBTU, hourly except during startup and shutdown. Emission limit 2 applies to each unit without duct burner firing and is 0.0013 LB/MMBTU, hourly except during startup and shutdown.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	4	PPMVD	At 15%O2; Not Incl. Startup/Shutdown				BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85%	Startup and Shutdown hours are limited to 300 hours per 12 month rolling time period.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	4	PPMVD	At 15%O2; Hourly				BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85%	Emission limit 1 above does not include startup and shutdown. Startup and Shutdown hours are limited to 300 hours per 12 month rolling time period.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	USA	VA	52588	04/26/2018	0.7	PPMVD @ 15% O2	3 Hr Av/Without DB	1.4	PPMVD @ 15% O2	3 Hr Av/With DB	BACT-PSD	Oxidation catalyst and good combustion practices	Alternative emission limits apply during startup and shutdown. Compliance is based on compliance with CO limits, determined by CEMS.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	USA	VA	52588	04/26/2018	1	PPMVD @ 15% O2	3 Hr Av/Without DB	2	PPMVD @ 15% O2	3 H Av/With DB	BACT-PSD	Oxidation catalyst and good combustion practice	Alternative emission limits apply during startup and shutdown. Compliance is based on compliance with CO limits, determined by CEMS.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Startup and Shutdown	USA	VA	52588	04/26/2018	60	LB/TURBINE/ EVENT	Cold Start 60 Min Or Less		LB/TURBINE /EVENT	Warm Start 50 Min Or Less	BACT-PSD	Oxidation catalyst and good combustion practices	14 lb/turbine/hot start event 65 lb/turbine/shutdown event Alternative emission limits apply during startup and shutdown. Compliance is based on compliance with CO limits, determined by CEMS.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combustion Turbine - Startup &; Shutdown	USA	VA	52588	04/26/2018	37	LB/TURBINE/ EVENT	Cold Start 55 Min Or Less	34	LB/TURBINE /EVENT	Warm Start 55 Min Or Less	BACT-PSD	Oxidation catalyst and good combustion practices	34 lb/turbine/hot start event 56 lb/turbine/shutdown event Alternative emission limits apply during startup and shutdown. Compliance is based on compliance with CO limits, determined by CEMS
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	4.36	LB/H	With Duct Burner. See Notes.	49.1	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	Good combustion practices and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen on a 24-hr block averaging period and 10.3 lb/h with duct burner, except startup and shutdown. 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen on a 24-hr block averaging period and 4.36 lb/h without duct burner, except startup and shutdown. 49.1 tons per rolling 12 month period for all operating modes, including startup and shutdown. 4.81 tons per rolling 12 month period for startup and shutdown periods.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	9.8	LB/H	With Duct Burner. See Notes.	84.7	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	Good combustion practices and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen and 9.8 lb/h with duct burner, except startup and shutdown. 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen and 4.7 lb/h without duct burner, except startup and shutdown. 84.7 tons per rolling 12 month period for all operating modes, including startup and shutdown. 42.50 tons per rolling 12 month period for startup and shutdown periods.
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	2	PPMVD	15% O2 3 Hour Average				LAER	Oxidation catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine MSS Reduced Load	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	2000	LB/H					LAER	minimizing duration of startup / shutdown events, engaging the pollution control equipment as soon as practicable (based on vendor recommendations and guarantees), and meeting the emissions limits on the MAERT	
*WV-0029	ESC Harrison County Power, LLC - Harrison County Power Plant	GE 7HA.02 Turbine	Harrison	WV	R14-0036	03/27/2018	11.4	LB/HR		54.8	TONS/YEAR		BACT-PSD	Oxidation Catalyst, Good Combustion Practices	VOC BACT is different for no Duct Firing = 1 ppm
FL-0364	Seminole Electric Cooperative, Inc. - Seminole Generating Station	2-on-1 natural gas combined-cycle unit (GE 7HA.02)	Putnam	FL	1070025-028-AC / PSD-FL-443	03/21/2018	1	PPMVD@15% O2	Without Duct Burner Firing	2	PPMVD@15 % O2	CT + Duct Burner Operation	BACT-PSD	Oxidation catalyst	
*PA-0316	Renovo Energy Center, LLC - Renovo Energy Center, LLC	Combustion Turbine Firing NG	Clinton	PA	18-00033A	01/26/2018	1	PPMDV	Corrtected To 15% O2	31.05	TPY		LAER		
*FL-0363	Florida Power And Light Company - Dania Beach Energy Center	2-on-1 combined cycle unit (GE 7HA)	Broward	FL	0110037-017-AC	12/04/2017	1	PPMVD@15% O2	For Natural Gas Operation	2.6	PPMVD@15 % O2	For Oil Operation	BACT-PSD	Clean fuels	Initial stack test only; CO used as proxy thereafter
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	4.54	LB/H	Except Startup And Shutdown. See Notes	26.4	T/YR	Per Rolling 12 Month Period.	BACT-PSD	Oxidation catalyst and good combustion practices as recommended by the manufacturer.	1.0 ppmvd at 15% oxygen (O2) and 4.54 pounds per hour, excluding periods of startup and shutdown. 78.1 lb/h during cold startup, 11.5 lb/h during hot startup, 12.0 lb/h during warm startup, and 29.6 lb/h during shutdown.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	8.8	LB/H	With Duct Burner. See Notes.	79.3	T/YR	Per Rolling 12 Month Period.	BACT-PSD	oxidation catalyst and shall operate the emissions unit in accordance with good combustion practices as recommended by the manufacturer	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen and 8.80 lb/h with duct burner (except startup and shutdown). 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen and 4.60 lb/h without duct burner (except startup and shutdown). 224.7 lb/h during cold startup, 225.1 lb/h during warm startup, 185.9 lb/h during hot startup, and 97.0 lb/h during shutdown.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	9.5	LB/H	With Duct Burner. See Notes.	50.8	T/YR	Per Rolling 12 Month Period.	BACT-PSD	oxidation catalyst and shall operate the emissions unit in accordance with good combustion practices as recommended by the manufacturer	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen and 9.5 lb/h with duct burner (except startup and shutdown). 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen and 3.9 lb/h without duct burner (except startup and shutdown). 40.4 lb/h during cold startup, 40.2 lb/h during warm startup, 40.7 lb/h during hot startup, and 39.4 lb/h during shutdown.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	11.73	LB/H	With Duct Burner. See Notes.	4.92	LB/H	Without Duct Burners. See Notes.	BACT-PSD	oxidation catalyst and good combustion practices as recommended by the manufacturer	Limits are for single turbine except as noted. 2.0 ppm by volume, dry basis (ppmvd) at 15% oxygen turbine with duct burners. 1.0 ppm by volume, dry basis (ppmvd) at 15% oxygen without duct burners. Both excluding startup and shutdown. 4.92 lb/h without duct burners. 11.73 lb/h with duct burners. Both excluding startup and shutdown. 55.9 lb/cold startup, 13.7 lb/hot startup, 16.5 lb/warm startup and 34.9 lb/shutdown. 146.91 t/yr per rolling 12 month period total for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	8.8	LB/H	With Duct Burner. See Notes.	50.28	T/YR	Per Rolling 12 Month Period. See Notes.	BACT-PSD	oxidation catalyst and good combustion control	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen, with duct burner. 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen, without duct burner. 8.8 lb/h with duct burner. 4.1 lb/h without duct burner. Each limit except startup and shutdown. 50.28 t/yr per rolling 12 month period for all operating modes, including startup. 64.4 lb/h during cold startup, 60.1 lb/h during hot startup, 59.6 lb/h during warm startup, and 62.8 lb/h during shutdown.
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	8.8	LB/H	With Duct Burner. See Notes.	50.3	T/YR	Per Rolling 12 Month Period.	BACT-PSD	Good combustion controls and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen with duct burner, 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen without duct burner, 8.8 lb/h with duct burner, 4.1 lb/h without duct burner (each limit except startup and shutdown). 64.4 lb/h during cold startup, 60.1 lb/h during hot startup, 59.6 lb/h during warm startup, and 67.9 lb/h during shutdown.
CT-0161	NTE Connecticut, LLV - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	0.7	PPMVD @15% O2					BACT-PSD	Oxidation Catalyst	
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/Duct Firing	Windham	CT	089-0107	06/30/2017	1.6	PPMVD @15% O2					BACT-PSD	Oxidation Catalyst	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	3.5	PPMVD	15% O2				BACT-PSD	Oxidation catalyst and good combustion practices	
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Combustion Turbine without Duct Burner	Greene	PA	30-00233B	04/12/2017	1	PPMDV	Corrected To 15% O2	59.31	TPY		LAER		
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Combustion Turbine With Duct Burner	Greene	PA	30-00233B	04/12/2017	2	PPMDV	Corrected To 15% O2				LAER		
TX-0817	Ineos Usallc - Chocolate Bayou Steam Generating (CBSG) Station	Combined Cycle Cogeneration	Brazoria	TX	123117, PSDTX1460, GHGPSDTX135	02/17/2017	1	PPMDV					BACT-PSD	Oxidation Catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	4	PPM	Test Protocol Will Specify				BACT-PSD	Oxidation Catalyst Technology and Good Combustion Practices; 85%	The emission limit above is 4 ppmvd at 15%O2 and is for EACH CTGHRSG. Startup and shutdown operations are limited to 500 hours per 12-month rolling time period for each CTGHRSG train. The efficiency range is 85-90 percent.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG (2 Combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	4	PPM AT 15% O2	Test Protocol Will Specify Avg Time				BACT-PSD	Oxidation catalyst technology and good combustion practices.; 85%	The emission limit above is 4 ppmvd at 15% O2 and is for each CTGHRSG. Startup and shutdown operations are limited to 635 hours per 12-month rolling time period combined for both CTGHRSGs.
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	10.64	LB/H	With Duct Burner. See Notes.	50.6	T/YR	Per Rolling 12 Month Period.	BACT-PSD	Good combustion controls and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen, hourly average, natural gas, with duct burner. 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen, hourly average, natural gas, turbine only. 2.0 ppm by volume dry basis (ppmvd) at 15% oxygen, hourly average, ultra low sulfur diesel. 10.64 lb/h with duct burner (except startup and shutdown). 4.35 lb/h without duct burner (except startup and shutdown). 9.25 lb/h for ultra low sulfur diesel (except startup and shutdown). When firing natural gas, 21.4 lb/h during startup and 55.2 lb/h during shutdown. When firing ultra low sulfur diesel, 109.0 lb/h during startup and 41.3 lb/h during shutdown.
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG with duct burner NG only	Cambria	PA	11-00536A	09/02/2016	1.5	PPMDV @ 15% O2		64.2	TONS	12-Month Rolling Basis	LAER	Oxidation catalyst and good combustion practices	ppmdv limit is for each turbine and duct burner, TPY is a cumulative total
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG without duct burner NG only	Cambria	PA	11-00536A	09/02/2016	1	PPMDV @ 15% O2					BACT-PSD		Limit is for each turbine and HRSG with the duct burner not fired.
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016	61.27	LB/H	Hourly Maximum	226.16	T/YR	Annual Maximum	BACT-PSD	Catalytic oxidation and good combustion practices for normal operations, and good combustion practices for startup/shutdown operations.	BACT Limit = 2.0 PPM@15% O2 during normal operations only (not during startup/shutdown conditions) (3-hour average)
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016	61.27	LB/H	Hourly Maximum	226.16	T/YR	Annual Maximum	BACT-PSD	Catalytic oxidation and good combustion practices during normal operations, and good combustion practices during startup/shutdown operations.	BACT Limit = 2.0 PPM@15% O2 during normal operations only (not during startup/shutdown conditions) (3-hour average)
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	2	PPMVD@15% O2	Av Of Three One H Stack Tests Every 5 Yr	10.3	LB/H	Av Of Three One H Stack Tests Every 5 Yr	LAER	Oxidation Catalyst and good combustion practices; 7%	
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	1	PPMVD@15% O2	Av Of Three One H Stack Tests Every 5 Yr	4.37	LB/H	Av Of Three One H Stack Tests Every 5 Yr	LAER	Oxidation catalyst and good combustion practices; 7%	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion Turbine Generator with Duct-Fired Heat Recovery Steam Generators (3)	Greensville	VA	52525	06/17/2016	1.4	PPMVD		214.8	T/YR	Per Turbine-12 Mo Rolling Total	N/A	Oxidation Catalyst and good combustion practices	Emission Limit 1: Turbine: 0.7 ppmvd without DB
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	2	PPM					BACT-PSD	Oxidation Catalyst	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	1	PPMVD@15% O2	Gas Operation	2	PPMVD@15 %O2	ULSD Operation	BACT-PSD	Complete combustion minimizes VOC	Method 18 or 25A for initial test only -- CO used as proxy thereafter.
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	2	PPM					BACT-PSD	Oxidation Catalyst	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	2	PPM	3-Hr Avg				BACT-PSD	Dry low NOx burners and good combustion practices	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	2	PPM	3-Hr Average				BACT-PSD	Oxidation Catalyst	
PA-0306	Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	Large combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	2.4	PPMDV@15% O2		9.4	LB/HR		LAER	Ox Cat and good combustion practices	Limit is for turbine operation with duct burners.
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine with duct burner	Lackawanna	PA	35-00069A	12/23/2015	1.5	PPMDV @ 15% O2		24.6	TONS	Year	LAER	Oxidation catalyst, combustion controls, exclusive natural gas	CO CEMS (as surrogate)
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine without duct burner	Lackawanna	PA	35-00069A	12/23/2015	1	PPNDV @ 15% O2					LAER	Oxidation catalyst, combustion controls, exclusive natural gas	
CT-0157	CPV Towantic, LLV - CPV Towantic, LLV	Combined Cycle Power Plant	New Haven	CT	144-0023	11/30/2015	1	PPMVD @15% O2		2	PPMVD @15% O2		BACT-PSD	Oxidation Catalyst	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
CT-0158	CPV Towantic, LLV - CPV Towantic, LLV	Combined Cycle Power Plant	New Haven	CT	144-0024	11/30/2015	1	PPMVD @15% O2		2	PPMVD @15% O2		BACT-PSD	Oxidation Catalyst	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines - cold startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	301	LB/EVENT	Cold Startup				LAER	Oxidation Catalyst And Good Combustion Practices	Limits Are For Each CT.
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	1	PPMVD @ 15% O2	3-Hr Block Avg. W/Out Duct Firing	1.9	PPMVD @ 15% O2	3-Hr Block Avg. With Duct Firing	LAER	Oxidation Catalyst And Good Combustion Practices	Excluding SU/SD. CO CEMS Used As Surrogate For VOC Emissions. A Correlation Shall Be Developed Between CO And VOC Emissions Based On An Initial Stack Test And Verified Annually.
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines - warm startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	258	LB/EVENT	Warm Startup				LAER	Oxidation Catalyst And Good Combustion Practices	Limits Are For Each CT.
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines - hot startup	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	207	LB/EVENT	Hot Startup				LAER	Oxidation Catalyst And Good Combustion Practices	Limits Are For Each CT.
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines - shutdown	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	63	LB/EVENT	Shutdown				LAER	Good Combustion Practices And Oxidation Catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0773	FGE Eagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	2	PPM					BACT-PSD	Oxidation Catalyst	
TX-0767	Lon C. Hill, L.P. - Lon C. Hill Power Station	Combined Cycle Turbines (25 MW)	Nueces	TX	114911 AND PSDTX1380	10/02/2015	2	PPM					BACT-PSD	oxidation catalyst	
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine With Duct Burner	Luzerne	PA	40-00129A	09/01/2015	1.5	PPMDV @ 15% O2		8.93	LB/HR		LAER	Oxidation catalyst and good engineering practice	38.5 tpy on 12-month rolling basis
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine without Duct Burner	Luzerne	PA	40-00129A	09/01/2015	1.5	LB/MMBTU		4.2	LB/HR		LAER	Oxidation catalyst, and good engineering practice	38.5 tpy on 12-month rolling basis
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	8.2	LB/H	With Duct Burner. See Notes.	47.1	T/YR	Per Rolling 12 Month Period	BACT-PSD	Good combustion controls and oxidation catalyst	2.0 ppm by volume dry basis (ppmvd) at 15% oxygen with ductburner. 1.0 ppm by volume dry basis (ppmvd) at 15% oxygen turbine only. 8.2 lb/h, with duct burner (except startup and shutdown). 3.9 lb/h without duct burner (except startup and shutdown). 64.4 lb/h during cold startup, 60.1 lb/h during hot startup, 59.6 lb/h during warm startup, and 62.8 lb/h during shutdown.
TX-0756	Castleton Commodities International (CCI) Corpus C - CCI Corpus Christi Condensate Splitter Facility	Boilers, BL-1 and BL-2	Nueces	TX	116072 AND PSDTX1388	06/19/2015	0.005	LB/100 SCF	Each Boiler				BACT-PSD	Good combustion practices will limit VOC emissions to 0.005 lb per 1000 scf. Fuel flow will be measured.	
TX-0751	Eagle Mountain Power Company LLC - Eagle Mountain Steam Electric Station	Combined Cycle Turbines (25 MW) natural gas	Tarrant	TX	117026, PSDTX1390, N194	06/18/2015	2	PPM					LAER	Oxidation catalyst	
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two combined cycle turbines with out duct burner	York	PA	67-05083D/F	06/15/2015	1.5	PPMDV @ 15% O2					LAER	Oxidation catalyst, good combustion practices and low sulfur fuels	Tons per year limit is for cumulative Emissions from both CCCT in any 12-month period
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two Combine Cycle Combustion Turbine with Duct Burner	York	PA	67-05083D/F	06/15/2015	1.9	PPMDV @ 15% O2		256.4	TONS	Any 12-Month Period	LAER	Oxidation catalyst, good combustion practices and low sulfur fuels	Tons per year limit is for cumulative emissions from both CCCT in any 12-month period. VOC limit expressed as methane.
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	611.38	T/YR	Per Rolling 12 Month Period. See Notes.			See Notes.	BACT-PSD	good combustion practices along with clean fuels	Limits are for single turbine except as noted. 1.4 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, turbine only without duct burners. 3.1 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, turbine with duct burners. 1004 lb/cold startup, 440 lb/hot startup, 740 lb/warm startup and 261 lb/shutdown. 611.38 t/yr per rolling 12 month period total for all 4 turbines.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015							BACT-PSD	good combustion practices along with clean fuels	Limits are for single turbine except as noted. 0.84 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, turbine only without duct burners. 2.6 ppm by volume, dry basis (ppmvd) at 15% oxygen, 3-hour average, turbine with duct burners. 1004 lb/cold startup, 440 lb/hot startup, 740 lb/warm startup and 261 lb/shutdown. 600.62 t/yr per rolling 12 month period total for all 4 turbines.
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX112	04/01/2015	4	PPMVD @ 15% O2	3-Hr Average				BACT-PSD	SCR and oxidation catalyst	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR SO2 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	SO2 Limit	SO2 Limit Unit	SO2 Avg Time	SO2 Limit 2	SO2 Limit 2 Unit	SO2 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	Sulfur Dioxide (SO2)	4	PPMV	ANNUAL AVERAGE				BACT-PSD	Exclusive Combustion of Low Sulfur Fuel and Proper Engineering Practices	BACT limit is 4 PPMV H2S; Annual Average Content in Fuel.
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	Sulfur Dioxide (SO2)	0.8	GR/100 SCF	NAT.GAS BURNED IN FG-TURB/DB1-3	0.06	LB/MMBTU	HOURLY; EACH CT/HRSG TRAIN; NSPS KKKK	BACT-PSD	Use of clean fuel (natural gas) with a fuel sulfur limit of 0.8 grains per 100 standard cubic feet of natural gas.	
*FL-0367	Shady Hills Energy Center, LLC - Shady Hills Combined Cycle Facility	1-on-1 combined cycle unit (GE 7HA)	Pasco	FL	1010524-001-AC	07/27/2018	Sulfur Dioxide (SO2)							BACT-PSD	Clean Fuels	Limits on sulfur content of fuel limit SO2 emissions. Natural Gas limited to 2.0 grains per 100 scf.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Sulfur Dioxide (SO2)	6.6	LB/H	HOURLY	0.6	GR S/100 SCF	FUEL SUPPLIER RECORDS	BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Sulfur Dioxide (SO2)	6.6	LB/H	HOURLY	0.6	GR S/100 SCF	FUEL SUPPLIER RECORDS	BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	USA	VA	52588	04/26/2018	Sulfur Dioxide (SO2)	0.0011	LB/MMBTU	3 HR AVG				OTHER CASE-BY-CASE	use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-month rolling average.	Short term limits apply at all times. Determined by fuel monitoring
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	USA	VA	52588	04/26/2018	Sulfur Dioxide (SO2)	0.0011	LB/MMBTU	3 H AV	19.3	T/YR		OTHER CASE-BY-CASE	use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12 mo rolling av.	Short term limits apply at all times. Compliance based on fuel sulfur content measurements and annual fuel consumption
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	Sulfur Dioxide (SO2)	0.0017	LB/MMBTU	SEE NOTES.	5.75	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.00174 lb/mmbtu and 4.13 lb/h with duct burner, except startup and shutdown. 0.00174 lb/mmbtu and 5.75 lb/h without duct burner. 28.65 tons per rolling 12 month period for all operating modes, including startup.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	Sulfur Dioxide (SO2)	0.0021	LB/MMBTU		7.22	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.0021 lb/mmbtu and 7.22 lb/h with duct burner. 0.0021 lb/mmbtu and 6.92 lb/h without duct burner. 29.57 tons per rolling 12 month period.
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	Sulfur Dioxide (SO2)	1	GR/100 DSCF					BACT-PSD	Pipeline quality Natural Gas	
*FL-0363	Florida Power And Light Company - Dania Beach Energy Center	2-on-1 combined cycle unit (GE 7HA)	Broward	FL	0110037-017-AC	12/04/2017	Sulfur Dioxide (SO2)							BACT-PSD	Clean fuels	Limits on sulfur content of fuels limit emissions. Gas limited to 2.0 grains per 100 scf, and oil limited to 0.0015% sulfur.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR SO2 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	SO2 Limit	SO2 Limit Unit	SO2 Avg Time	SO2 Limit 2	SO2 Limit 2 Unit	SO2 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	Sulfur Dioxide (SO2)	0.0015	LB/MMBTU	SEE NOTES.	6.77	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	pipeline quality natural gas with a maximum sulfur content not exceed 0.50 grain/100 scf	Limits are for single turbine except as noted. 0.0015 lb/mmbtu with duct burners and without duct burners. Both excluding startup and shutdown. 5.27 lb/h without duct burners. 6.77 lb/h with duct burners. Both excluding startup and shutdown. 88.96 t/yr per rolling 12 month period total for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	Sulfur Dioxide (SO2)	5.1	LB/H	WITH DUCT BURNER. SEE NOTES.	21.46	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	low sulfur fuel	1.5x10-3 lb/mmbtu. 5.1 lb/h with duct burner (except startup and shutdown). 4.8 lb/h without duct burner (except startup and shutdown).
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	Sulfur Dioxide (SO2)	5.1	LB/H	WITH DUCT BURNER. SEE NOTES.	21	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	Low sulfur fuel	1.5x10-3 lb/mmbtu, 5.1 lb/h with duct burner, 4.8 lb/h without duct burner (each limit except startup and shutdown).
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	Sulfur Dioxide (SO2)	0.0015	LB/MMBTU					OTHER CASE-BY-CASE	Low Sulfur fuel	State BACT Only
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/Duct Firing	Windham	CT	089-0107	06/30/2017	Sulfur Dioxide (SO2)	0.0015	LB/MMBTU					OTHER CASE-BY-CASE	Low Sulfur Fuel	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Sulfur Dioxide (SO2)	1.54	GR/100 DSCF					BACT-PSD	Pipeline quality natural gas	
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	Sulfur Dioxide (SO2)	11.7	LB/H	TEST PROTOCOL WILL SPECIFY AVG TIME	0.06	LB/MMBTU	TEST PROTOCOL WILL SPECIFY AVG TIME	BACT-PSD	Good Combustion Practices and the use of pipeline quality natural gas.	The emission limits above are for EACH CTGHRSG. There is also a NSPS natural gas material limit of 20 grains of sulfur per 100 scf.
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	Sulfur Dioxide (SO2)	5.64	LB/H	NAT GAS, WITH DUCT BURNER. SEE NOTES.	23.5	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	Low sulfur fuels	1.4x10-3 lb/mmbtu, hourly average, natural gas, with and without duct burner. 1.5x10-3 lb/mmbtu, hourly average, ultra low sulfur diesel. 5.64 lb/h with duct burner (except startup and shutdown). 4.61 lb/h without duct burner (except startup and shutdown). 5.19 lb/h for ultra low sulfur diesel (except startup and shutdown).
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	Sulfur Dioxide (SO2)	6.64	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				OTHER CASE-BY-CASE	Use Of Natural Gas A Low Sulfur Fuel Clean Fuel	SO2 Limits Are Based On NJDEP State Of The Art (SOTA) Requirements.
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	Sulfur Dioxide (SO2)	5.62						OTHER CASE-BY-CASE	Use Of Natural Gas A Clean Burning Low Sulfur Fuel	SO2 Limits Are Based On NJDEP State Of The Art (SOTA) Requirements.
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion Turbine Generator With Duct-fired Heat Recovery Steam Generators (3)	Greensville	VA	52525	06/17/2016	Sulfur Dioxide (SO2)	0.0011	LB/MMBTU	DURING NORMAL OPERATION INCLUDING SU/SD	18.7	T/YR	PER TURBINE	N/A	Low Sulfur fuel	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR SO2 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	SO2 Limit	SO2 Limit Unit	SO2 Avg Time	SO2 Limit 2	SO2 Limit 2 Unit	SO2 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Sulfur Dioxide (SO2)	1	GR/100 SCF	HOURLY	0.25	GR/100 SCF	ANNUAL AVERAGE	BACT-PSD	Good combustion practices, Low Sulfur Fuel	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	Sulfur Dioxide (SO2)	2	GR. S/100 SCF GAS	FOR NATURAL GAS	0.0015	% S IN ULSD	FOR ULSD	BACT-PSD	Use of low-sulfur fuels	
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	Sulfur Dioxide (SO2)	5	GR/100 SCF	HOURLY	1	GR/100 SCF	ANNUAL	BACT-PSD	Good combustion practices and Low Sulfur Fuel	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Sulfur Dioxide (SO2)	5	GR/100 SCF					BACT-PSD	Dry low NOx burners, good combustion practices, pipeline quality sweet natural gas fuel (low sulfur fuel)	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Sulfur Dioxide (SO2)	2.96	LB/H		1.88	T/YR		BACT-PSD	Equipment specifications & work practices - Good combustion practices and use of low carbon, low sulfur fuel	
CT-0157	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0023	11/30/2015	Sulfur Dioxide (SO2)	4.49	LB/H		6.2	LB/H		BACT-PSD		Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
CT-0158	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0024	11/30/2015	Sulfur Dioxide (SO2)	4.49	LB/H		6.2	LB/H		BACT-PSD	Use of inherently low sulfur fuel	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Sulfur Dioxide (SO2)	26	NG/J HEAT INPUT	AT ALL TIMES	0.06	LB/MMBTU HEAT INPUT	AT ALL TIMES	N/A		
TX-0751	Eagle Mountain Power Company LLC - Eagle Mountain Steam Electric Station	Combined Cycle Turbines (25 MW) natural gas	Tarrant	TX	117026, PSDTX1390, N194	06/18/2015	Sulfur Dioxide (SO2)	40.66	LB/H		35.62	T/YR		BACT-PSD	Good combustion practices, low sulfur fuel	
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX112	04/01/2015	Sulfur Dioxide (SO2)	2	GR/100 SCF	1-HOUR	0.5	GR/100 SCF	ANNUAL	BACT-PSD	efficient combustion, natural gas fuel	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0439	Consumers Energy Company - Jackson Generating Station	FGLMDB1-6 (6 combined cycle natural gas fired CTG each equipped with a HRSG)	Jackson	MI	118-18	04/02/2019	Particulate matter, total 2.5 µ (TPM2.5)	4.9	LB/HR	24 HR AVG DET.EACH OPERATING HR; EACH UNIT				BACT-PSD	Combustion inlet air filters, good combustion practices and only combust natural gas.	The limit is also per stack during periods when the turbine operates alone and when the turbine operates in conjunction with its respective duct burner. The limits do not apply during startup and shutdown. This limit equates to approximately 0.0078 lb/MMBTU.
MI-0439	Consumers Energy Company - Jackson Generating Station	FGLMDB1-6 (6 combined cycle natural gas fired CTG each equipped with a HRSG)	Jackson	MI	118-18	04/02/2019	Particulate matter, total 10 µ (TPM10)	4.9	LB/H	24-HR AVG, EACH HR UNIT OPERATES, EACH UNIT				BACT-PSD	Combustion inlet air filters, good combustion practices and only combust natural gas.	The limit is also per stack during periods when the turbine operates alone and when the turbine operates in conjunction with its respective duct burner. The limits do not apply during startup and shutdown. This limit equates to approximately 0.0078 lb/MMBTU.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG2--A 667 MMBTU/H natural gas fired CTG with a HRSG.	Eaton	MI	74-18	12/21/2018	Particulate matter, total 10 µ (TPM10)	6.02	LB/H	HOURLY				BACT-PSD	Pipeline quality natural gas, inlet air conditioning, and good combustion practices.	The emission limit applies during all operating modes.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG2--A 667 MMBTU/H natural gas fired CTG with a HRSG.	Eaton	MI	74-18	12/21/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.02	LB/H	HOURLY				BACT-PSD	Pipeline quality natural gas, inlet air conditioning, and good combustion practices.	The emission limit applies during all operating modes.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG1--A 667 MMBTU/H NG fired combustion turbine generator coupled with a heat recovery steam generator (HRSG)	Eaton	MI	74-18	12/21/2018	Particulate matter, total 10 µ (TPM10)	6.02	LB/H	HOURLY				BACT-PSD	Pipeline quality natural gas, inlet air conditioning, and good combustion practices.	The emission limit applies during all operating modes.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG1--A 667 MMBTU/H NG fired combustion turbine generator coupled with a heat recovery steam generator (HRSG)	Eaton	MI	74-18	12/21/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.02	LB/H	HOURLY				BACT-PSD	Pipeline quality natural gas, inlet air conditioning and good combustion practices.	The emission limit applies during all operating modes.
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	Particulate matter, total 10 µ (TPM10)	9.53	LB/H	3 HOUR AVERAGE				BACT-PSD	Exclusive Combustion of Fuel Gas and Good Combustion Practices.	
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	Particulate matter, total 2.5 µ (TPM2.5)	9.53	LB/H	3 HOUR AVERAGE				BACT-PSD	Exclusive Combustion of Fuel Gas and Good Combustion Practices.	
*PA-0319	APVRenaissance Partners - Renaissance Energy Center	Combustion Turbine Unit w/o Duct Burners Unit	Greene	PA	30-00235A	08/27/2018	Particulate matter, total 10 µ (TPM10)	0.0043	LB/MMBTU	HR	121.72	TPY		BACT-PSD		
*PA-0319	APVRenaissance Partners - Renaissance Energy Center	Combustion Turbine Unit w/o Duct Burners Unit	Greene	PA	30-00235A	08/27/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.0043	LB/MMBTU	HR	121.72	TPY		BACT-PSD		
IL-0129	CPV Three Rivers, LLC - CPV Three Rivers Energy Center	Combined Cycle Combustion Turbines	Grundy	IL	16060032	07/30/2018	Particulate matter, total 10 µ (TPM10)	0.0069	LB/MMBTU	3-HOUR BLOCK AVERAGE	0.032	LB/MMBTU	3-HOUR BLOCK AVERAGE	BACT-PSD	Good combustion practice	Emission Limit 1 is for natural gas. Emission Limit 2 is for ULSD. Emission Limits 1 and 2 and permit limits address PM10 and PM2.5 together as PM10/PM2.5. For natural gas: With duct burner: 18.9 lb/hr Without duct burner: 11.5 lb/hr For ULSD: 65.1 lb/hr
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	Particulate matter, total 10 µ (TPM10)	10.7	LB/H	HOURLY; EACH CT/HRSG TRAIN				BACT-PSD	Use clean fuel (natural gas) and good combustion practices.	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	Particulate matter, total 2.5 µ (TPM2.5)	10.7	LB/H	HOURLY; EACH CT/HRSG TRAIN				BACT-PSD	Use clean fuel (natural gas) and good combustion practices.	
*FL-0367	Shady Hills Energy Center, LLC - Shady Hills Combined Cycle Facility	1-on-1 combined cycle unit (GE 7HA)	Pasco	FL	1010524-001-AC	07/27/2018	Particulate matter, total 10 µ (TPM10)							BACT-PSD	Clean fuels	Limits on sulfur content of fuel limit PM emissions. Natural Gas limited to 2.0 grains per 100 scf. Also subject to 10% opacity limit.
*FL-0367	Shady Hills Energy Center, LLC - Shady Hills Combined Cycle Facility	1-on-1 combined cycle unit (GE 7HA)	Pasco	FL	1010524-001-AC	07/27/2018	Particulate matter, total 2.5 µ (TPM2.5)							BACT-PSD	Clean fuels	Limits on sulfur content of fuel limit PM emissions. Natural Gas limited to 2.0 grains per 100 scf. Also subject to 10% opacity limit.
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	Particulate matter, total 10 µ (TPM10)	16	LB/H	HOURLY; EACH UNIT	12.2	LB/H	HOURLY; EACH UNIT W/O DUCT BURNER FIRING	BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	The cost analysis was for the best scenario: 100 percent capture of PM2.5, where PM and PM10 calculations equaled PM2.5.
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	Particulate matter, total 2.5 µ (TPM2.5)	16	LB/H	HOURLY; EACH UNIT	12.2	LB/H	HOURLY; EACH UNIT W/O DUCT BURNER FIRING	BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	The cost analysis was for the best scenario: 100 percent capture of PM2.5, where PM and PM10 calculations equaled PM2.5.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Particulate matter, total 2.5 µ (TPM2.5)	19.1	LB/H	HOURLY				BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	19.1 pph is equivalent to 0.005 lb/MMBTU, which includes startup and shutdown The cost analysis was for the best scenario: 100 percent capture of PM2.5/PM10, which are higher emitting than PM.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Particulate matter, total 10 µ (TPM10)	19.1	LB/H	HOURLY				BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	19.1 pph is equivalent to 0.005 lb/MMBTU, which includes startup and shutdown The cost analysis was for the best scenario: 100 percent capture of PM2.5/PM10, which are higher emitting than PM.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Particulate matter, total 10 µ (TPM10)	19.1	LB/H	HOURLY				BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	(19.1 lb/h is equivalent to 0.005 lb/MMBTU which includes startup and shutdown). The cost analysis was for the best scenario: 100 percent capture of PM2.5/PM10 which are higher emitting than PM.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	Particulate matter, total 2.5 µ (TPM2.5)	19.1	LB/H	HOURLY				BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	(19.1 pph is equivalent to 0.005 lb/MMBTU, which includes startup and shutdown). The cost analysis was for the best scenario: 100 percent capture of PM2.5/PM10, which are higher emitting than PM.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	USA	VA	52588	04/26/2018	Particulate matter, total 10 µ (TPM10)	0.0069	LB/MMBTU WITHOUT DUC	AV OF 3 TEST RUNS	0.0049	LB/MMBTU WITH DUC	AV OF 3 TEST RUNS	BACT-PSD	good combustion practices and the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-month rolling average.	Additional limits: 12.2 lb/hr without duct burning; 17.3 lb/hr with duct burning. These short term limits apply at all times.
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	USA	VA	52588	04/26/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.0069	LB/MMBTU WITHOUT DUC	AV OF 3 TEST RUNS	0.0049	LB/MMBTU WITH DUC	AV OF 3 TEST RUNS	BACT-PSD	good combustion practices and the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-month rolling average.	Additional limits: 12.2 lb/hr without duct burning; 17.3 lb/hr with duct burning. These short term limits apply at all times.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	USA	VA	52588	04/26/2018	Particulate matter, total 10 µ (TPM10)	0.0065	LB/MMBTU	AV OF 3 TEST RUNS/WITHOUT DUCT BURNING	0.0065	LB/MMBTU	AV OF 3 TEST RUNS/WITH DUCT BURNING	BACT-PSD	good combustion practices and the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12 mo rolling av.	Additional limits: 13.7 lb/hr without duct burning; 24.2 lb/hr with duct burning. These short term limits apply at all times.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	USA	VA	52588	04/26/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.0065	LB/MMBTU	AV OF 3 TEST RUNS/WITHOUT DUCT BURNING	0.0065	LB/MMBTU	AV OF 3 TEST RUNS/WITH DUCT BURNING	BACT-PSD	good combustion practices and the use of pipeline quality natural gas with a maximum sulfur content of 0.4 gr/100 scf on a 12-month rolling average.	Additional limits: 13.7 lb/hr without duct burning; 24.2 lb/hr with duct burning. These short term limits apply at all times.
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	Particulate matter, total 10 µ (TPM10)	0.0052	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	18.4	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.00522 lb/mmbtu and 18.4 lb/h with duct burner. 0.00735 lb/mmbtu and 12.0 lb/h without duct burner. 80.2 tons per rolling 12 month period for all operating modes.
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.0052	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	18.4	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.00522 lb/mmbtu and 18.4 lb/h with duct burner. 0.00735 lb/mmbtu and 12.0 lb/h without duct burner. 80.2 tons per rolling 12 month period for all operating modes.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	Particulate matter, total 10 µ (TPM10)	0.005	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	17.7	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.005 lb/mmbtu and 17.7 lb/h with duct burner. 0.00444 lb/mmbtu and 14.10 lb/h without duct burner. 77.5 tons per rolling 12 month period for all operating modes.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.005	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	17.7	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.005 lb/mmbtu and 17.7 lb/h with duct burner. 0.00444 lb/mmbtu and 14.10 lb/h without duct burner. 77.5 tons per rolling 12 month period for all operating modes.
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	Particulate matter, total 10 µ (TPM10)	125.7	TON/YR					BACT-PSD	Pipeline Natural Gas, good combustion	
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	Particulate matter, total 2.5 µ (TPM2.5)	125.7	TON/YR					BACT-PSD	Pipeline Natural Gas, good combustion	
*FL-0363	Florida Power And Light Company - Dania Beach Energy Center	2-on-1 combined cycle unit (GE 7HA)	Broward	FL	0110037-017-AC	12/04/2017	Particulate matter, total 10 µ (TPM10)							BACT-PSD	Clean fuels	Limits on sulfur content of fuels limit PM emissions. Gas limited to 2.0 grains per 100 scf, and oil limited to 0.0015% sulfur. Also subject to 10% opacity limit.
*FL-0363	Florida Power And Light Company - Dania Beach Energy Center	2-on-1 combined cycle unit (GE 7HA)	Broward	FL	0110037-017-AC	12/04/2017	Particulate matter, total 2.5 µ (TPM2.5)							BACT-PSD	Clean fuels	Limits on sulfur content of fuels limit PM emissions. Gas limited to 2.0 grains per 100 scf, and oil limited to 0.0015% sulfur. Also subject to 10% opacity limit.
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Combined cycle CTG with unfired HRSG)	Manistee	MI	66-17	11/17/2017	Particulate matter, total 10 µ (TPM10)	0.0066	LB/MMBTU					BACT-PSD	Good combustion practices and the use of pipeline quality natural gas, combustion inlet air filter.	
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Combined cycle CTG with unfired HRSG)	Manistee	MI	66-17	11/17/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0066	LB/MMBTU					BACT-PSD	Good combustion practices and the use of pipeline quality natural gas, combustion inlet air filter.	
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	Particulate matter, total 10 µ (TPM10)	0.0036	LB/MMBTU		12.1	LB/H		BACT-PSD	natural gas or a natural gas and ethane mixture only	53.0 t/yr per rolling, 12-month period, including start-up and shutdown emissions.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0036	LB/MMBTU		12.1	LB/H		BACT-PSD	natural gas or a natural gas and ethane mixture only	53.0 t/yr per rolling, 12-month period, including start-up and shutdown emissions.

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	Particulate matter, total 10 µ (TPM10)	0.004	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	12.6	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	natural gas or a natural gas and ethane mixture only	0.004 lb/mmbtu and 12.60 lb/h with duct burner (except startup and shutdown). 0.0037 lb/mmbtu and 12.3 lb/h without duct burner (except startup and shutdown). 55.2 t/yr per rolling 12 month period for all operating modes, including startup.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.004	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	12.6	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	natural gas or a natural gas and ethane mixture only	0.004 lb/mmbtu and 12.60 lb/h with duct burner (except startup and shutdown). 0.0037 lb/mmbtu and 12.3 lb/h without duct burner (except startup and shutdown). 55.2 t/yr per rolling 12 month period for all operating modes, including startup.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	Particulate matter, total 10 µ (TPM10)	0.0057	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	19.8	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	natural gas or a natural gas and ethane mixture only	0.0057 lb/mmbtu and 19.8 lb/h with duct burner (except startup and shutdown). 0.006 lb/mmbtu and 13 lb/h without duct burner (except startup and shutdown). 86.7 t/yr per rolling 12 month period for all operating modes, including startup.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0057	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	19.8	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	natural gas or a natural gas and ethane mixture only	0.0057 lb/mmbtu and 19.8 lb/h with duct burner (except startup and shutdown). 0.006 lb/mmbtu and 13 lb/h without duct burner (except startup and shutdown). 86.7 t/yr per rolling 12 month period for all operating modes, including startup.
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	Particulate matter, total 10 µ (TPM10)	0.0073	LB/MMBTU	SEE NOTES.	23.3	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	pipeline quality natural gas	Limits are for single turbine except as noted. 0.0073 lb/mmbtu with duct burners and without duct burners. Both excluding startup and shutdown. 12.30 lb/h without duct burners. 23.30 lb/h with duct burners. Both excluding startup and shutdown. 290.39 t/yr per rolling 12 month period total for all 3 turbines.
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0073	LB/MMBTU	SEE NOTES.	23.3	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	pipeline quality natural gas	Limits are for single turbine except as noted. 0.0073 lb/mmbtu with duct burners and without duct burners. Both excluding startup and shutdown. 12.30 lb/h without duct burners. 23.30 lb/h with duct burners. Both excluding startup and shutdown. 290.39 t/yr per rolling 12 month period total for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	Particulate matter, total 10 µ (TPM10)	15.4	LB/H	WITH DUCT BURNER. SEE NOTES.	65.26	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	good combustion practices and pipeline quality natural gas	4.6x10-3 lb/mmbtu with duct burners. 6.0x10-3 lb/mmbtu without duct burners. 15.4 lb/h with duct burner (except startup and shutdown). 14.0 lb/h without duct burner (except startup and shutdown). 65.26 t/yr per rolling 12 month period for all operating modes, including startup.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	Particulate matter, total 2.5 µ (TPM2.5)	15.4	LB/H	WITH DUCT BURNER. SEE NOTES.	65.26	T/YR	PER ROLLING 12 MONTH PERIOD	BACT-PSD	good combustion practices and pipeline quality natural gas	4.6x10-3 lb/mmbtu with duct burners. 6.0x10-3 lb/mmbtu without duct burners. 15.4 lb/h with duct burner (except startup and shutdown). 14.0 lb/h without duct burner (except startup and shutdown).
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	Particulate matter, total 10 µ (TPM10)	15.2	LB/H	WITH DUCT BURNER. SEE NOTES.	64.4	T/YR	PER ROLLING 12 MONTH PERIOD	BACT-PSD	Good combustion controls and low sulfur fuel	4.6x10-3 lb/mmbtu with duct burners, 6.0x10-3 lb/mmbtu without duct burners, 15.2 lb/h with duct burner, 12.9 lb/h without duct burner (each limit except startup and shutdown).

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RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	Particulate matter, total 2.5 µ (TPM2.5)	15.2	LB/H	WITH DUCT BURNER. SEE NOTES.	64.4	T/YR	PER ROLLING 12 MONTH PERIOD	BACT-PSD	Good combustion controls and low sulfur fuel	4.6x10-3 lb/mmbtu with duct burners, 6.0x10-3 lb/mmbtu without duct burners, 15.2 lb/h with duct burner, 12.9 lb/h without duct burner (each limit except startup and shutdown).
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	Particulate matter, total 10 µ (TPM10)	0.044	LB/MMBTU					BACT-PSD	Good Combustion	
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0044	LB/MMBTU					BACT-PSD	Good Combustion	
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/Duct Firing	Windham	CT	089-0107	06/30/2017	Particulate matter, total 10 µ (TPM10)	0.005	LB/MMBTU					BACT-PSD	Good Combustion	
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/Duct Firing	Windham	CT	089-0107	06/30/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.005	LB/MMBTU					BACT-PSD	Good Combustion	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Particulate matter, total 10 µ (TPM10)							BACT-PSD	Pipeline quality natural gas; good combustion practices	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Particulate matter, total 2.5 µ (TPM2.5)							BACT-PSD	Pipeline quality natural gas; good combustion practices	
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Combustion Turbine without Duct Burner	Greene	PA	30-00233B	04/12/2017	Particulate matter, total 10 µ (TPM10)	0.0072	LB	MMBTU	105.28	TPY		BACT-PSD		
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Combustion Turbine without Duct Burner	Greene	PA	30-00233B	04/12/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0072	LB	MMBTU	105.28	TPY		BACT-PSD		
TX-0817	Ineos Usallc - Chocolate Bayou Steam Generating (CBSG) Station	Combined Cycle Cogeneration	Brazoria	TX	123117, PSDTX1460, GHGPSDTX135	02/17/2017	Particulate matter, filterable 10 µ (FPM10)	6.98	LB/H					BACT-PSD		
TX-0817	Ineos Usallc - Chocolate Bayou Steam Generating (CBSG) Station	Combined Cycle Cogeneration	Brazoria	TX	123117, PSDTX1460, GHGPSDTX135	02/17/2017	Particulate matter, filterable 2.5 µ (FPM2.5)	6.98	LB/H					BACT-PSD		
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	Particulate matter, total 10 µ (TPM10)	19.8	LB/H	TEST PROTOCOL WILL SPECIFY AVG TIME				BACT-PSD	Good combustion practices, inlet air conditioning, and the use of pipeline quality natural gas.	The emission limit applies for each CTGHRSG.
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	Particulate matter, total 2.5 µ (TPM2.5)	19.8	LB/H	TEST PROTOCOL WILL SPECIFY AVG TIME				BACT-PSD	Good Combustion Practices, inlet air conditioning, and the use of pipeline quality natural gas.	The emission limit applies for each CTGHRSG.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG (2 Combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	Particulate matter, total 10 µ (TPM10)	0.014	LB/MMBTU	TEST PROTOCOL WILL SPECIFY AVG TIME				BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	The emission limit applies for each CTGHRSG.
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG (2 Combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	Particulate matter, total 2.5 µ (TPM2.5)	0.014	LB/MMBTU	TEST PROTOCOL WILL SPECIFY AVG TIME				BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	The emission limit applies for each CTGHRSG.

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	Particulate matter, total 10 µ (TPM10)	25	LB/H	NAT GAS, WITH DUCT BURNER. SEE NOTES.	128.9	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	Good combustion controls	6.9x10-3 lb/mmbtu, hourly average, natural gas, with duct burner. 7.7x10-3 lb/mmbtu, hourly average, natural gas, turbine only. 1.9x10-2 lb/mmbtu, hourly average, ultra low sulfur diesel. 25.0 lb/h with duct burner (including startup and shutdown). 16.16 lb/h without duct burner (including startup and shutdown). 55.4 lb/h for ultra low sulfur diesel (except startup and shutdown). 128.9 t/yr per rolling 12 month period for all operating modes, including startup and shutdown. When firing ultra low sulfur diesel, 77.4 lb/h during startup and shutdown.
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	Particulate matter, total 2.5 µ (TPM2.5)	25	LB/H	NAT GAS, WITH DUCT BURNER. SEE NOTES.	128.9	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	Good combustion controls	6.9x10-3 lb/mmbtu, hourly average, natural gas, with duct burner. 7.7x10-3 lb/mmbtu, hourly average, natural gas, turbine only. 1.9x10-2 lb/mmbtu, hourly average, ultra low sulfur diesel. 25.0 lb/h with duct burner (including startup and shutdown). 16.16 lb/h without duct burner (including startup and shutdown). 55.4 lb/h for ultra low sulfur diesel (except startup and shutdown). 128.9 t/yr per rolling 12 month period for all operating modes, including startup and shutdown. When firing ultra low sulfur diesel, 77.4 lb/h during startup and shutdown.
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG with duct burner NG only	Cambria	PA	11-00536A	09/02/2016	Particulate matter, total 10 µ (TPM10)	0.005	LB/MMBTU		131.5	TONS	12-MONTH ROLLING BASIS	BACT-PSD	Low sulfur fuel, good combustion practices	lb/MMBtu limit is for each turbine and duct burner, TPY is a cumulative total
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG with duct burner NG only	Cambria	PA	11-00536A	09/02/2016	Particulate matter, total 2.5 µ (TPM2.5)	0.005	LB/MMBTU		131.5	TONS	12-MONTH ROLLING BASIS	BACT-PSD	Low sulfur fuel, good combustion practices	lb/MMBtu limit is for each turbine and duct burner, TPY is a cumulative total
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG without duct burner NG only	Cambria	PA	11-00536A	09/02/2016	Particulate matter, total 2.5 µ (TPM2.5)	0.0068	LB/MMBTU					BACT-PSD	Low sulfur fuels and good combustion practices	Limit is for each turbine and HRSG with the duct burner not fired.
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG without duct burner NG only	Cambria	PA	11-00536A	09/02/2016	Particulate matter, total 10 µ (TPM10)	0.0068	LB/MMBTU					BACT-PSD	Low sulfur fuels and good combustion practices	Limit is for each turbine and HRSG with the duct burner not fired.
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016	Particulate matter, filterable 10 µ (FPM10)	17.52	LB/H	HOURLY MAXIMUM	73.35	T/YR		BACT-PSD	Good combustion practices and clean burning fuels (natural gas)	BACT Limit = 0.008 LB/MMBTU (3-Hour Average)
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016	Particulate matter, filterable 2.5 µ (FPM2.5)	17.52	LB/H	HOURLY MAXIMUM	73.35	T/YR	ANNUAL MAXIMUM	BACT-PSD	Good combustion practices and clean burning fuels (natural gas)	BACT Limit = 0.008 LB/MMBTU (3-Hour Average)
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016	Particulate matter, filterable 10 µ (FPM10)	17.52	LB/H	HOURLY MAXIMUM	73.35	T/YR	ANNUAL MAXIMUM	BACT-PSD	Good combustion practices and clean burning fuels (natural gas)	BACT Limit = 0.0082 LB/MMBTU (3-hour average)
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016	Particulate matter, filterable 2.5 µ (FPM2.5)	17.52	LB/H	HOURLY MAXIMUM	73.35	T/YR	ANNUAL MAXIMUM	BACT-PSD	Good combustion practices and clean burning fuel (natural gas)	BACT Limit = 0.008 LB/MMBTU (3-hour average)
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	Particulate matter, total 2.5 µ (TPM2.5)	18.3	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				BACT-PSD	Compliance by Stack Testing	
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	Particulate matter, total 10 µ (TPM10)	18.3	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				BACT-PSD	Compliance by Stack Testing	
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	Particulate matter, total 10 µ (TPM10)	11.7	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				BACT-PSD	Use of Natural Gas a clean burning fuel	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	Particulate matter, total 2.5 µ (TPM2.5)	11.7	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				BACT-PSD	Use of Natural Gas a clean burning fuel	
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion Turbine Generator With Duct-Fired Heat Recovery Steam Generators (3)	Greensville	VA	52525	06/17/2016	Particulate matter, filterable 2.5 µ (FPM2.5)	0.0039	LB/MMBTU	AVG OF 3 TEST RUNS	14.1	LB/H		N/A	Pipeline Quality Natural Gas	Turbine without DB: 9.2 lb/hr (0.0030 lb/MMBtu); with DB: 14.1 lbs/hr (0.0039 lb/MMBtu) (average of three test runs)
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion Turbine Generator With Duct-Fired Heat Recovery Steam Generators (3)	Greensville	VA	52525	06/17/2016	Particulate matter, total 10 µ (TPM10)	0.0039	LB/MMBTU	AVG OF 3 TEST RUNS				N/A	Low sulfur/carbon fuel and good combustion pratices	Turbines without DB: 9.2 lbs/hr (0.0030 lb/MMBtu)
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Particulate matter, total 10 µ (TPM10)	19.35	LB/H					BACT-PSD	Good Combustion Practices, Low Sulfur Fuel	
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Particulate matter, total 2.5 µ (TPM2.5)	19.35	LB/H					BACT-PSD	Good Combustion Practices and Low Sulfur Fuel	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	Particulate matter, total 10 µ (TPM10)	2	GR. S/100 SCF GAS	FOR NATURAL GAS	0.0015	% S IN ULSD	FOR ULSD	BACT-PSD	Use of clean fuels	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	Particulate matter, total 2.5 µ (TPM2.5)	2	GR. S/100 SCF GAS	FOR NATURAL GAS	0.0015	% S IN ULSD	FOR ULSD	BACT-PSD	Use of clean fuels	
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	Particulate matter, total 10 µ (TPM10)	35.47	LB/H					BACT-PSD	Good Combustion Practices and Low Sulfur Fuel	
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	Particulate matter, total 2.5 µ (TPM2.5)	35.47	LB/H					BACT-PSD	Good Combustion Practices and Low Sulfur Fuel	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Particulate matter, total 10 µ (TPM10)	11.07	LB/H		42.15	T/YR		BACT-PSD	Dry low NOx burners, good combustion practices, pipeline quality sweet natural gas fuel	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Particulate matter, total 2.5 µ (TPM2.5)	11.07	LB/H		42.15	T/YR		BACT-PSD	Dry low NOx burners, good combustion practices, pipeline quality sweet natural gas fuel	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Particulate matter, total 10 µ (TPM10)	2.32	LB/H		8.84	T/YR		BACT-PSD	Equipment specifications & work practices - Good combustion practices and use of low carbon, low sulfur fuel	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	Particulate matter, total 2.5 µ (TPM2.5)	2.32	LB/H		8.84	T/YR		BACT-PSD	Equipment specifications & work practices - Good combustion practices and use of low carbon, low sulfur fuel	
PA-0306	Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	Large combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	Particulate matter, total 10 µ (TPM10)	0.0039	LB/MMBTU		11.8	LB/HR		BACT-PSD	Good combustion practices with the use of low ash/sulfer fuels	
PA-0306	Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	Large combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	Particulate matter, total 2.5 µ (TPM2.5)	0.0039	LB/MMBTU		11.8	LB/HR		BACT-PSD	Good combustion practices	
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine with duct burner	Lackawanna	PA	35-00069A	12/23/2015	Particulate matter, total 10 µ (TPM10)	0.0059	LB/MMBTU		48.2	TONS	YEAR	BACT-PSD	Exclusive natural gas, high-efficiency inlet air filters and DLN	
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine with duct burner	Lackawanna	PA	35-00069A	12/23/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0059	LB/MMBTU		48.2	TONS	YEAR	BACT-PSD	Exclusive natural gas, high-efficiency inlet air filters and DLN	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
CT-0157	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0023	11/30/2015	Particulate matter, total 2.5 µ (TPM2.5)	9.73	LB/H		20.4	LB/H		BACT-PSD		Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
CT-0158	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0024	11/30/2015	Particulate matter, total 2.5 µ (TPM2.5)	9.73	LB/H		20.4	LB/H		BACT-PSD		Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Particulate matter, total 10 µ (TPM10)	17.9	LB/H	W/OUT DUCT FIRING, AVG. OF 3 STACK TESTS	27.7	LB/H	WITH DUCT FIRING, AVG. OF 3 STACK TESTS	BACT-PSD	Use Of Pipeline Quality Natural Gas Exclusively And Good Combustion Practices	At all times
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	Particulate matter, total 2.5 µ (TPM2.5)	17.9	LB/H	W/OUT DUCT FIRING, AVG. OF 3 STACK TESTS	27.7	LB/H	WITH DUCT FIRING, AVG. OF 3 STACK TESTS	BACT-PSD	Use Of Pipeline Quality Natural Gas Exclusively And Good Combustion Practices	At all times
TX-0773	FGEEagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	Particulate matter, total 10 µ (TPM10)	21.4	LB/H		93.7	T/YR		BACT-PSD		
TX-0773	FGEEagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	Particulate matter, total 2.5 µ (TPM2.5)	21.4	LB/H		93.7	T/YR		BACT-PSD		
TX-0767	Lon C. Hill, L.P. - Lon C. Hill Power Station	Combined Cycle Turbines (25 MW)	Nueces	TX	114911 AND PSDTX1380	10/02/2015	Particulate matter, total 10 µ (TPM10)	16	LB/HR		109.5	TPY		BACT-PSD	Good combustion practices and use of pipeline quality natural gas	Lbs/hr limit based on one stack and TPY is based on both turbines
TX-0767	Lon C. Hill, L.P. - Lon C. Hill Power Station	Combined Cycle Turbines (25 MW)	Nueces	TX	114911 AND PSDTX1380	10/02/2015	Particulate matter, total 2.5 µ (TPM2.5)	16	LB/HR		109.5	TPY		BACT-PSD	Good combustion practices and use of pipeline quality natural gas	
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine With Duct Burner	Luzerne	PA	40-00129A	09/01/2015	Particulate matter, total 10 µ (TPM10)	0.0063	LB/MMBTU		13.9	LB/HR		BACT-PSD		58 tpy 12-month rolling basis
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine With Duct Burner	Luzerne	PA	40-00129A	09/01/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0063	LB/MMBTU		13.9	LB/HR		BACT-PSD		13.9 tpy 12-month rolling basis
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine without Duct Burner	Luzerne	PA	40-00129A	09/01/2015	Particulate matter, total 10 µ (TPM10)	0.0063	LB/MMBTU		11.7	LB/HR		BACT-PSD		58 tpy on 12-month rolling basis
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine without Duct Burner	Luzerne	PA	40-00129A	09/01/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0063	LB/MMBTU		11.7	LB/HR		BACT-PSD		58 tpy on 12-month rolling basis
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	Particulate matter, total 10 µ (TPM10)	14.9	LB/H	WITH DUCT BURNER. SEE NOTES.	62.6	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	Low sulfur fuel	14.9 lb/h and 4.9x10-3 lb/mmbtu with duct burner, except startup and shutdown. 13.1 lb/h and 6.8x10-3 lb/mmbtu turbine only, except startup and shutdown. 62.6 tons per rolling 12 month period for all operating modes, including startup.
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	Particulate matter, total 2.5 µ (TPM2.5)	14.9	LB/H	WITH DUCT BURNER. SEE NOTES.	62.6	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	Low sulfur fuel	14.9 lb/h and 4.9x10-3 lb/mmbtu with duct burner, except startup and shutdown. 13.1 lb/h and 6.8x10-3 lb/mmbtu turbine only, except startup and shutdown. 62.6 tons per rolling 12 month period for all operating modes, including startup.
KS-0029	The Empire District Electric Company - The Empire District Electric Company	Combined cycle combustion turbine	Cherokee	KS	C-12987	07/14/2015	Particulate matter, total 2.5 µ (TPM2.5)	30.2	LB/H					OTHER CASE-BY-CASE	dry low NOx burners heat recovery steam generator (HRSG)	
KS-0029	The Empire District Electric Company - The Empire District Electric Company	Combined cycle combustion turbine	Cherokee	KS	C-12987	07/14/2015	Particulate matter, total 10 µ (TPM10)	30.2	LB/H					BACT-PSD	dry low NOx burners heat recovery steam generator (HRSG)	
TX-0751	Eagle Mountain Power Company LLC - Eagle Mountain Steam Electric Station	Combined Cycle Turbines (25 MW) natural gas	Tarrant	TX	117026, PSDTX1390, N194	06/18/2015	Particulate matter, total 10 µ (TPM10)	35.47	LB/H		81.88	T/YR		BACT-PSD	Good combustion practices, low sulfur fuel	
TX-0751	Eagle Mountain Power Company LLC - Eagle Mountain Steam Electric Station	Combined Cycle Turbines (25 MW) natural gas	Tarrant	TX	117026, PSDTX1390, N194	06/18/2015	Particulate matter, total 2.5 µ (TPM2.5)	35.47	LB/H		81.88	T/YR		BACT-PSD	Good combustion practices, low sulfur fuel	
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two combined cycle turbines with out duct burner	York	PA	67-05083D/F	06/15/2015	Particulate matter, total 10 µ (TPM10)	0.0068	LB/MMBTU					BACT-PSD	Good combustion practices and low sulfur fuels	Tons per year limit is for cumulative Emissions from both CCCT in any 12-month period

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two combined cycle turbines with out duct burner	York	PA	67-05083D/F	06/15/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0068	LB/MMBTU					BACT-PSD	Good combustion practices and low sulfur fuels	Tons per year limit is for cumulative Emissions from both CCCT in any 12-month period
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two Combine Cycle Combustion Turbine with Duct Burner	York	PA	67-05083D/F	06/15/2015	Particulate matter, total 10 µ (TPM10)	0.0066	LB/MMBTU		159.1	TONS	ANY 12-MONTH PERIOD	BACT-PSD	Good combustion practices and low sulfur fuels	Tons per year limit is for cumulative emissions from both CCCT in any 12-month period
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two Combine Cycle Combustion Turbine with Duct Burner	York	PA	67-05083D/F	06/15/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0066	LB/MMBTU		159.1	TONS	ANY 12-MONTH PERIOD	BACT-PSD	Good combustion practices and low sulfur fuels	Tons per year limit is for cumulative emissions from both CCCT in any 12-month period
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	Particulate matter, total 10 µ (TPM10)	0.0068	LB/MMBTU	HHV, 3 HR AVG. SEE NOTES.	58.62	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	good combustion practices along with clean fuels	Limits are for single turbine except as noted. 0.0068 lb/mmbtu HHV, 3 hour average with duct burners. 9.5 lb/h, 3 hour average without duct burners. 15.8 lb/h, 3 hour average with duct burners.
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0068	LB/MMBTU	HHV, 3 HR AVG. SEE NOTES.	58.62	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	good combustion practices along with clean fuels	Limits are for single turbine except as noted. 0.0068 lb/mmbtu HHV, 3 hour average with duct burners. 9.5 lb/h, 3 hour average without duct burners. 15.8 lb/h, 3 hour average with duct burners.
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	Particulate matter, total 10 µ (TPM10)	0.0085	LB/MMBTU	HHV, 3 HR AVG. SEE NOTES.	86.7	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	good combustion practices along with clean fuels	Limits are for single turbine except as noted. 0.0085 lb/mmbtu HHV, 3 hour average with and without duct burners. 15.9 lb/h, 3 hour average without duct burners. 22.2 lb/h, 3 hour average with duct burners.
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0085	LB/MMBTU	HHV, 3 HR AVG. SEE NOTES.	86.7	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	good combustion practices along with clean fuels	Limits are for single turbine except as noted. 0.0085 lb/mmbtu HHV, 3 hour average with and without duct burners. 15.9 lb/h, 3 hour average without duct burners. 22.2 lb/h, 3 hour average with duct burners.
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX112	04/01/2015	Particulate matter, total 10 µ (TPM10)	43	LB/H					BACT-PSD	efficient combustion, natural gas fuel	
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX112	04/01/2015	Particulate matter, total 2.5 µ (TPM2.5)	43	LB/H					BACT-PSD	efficient combustion, natural gas fuel	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*IL-0130	Jackson Generation, LLC - Jackson Energy Center	Combined-Cycle Combustion Turbine	Will	IL	17040013	12/31/2018	5	POUNDS/HOUR	3-HR BLOCK AVG				BACT-PSD		
*WV-0032	ESC Brooke County Power I, LLC - Brooke County Power Plant	GE 7HA.01 Turbine	Brooke	WV	R14-0035	09/18/2018	2.6	LB/HR					BACT-PSD	Use of Natural Gas	
*PA-0319	APV Renaissance Partners - Renaissance Energy Center	Combustion Turbine Unit w/o Duct Burners Unit	Greene	PA	30-00235A	08/27/2018	5.98	TPY					BACT-PSD		
IL-0129	CPV Three Rivers, LLC - CPV Three Rivers Energy Center	Combined Cycle Combustion Turbines	Grundy	IL	16060032	07/30/2018							BACT-PSD	No controls feasible for use of natural gas. For ULSD, use ultra-low sulfur diesel as a backup fuel	Permit limits are as follows. Permit limits are applicable on a 3-hour block average For natural gas, with duct burner: 2.8 lb/hr For natural gas, without duct burner: 2.3 lb/hr. For ULSD: 4.0 lb/hr
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	1	LB/H	HOURLY; EACH CT/HRSG TRAIN	0.8	GR/100 SCF	NAT. GAS BURNED IN FG-TURB/DB1-3	BACT-PSD	Use of clean fuel (natural gas) with a fuel sulfur limit of 0.8 grains per 100 standard cubic feet of natural gas.	
*FL-0367	Shady Hills Energy Center, LLC - Shady Hills Combined Cycle Facility	1-on-1 combined cycle unit (GE 7HA)	Pasco	FL	1010524-001-AC	07/27/2018							BACT-PSD	Clean fuels	Limits on sulfur content of fuel limit SAM emissions. Natural Gas limited to 2.0 grains per 100 scf.
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	0.0013	LB/MMBTU	HOURLY; EACH UNIT	5.04	LB/H	HOURLY; EACH UNIT W/O DUCT BURNER FIRING	BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	2.7	LB/H	HOURLY				BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	H2SO4 was calculated from manufacturer's data, assuming 100% conversion of SO3 to H2SO4.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	2.7	LB/H	HOURLY				BACT-PSD	Good combustion practices and the use of pipeline quality natural gas.	H2SO4 was calculated from manufacturer's data, assuming 100% conversion of SO3 to H2SO4.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	USA	VA	52588	04/26/2018	2.5	LB/H	3 H AV/WITHOUT DUCT BURNING	2.7	LB/H	3 H AV/WITH DUCT BURNING	BACT-PSD	use of natural gas with a sulfur content of no more than 0.4 gr/100scf, 12-mo rolling av	Short term limits apply at all times. Compliance based on fuel sulfur monitoring.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combustion Turbine - Option 2 - Normal Operation	USA	VA	52588	04/26/2018	2.2	LB/H	3 H AV/WITHOUT DB	2.7	LB/H	3 H AV/WITH DB	BACT-PSD	use of natural gas with a sulfur content of no more than 0.4 gr/100scf, 12 mo rolling av.	Short term limits apply at all times.
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	0.001	LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	3.52	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.00103 lb/mmbtu and 4.13 lb/h with duct burner, except startup and shutdown. 0.00102 lb/mmbtu and 3.52 lb/h without duct burner. 17.55 tons per rolling 12 month period for all operating modes, including startup.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	0.0022	LB/MMBTU		7.74	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	Good combustion practices and pipeline quality natural gas	0.0022 lb/mmbtu and 7.74 lb/h with duct burner. 0.0022 lb/mmbtu and 7.41 lb/h without duct burner. 31.69 tons per rolling 12 month period.
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	1	GR/100 DSCF					BACT-PSD	Pipeline Quality Natural Gas	
*WV-0029	ESC Harrison County Power, LLC - Harrison County Power Plant	GE 7HA.02 Turbine	Harrison	WV	R14-0036	03/27/2018	3.8	LB/HR		16.7	TONS/YEAR		BACT-PSD	Use of Natural Gas	
*FL-0363	Florida Power And Light Company - Dania Beach Energy Center	2-on-1 combined cycle unit (GE 7HA)	Broward	FL	0110037-017-AC	12/04/2017							BACT-PSD	Clean fuels	Limits on sulfur content of fuels limit emissions. Gas limited to 2.0 grains per 100 scf, and oil limited to 0.0015% sulfur.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	0.0011	LB/MMBTU		3.78	LB/H		BACT-PSD	natural gas or a natural gas and ethane mixture only	16.56 t/yr per rolling, 12-month period, including start-up and shutdown emissions.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	0.0009	LB/MMBTU		2.85	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	natural gas or a natural gas and ethane mixture only	0.0009 lb/mmbtu. 2.85 lb/h with duct burner (except startup and shutdown). 2.99 lb/h without duct burner (except startup and shutdown). 13.1 t/yr per rolling 12 month period for all operating modes, including startup.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	5.2	X10-4 LB/MMBTU	WITH DUCT BURNER. SEE NOTES.	1.81	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	natural gas or a natural gas and ethane mixture only	0.00052 lb/mmbtu and 1.81 lb/h with duct burner (except startup and shutdown). 0.00055 lb/mmbtu and 1.5 lb/h without duct burner (except startup and shutdown). 7.9 t/yr per rolling 12 month period for all operating modes, including startup.
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	0.0011	LB/MMBTU	SEE NOTES.	4.96	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	pipeline quality natural gas with a maximum sulfur content not exceed 0.50 grain/100 scf	Limits are for single turbine except as noted. 0.0011 lb/mmbtu with duct burners and without duct burners. Both excluding startup and shutdown. 3.87 lb/h without duct burners. 4.96 lb/h with duct burners. Both excluding startup and shutdown. 65.17 t/yr per rolling 12 month period total for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	3.7	LB/H	WITH DUCT BURNER. SEE NOTES.	15.77	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	Low sulfur fuel	1.1x10-3 lb/mmbtu. 3.7 lb/h with duct burner (except startup and shutdown). 3.5 lb/h without duct burner (except startup and shutdown).
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	3.7	LB/H	WITH DUCT BURNER. SEE NOTES.	15.8	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	Low sulfur fuel	1.1x10-3 lb/mmbtu, 3.7 lb/h with duct burner, 3.5 lb/h without duct burner (each limit except startup and shutdown).
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	0.0005	LB/MMBTU					BACT-PSD	Low Sulfur content fuel	
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/Duct Firing	Windham	CT	089-0107	06/30/2017		LB/MMBTU					BACT-PSD	Low Sulfur Fuels	
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	4.6	LB/H	TEST PROTOCOL WILL SPECIFY AVG TIME				BACT-PSD	Good Combustion Practices and the use of pipeline quality natural gas.	The emission limit above is for EACH CTGHRSG. H2SO4 was calculated from manufacturer's data, assuming 100% conversion of SO3 to H2SO4.
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	6.96	LB/H	WITH DUCT BURNER. SEE NOTES.	29	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	Low sulfur fuels	1.7x10-3 lb/mmbtu, hourly average, natural gas, with and without duct burner. 1.9x10-3 lb/mmbtu, hourly average, ultra low sulfur diesel. 6.96 lb/h with duct burner (except startup and shutdown). 5.65 lb/h without duct burner (except startup and shutdown). 6.35 lb/h for ultra low sulfur diesel (except startup and shutdown).
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG with duct burner NG only	Cambria	PA	11-00536A	09/02/2016	0.0014	LB/MMBTU					BACT-PSD	ULSD fuel (CCCT only - duct burner is not fired with ULSD), good combustion practices	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG without duct burner NG only	Cambria	PA	11-00536A	09/02/2016	0.0014	LB/MMBTU					BACT-PSD	Low sulfur fuels and good combustion practices	Limit is for each turbine and HRSG with the duct burner not fired.
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016	1.21	LB/H	HOURLY MAXIMUM	5.28	T/YR	ANNUAL MAXIMUM	BACT-PSD	Use of low sulfur fuel	BACT Limit = 0.0005 LB/MMBTU
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016	1.21	LB/H	HOURLY MAXIMUM	5.28	T/YR	ANNUAL MAXIMUM	BACT-PSD	Use of low sulfur fuels	BACT Limit = 0.0005 LB/MMBTU
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP 150001	07/19/2016	4.26	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				BACT-PSD	Use of Natural Gas a Low Sulfur Fuel	
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP 150001	07/19/2016	3.61	LB/H	AV OF THREE ONE H STACK TESTS EVERY 5 YR				BACT-PSD	Use of natural gas a clean burning fuel	
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion Turbine Generator with duct-fired Heat Recovery Steam Generators (3)	Greensville	VA	52525	06/17/2016	0.0006	LB/MMBTU		9.9	T/YR	12 MO ROLLING AVG	N/A	Low Sulfur fuel	Emission Limit 1: Turbines: 0.00053 lb/MMBtu without DB
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	1	GR/100 SCF	HOURLY	0.25	GR/100 SCF	ANNUAL AVERAGE	BACT-PSD	Good Combustion Practices And Low Sulfur Fuel	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	2	GR. S/100 SCF GAS	FOR GAS	0.0015	% S IN ULSD	FOR ULSD	BACT-PSD	Use of low-sulfur fuels	
TX-0789	Decordova II Power Company LLC - Decordova Steam Electric Station	Combined Cycle & Cogeneration	Hood	TX	107569 AND PSDTX1432	03/08/2016	5	GR/100 SCF	HOURLY	1	GR/100 SCF	ANNUAL	BACT-PSD	Good Combustion Practices And Low Sulfur Fuel	
PA-0306	Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	Large combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	0.0006	LB/MMBTU	HHV	1.8	LB/HR		BACT-PSD	Low sulfur fuel and good combustion practices	
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine with duct burner	Lackawanna	PA	35-00069A	12/23/2015	0.0009	LB/MMBTU		10.4	TONS	YEAR	BACT-PSD	Exclusive natural gas	
CT-0157	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0023	11/30/2015	2.11	LB/H		2.7	LB/H		BACT-PSD	0	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
CT-0158	CPV Towantic, LLC - CPV Towantic, LLC	Combined Cycle Power Plant	New Haven	CT	144-0024	11/30/2015	2.11	LB/H		2.7	LB/H		BACT-PSD	Use of inherently low sulfur fuel	Emission 1: turbine w/o duct firing Emission 2: turbine w/ duct firing
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-Cycle Combustion Turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	4.6	LB/H	3-HR BLOCK AVERAGE, W/OUT DUCT FIRING	5.6	LB/H	3-HR BLOCK AVERAGE WITH DUCT FIRING	BACT-PSD	Initial And Annual Performance Test Using EPA Method 8 Or Equivalent Method Approved By MDE-ARMA	Except During Periods Of SU/SD
TX-0773	FGE Eagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	10.4	T/YR					BACT-PSD	low sulfur fuel	
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine With Duct Burner	Luzerne	PA	40-00129A	09/01/2015	0.0009	LB/MMBTU		3.06	LB/HR		BACT-PSD		12.5 tpy 12-month rolling basis
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine without Duct Burner	Luzerne	PA	40-00129A	09/01/2015	0.0009	LB/MMBTU		2.9	LB/HR		BACT-PSD		12.5 tpy on 12-month rolling basis
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	3.4	LB/H	WITH DUCT BURNER. SEE NOTES.	14	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	Low sulfur fuel	0.0011 lb/mmbtu. 3.4 lb/h with duct burner (except startup and shutdown). 3.2 lb/h without duct burner (except startup and shutdown).
TX-0751	Eagle Mountain Power Company LLC - Eagle Mountain Steam Electric Station	Combined Cycle Turbines (25 MW) natural gas	Tarrant	TX	117026, PSDTX1390, N194	06/18/2015	15.56	LB/H		13.63	T/YR		BACT-PSD	Good combustion practices, low sulfur fuel	
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two Combine Cycle Combustion Turbine with Duct Burner	York	PA	67-05083D/F	06/15/2015	0.0011	LB/MMBTU		28.3	TONS	ANY 12-MONTH PERIOD	BACT-PSD		
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	2	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.				BACT-PSD	good combustion practices along with clean fuels. Firing only natural gas with a sulfur content of 0.25 grains per 100 standard cubic feet (gr/100 scf)	Limits are for single turbine. 2.0 T/YR per rolling 12 month period with and without duct burners. 0.25 grains per 100 standard cubic feet (gr/100 scf)
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	2.1	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.				BACT-PSD	good combustion practices along with clean fuels. Firing only natural gas with a sulfur content of 0.25 grains per 100 standard cubic feet (gr/100 scf)	Limits are for single turbine. 2.1 T/YR per rolling 12 month period with and without duct burners. 0.25 grains per 100 standard cubic feet (gr/100 scf)

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0730	Colorado Bend II Power, LLC - Colorado Bend Energy Center	Combined-cycle gas turbine electric generating facility	Wharton	TX	119365, PSDTX1410, GHGPSDTX112	04/01/2015	2	GR/100 SCF	1-HOUR	0.5	GR/100 SCF	ANNUAL	BACT-PSD	efficient combustion, natural gas fuel	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0439	Consumers Energy Company - Jackson Generating Station	FGLMDB1-6 (6 combined cycle natural gas fired CTG each equipped with a HRSG)	Jackson	MI	118-18	04/02/2019	1000257	T/YR	12-MONTH ROLLING TIME PERIOD				BACT-PSD	Use of low carbon fuel (natural gas), good combustion practices, and energy efficiency measures.	Energy efficiency measures involve the installation of combined cycle units, following vendor recommended maintenance practices, the minimization of heat loss, and automated instrumentation and controls for efficient combustion. Emission limit = 1,000,257 tons/yr applied to all stacks combined on a 12-month rolling time period basis. This limit applies during periods of startup and shutdown.
*IL-0130	Jackson Generation, LLC - Jackson Energy Center	Combined-Cycle Combustion Turbine	Will	IL	17040013	12/31/2018	4733910	TONS/YEAR	12-MONTH ROLLING AVERAGE				BACT-PSD	Equipment design and proper operation	CO2 emissions of each turbine shall not exceed 1,000 lb/MWh of gross energy output, or, alternatively, 1,030 lb/MWh of net energy output on a 12-month rolling average basis.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG2--A 667 MMBTU/H natural gas fired CTG with a HRSG.	Eaton	MI	74-18	12/21/2018	430349	T/YR	12-MO ROLLING TIME PERIOD				BACT-PSD	low carbon fuel (pipeline quality natural gas), good combustion practices and energy efficiency measures.	Carbon capture and sequestration (CCS) would not be economically feasible based upon a qualitative assessment based upon the CTG/HRSG train analysis.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGHRSG1--A 667 MMBTU/H NG fired combustion turbine generator coupled with a heat recovery steam generator (HRSG)	Eaton	MI	74-18	12/21/2018	430349	T/YR	12-MO ROLLING TIME PERIOD				BACT-PSD	Low carbon fuel (pipeline quality natural gas), good combustion practices and energy efficiency measures.	The emission limit applies during all operating modes. Carbon capture and sequestration (CCS) would not be economically feasible based upon a qualitative assessment based upon the CTG/HRSG train analysis.
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Combined Cycle Combustion Turbines (CCCT1 to CCCT5)	Cameron	LA	PDS-LA-805	09/21/2018	2602275	T/YR	ANNUAL TOTAL				BACT-PSD	Combust low carbon fuel gas and good combustion practices	Annual Total for 5 Combined Cycle Turbines
*WV-0032	ESC Brooke County Power I, LLC - Brooke County Power Plant	GE 7HA.01 Turbine	Brooke	WV	R14-0035	09/18/2018	417382	LB/HR					BACT-PSD	Use of Natural Gas, Model GE7HA	
IL-0129	CPV Three Rivers, LLC - CPV Three Rivers Energy Center	Combined Cycle Combustion Turbines	Grundy	IL	16060032	07/30/2018							BACT-PSD	Equipment design and proper operation	Permit limit: 4,026,300 ton/yr, 12-month rolling average. See also Condition 2.1.2(h) of the issued permit.
MI-0432	New Covert Generating Company, LLC - New Covert Generating Facility	FG-TURB/DB1-3 (3 combined cycle combustion turbine and heat recovery steam generator trains)	Van Buren	MI	186-17	07/30/2018	1425081	T/YR	EACH CT/HRSG TRAIN; 12-MO. ROLL TIME PER	7978	BTU/KW-H	EACH CT/HRSG TRAIN; 12-MO ROLL AVG	BACT-PSD	Several energy efficiency measures and the use of natural gas.	Emission limit 1 above is 1,425,081 T/YR based on a 12-month rolling time period as determined at the end of each calendar month for each individual CT/HRSG. Emission limit 2 above is 7,978 BTU/KW-H (HHV) and is the Net Heat Rate on a 12-month rolling average basis for each individual CT/HRSG. CCS was estimated to cost over $75 per ton of CO2 removed, with an estimated annual cost of over $321 million to remove 4.24 million tons per year. Thus, this option was ruled out as economically infeasible.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0435	DTE Electric Company - Belle River Combined Cycle Power Plant	FGCTGHRSG (EUCTGHRSG1 & EUCTGHRSG2)	St. Clair	MI	19-18	07/16/2018	2042773	T/YR	12-MO ROLLING TIME PERIOD; EACH UNIT	794	LB/MW-H	12-OPER MO ROLL AVG; EACH UNIT	BACT-PSD	Energy efficiency measures	The estimated cost of CCS is over $70,000,000 per year. This does not take into account the large parasitic load caused by a CCS system. For emission limit 2 above (794 LB/MW-H), compliance is determined monthly at the end of the initial and each subsequent 12-operating month period. The first month of the initial compliance period is defined in 40 CFR 60.5525(c)(1)(i).
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (South Plant): A combined cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	1978297	T/YR	12-MO ROLLING TIME PERIOD	806	LB/MW-H	12-OPERATING MONTH ROLL AVG BASIS	BACT-PSD	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas).	For emission limit 2 (806 LB/MW-H) it is based on a 12-operating month rolling average basis as determined at the end of each operating calendar month (basis is BACT & NSPS TTTT). Compliance is determined monthly at the end of the initial and each subsequent 12-operating month period. The first month of the initial compliance period is defined in 40 CFR 60.5525(c)(1)(i). The amine-based CCS technologies were used since these are generally considered to be the most feasible near-term deployable technology for possible future CO2 removal. CCS is assumed to be about 90 percent effective. Using the lowest capital cost range, the estimated capital cost for CCS for the proposed project is approximately $393 million, including the cost of a pipeline to transport the CO2 and the cost of the CO2 control system. The cost per ton was close to $100/ton, which was not considered economically feasible.
MI-0433	Marshall Energy Center LLC - MEC North, LLC And MEC South LLC	EUCTGHRSG (North Plant): A combined-cycle natural gas-fired combustion turbine generator with heat recovery steam generator.	Calhoun	MI	167-17 AND 168-17	06/29/2018	1978297	T/YR	12-MO ROLL TIME PERIOD	806	LB/MWH	12-OPERATING MONTH ROLL AVG	BACT-PSD	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas).	Emission limit 2 is 806 LB/MWH based on 12-operating month rolling average basis as determined at the end of each operating calendar month. Compliance is determined monthly at the end of the initial and each subsequent 12-operating month period. The first month of the initial compliance period is defined in 40 CFR 60.5525(c)(1)(i). The amine-based CCS technologies were used since these are generally considered to be the most feasible near-term deployable technology for possible future CO2 removal. CCS is assumed to be about 90 percent effective. Using the lowest capital cost range, the estimated capital cost for CCS for the proposed project is approximately $393 million, including the cost of a pipeline to transport the CO2 and the cost of the CO2 control system. The cost per ton was close to $100/ton, which was not considered economically feasible.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
VA-0328	Novi Energy - C4GT, LLC	GE Combustion Turbine - Option 1 - Normal Operation	USA	VA	52588	04/26/2018	883	LB CO2E/MW-H	12 MO ROLLING TOTAL	6745	BTU/KW-H NET HHV	INITIAL HEAT RATE TEST	BACT-PSD	Energy efficient combustion practices and low GHG fuels	Compliance with the lb/Mw-hr limit can be based on CO2 CEMs or calculations, monthly by summing the CO2e emissions and dividing by the electrical energy output. Complianc with the heat rate limit (Btu/kW-hr) is based on an initial heat rate test on power block.
VA-0328	Novi Energy - C4GT, LLC	Siemens Combusion Turbine - Option 2 - Normal Operation	USA	VA	52588	04/26/2018	883	LB CO2E/MW H	12 MO ROLLING TOTAL	6625	BTU/KW H NET HHV	INITIAL HEAT RATE TEST	BACT-PSD	Energy efficient combustion practices and low GHG fuels	Compliance with the LB/MW H limit can be based on CO2 CEMS or calculations, monthly by summing the CO2e emissions & dividing the electrical energy output. Compliance with the heat rate limit (BTU/KW H) is based on an initial heat rate test on power block.
OH-0377	Harrison Power - Harrison Power	General Electric (GE) Combustion Turbines (P005 & P006)	Harrison	OH	P0122266	04/19/2018	1000	LB/MW-H	WITH DUCT BURNER. SEE NOTES.	1012.4	LB/MW-H	WITHOUT DUCT BURNERS. SEE NOTES.	BACT-PSD	High efficient combustion technology	With duct burners: 450 kg per MW-h of gross energy output (1,000 lbs/MW-h) on a 12-operating-month rolling average basis, or, if a petition is granted, CO2 emissions shall not exceed 470 kg per MW-h of net energy output (1,030 lbs/MW-h) on a 12-operating-month rolling average basis. [40 CFR 60.5520(a)-(c) and Table 2 of 40 CFR Part 60, Subpart TTTT] Without duct burners: 1,012.4 lbs/MW-hr gross energy output at full load ISO conditions when firing natural gas. Gross energy output is defined as the gross power output of the generators before accounting for any balance of plant loads. 2,499,820 t/yr of CO2e emissions per rolling, 12-month period.
OH-0377	Harrison Power - Harrison Power	Mitsubishi Hitachi Power Systems (MHPS) Combustion Turbines (P007 & P008)	Harrison	OH	P0122266	04/19/2018	1000	LB/MW-H	WITH DUCT BURNER. SEE NOTES.	976	LB/MW-H	WITHOUT DUCT BURNERS. SEE NOTES.	BACT-PSD	High efficient combustion technology	With duct burners: 450 kg per MW-h of gross energy output (1,000 lbs/MW-h) on a 12-operating-month rolling average basis, or, if a petition is granted, CO2 emissions shall not exceed 470 kg per MW-h of net energy output (1,030 lbs/MW-h) on a 12-operating-month rolling average basis. [40 CFR 60.5520(a)-(c) and Table 2 of 40 CFR Part 60, Subpart TTTT] Without duct burners: 976.0 lbs/MW-hr gross energy output at full load ISO conditions when firing natural gas. Gross energy output is defined as the gross power output of the generators before accounting for any balance of plant loads. 2,342,643 tons of CO2e emissions per rolling, 12-month period.
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	884	LB/MWH					BACT-PSD	Pipeline Quality Natural Gas, Good Combustion Practices	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0834	Entergy Texas Inc - Montgomery County Power Statioin	Combined Cycle Turbine MSS Reduced Load	Montgomery	TX	N256, PSDTX1510, AND GHGPSDTX1	03/30/2018	223	TON/H					BACT-PSD	minimizing duration of startup / shutdown events, engaging the pollution control equipment as soon as practicable (based on vendor recommendations and guarantees), and meeting the emissions limits on the MAERT	
*WV-0029	ESC Harrison County Power, LLC - Harrison County Power Plant	GE 7HA.02 Turbine	Harrison	WV	R14-0036	03/27/2018	528543	LB/HR		2315020	TONS/YEAR		BACT-PSD	Use of Natural Gas, Model GE7HA	
*TN-0164	Tennessee Valley Authority - TVA - Johnsonville Cogeneration	Dual-fuel CT and HRSG with duct burner	Humphreys	TN	972969	02/01/2018	1800	LB/MWH	12-MONTH MOVING AVERAGE				BACT-PSD	Good combustion design & practices	
MI-0427	Filer City Station Limited Partnership - Filer City Station	EUCCT (Combined cycle CTG with unfired HRSG)	Manistee	MI	66-17	11/17/2017	992286	T/YR	12-MO.ROLL.TIME PERIOD				BACT-PSD	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas).	CCS was estimated to cost over $240 per ton of CO2 removed, with an estimated annual cost of over $246 million. Terrestrial sequestration was estimated to cost over $160 per ton of CO2 removed, with an estimated annual cost of over $160 million. Thus, both of these options are ruled out, as they are not economically feasible.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	General Electric Combustion Turbine (P004)	Monroe	OH	P0122829	11/07/2017	775	LB/MW-H	SEE NOTES.	1915689	T/YR	PER ROLLING 12 MONTH PERIOD	BACT-PSD	high efficiency combustion practices as recommended by the manufacturer	775 lb/MW-hr gross energy output at full load ISO conditions when firing natural gas. Gross energy output is defined as the gross power output of the generators before accounting for any balance of plant loads.
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Mitsubishi Combustion Turbine (P005)	Monroe	OH	P0122829	11/07/2017	1000	LB/MW-H	WITH DUCT BURNER. SEE NOTES.	775	LB/MW-H	WITHOUT DUCT BURNERS. SEE NOTES.	BACT-PSD	high efficiency combustion practices as recommended by the manufacturer	With duct burners: 450 kg per MW-h of gross energy output (1,000 lbs/MW-h) on a 12-operating-month rolling average basis, or, if a petition is granted, CO2 emissions shall not exceed 470 kg per MW-h of net energy output (1,030 lbs/MW-h) on a 12-operating- month rolling average basis. [40 CFR 60.5520(a)-(c) and Table 2 of 40 CFR Part 60, Subpart TTTT] Without duct burners: 775 lb/MW-hr gross energy output at full load ISO conditions when firing natural gas. Gross energy output is defined as the gross power output of the generators before accounting for any balance of plant loads. 1,811,235 t/yr per rolling, 12-month period.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0375	Long Ridge Energy Generation LLC - Hannibal Power - Long Ridge Energy Generation LLC - Hannibal Power	Siemens Combustion Turbine (P006)	Monroe	OH	P0122829	11/07/2017	1000	LB/MW-H	WITH DUCT BURNER. SEE NOTES.	775	LB/MW-H	WITHOUT DUCT BURNERS. SEE NOTES.	BACT-PSD	high efficiency combustion practices as recommended by the manufacturer	450 kg per MW-h of gross energy output (1,000 lbs/MW-h) on a 12-operating-month rolling average basis, or, if a petition is granted, CO2 emissions shall not exceed 470 kg per MW-h of net energy output (1,030 lbs/MW-h) on a 12-operating- month rolling average basis. [40 CFR 60.5520(a)-(c) and Table 2 of 40 CFR Part 60, Subpart TTTT] 775 lb/MW-hr gross energy output at full load ISO conditions when firing natural gas. Gross energy output is defined as the gross power output of the generators before accounting for any balance of plant loads. 1,962,130 tons of CO2e emissions per rolling, 12-month period.
OH-0374	Guernsey Power Station LLC - Guernsey Power Station LLC	Combined Cycle Combustion Turbines (3, identical) (P001 to P003)	Guernsey	OH	P0122594	10/23/2017	846	LB/MW-H	WITHOUT DUCT BURNER. SEE NOTES.	1000	LB/MW-H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	high efficiency combustion practices as recommended by the manufacturer	Limits are for single turbine except as noted. 846 lb/MW-hr gross energy output at full load ISO conditions without duct burner. 450 kg per MW-h of gross energy output (1,000 lbs/MW-h) on a 12-operating-month rolling average basis with duct burner. 7,056,798 t/yr per rolling 12 month period for all 3 turbines.
OH-0372	Oregon Energy Center - Oregon Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Lucas	OH	P0121049	09/27/2017	401921	LB/H	SEE NOTES.	1689461	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	high efficiency combustion design	833 lb/MW-hr (pounds per megawatt-hour) gross energy output (at full load ISO conditions without duct firing) and 401,921 lb/hr (maximum under any condition with duct firing). 1,689,461 t/yr per rolling 12 month period for all operating modes, including startup and shutdown.
OH-0370	Trumbull Energy Center - Trumbull Energy Center	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0122331	09/07/2017	833	LB/MW-H	SEE NOTES.	1683213	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	High efficient combustion technology	833 lb/MW-hr gross energy output (at full load ISO conditions without duct firing). 884 lbs/ MW-hr gross energy output (maximum under any full load condition with duct firing). 401,084 lb/hr (maximum under any condition with duct firing). 1,683,213 T/YR per rolling 12 month period all operating modes, including startup and shutdown periods.
CT-0161	NTE Connecticut, LLC - Killingly Energy Center	Natural Gas w/o Duct Firing	Windham	CT	089-0107	06/30/2017	7273	BTU/KW-HR	12-MONTH ROLLING (NET PLANT, GAS ONLY)	816	LB/MW-HR	(NET, GAS ONLY)	BACT-PSD	Use of low carbon fuel	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Combined Cycle Turbine with Heat Recovery Steam Generator, fired Duct Burners, and Steam Turbine Generator		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	960	LB / MW H					BACT-PSD	Pipeline quality natural gas	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*PA-0315	Hilltop Energy Center, LLC - Hilltop Energy Center, LLC	Combustion Turbine without Duct Burner	Greene	PA	30-00233B	04/12/2017	879	LB	MWH (GROSS)	298774	TPY		OTHER CASE-BY-CASE		
TX-0817	Ineos Usallc - Chocolate Bayou Steam Generating (CBSG) Station	Combined Cycle Cogeneration	Brazoria	TX	123117, PSDTX1460, GHGPSDTX135	02/17/2017	1000	LB/MW H					BACT-PSD	0	
MI-0423	Indeck Niles, LLC - Indeck Niles, LLC	FGCTGHRSG (2 Combined Cycle CTGs with HRSGs)	Cass	MI	75-16	01/04/2017	2097001	T/YR	12-MONTH ROLLING TIME PERIOD				BACT-PSD	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas).	The emission limit above is for EACH CTGHRSG. The proposed permit also contains a 802 lb CO2 per MW-hour (lb/MWh) emission limit that serves as BACT due to energy efficiency, which is equivalent to a net heat rate of 6,855 Btu/kW-hr per 2x1 block and is more stringent than the required NSPS limit of the same units. The amine-based CCS technologies were used since these are generally considered to be the most feasible near-term deployable technology for possible future CO2 removal. CCS is assumed to be about 90 percent effective. Using the lowest capital cost range, the estimated capital cost for CCS for the proposed project is approximately $629,000,000. The cost of a pipeline to transport the CO2 was added to the result to estimate the total capital cost of the CO2 control system. The operating and maintenance and indirect operating costs were estimated to be around $53,000,000. Based on 90 percent CO2 removal and the control being applied to the facility-wide emissions, not just the CTG/HRSG trains, the resulting cost is estimated to be $30/ton and was not considered economically feasible.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
MI-0424	Holland Board Of Public Works - Holland Board Of Public Works - East 5th Street	FGCTGHRSG (2 Combined cycle CTGs with HRSGs; EUCTGHRSG10 & EUCTGHRSG11)	Ottawa	MI	107-13C	12/05/2016	312321	T/YR	12-MO. ROLLING TIME PERIOD; EACH EU.				BACT-PSD	Energy efficiency measures and the use of a low carbon fuel (pipeline quality natural gas).	The emission limit above is for each CTGHRSG and is 312,321 tons per year based upon a 12-month rolling time period as determined at the end of each calendar month. The proposed permit also contains a net heat rate limit of 8,361 BTU/KW-H per CTG/HRSG pair (2x1 block). The tons per year and net heat rate value equate to 992 lb CO2 per MW-H (lb/MW-H). CCS is assumed to be about 90 percent effective. However, the use of CCS technology creates a significant increase in parasitic electrical load, which would decrease the net plant output of the proposed plant from 115 MW to 106 MW, and the technology entails a significant economic impact on the proposed facility. Holland BPW reviewed the documents and utilized the costs provided for different plants at base case and with potential CCS control. The amine-based CCS technologies were used since these had the lowest estimated costs of the CCS technologies considered in the reports. An incremental cost of $800/kW capital cost rate was derived based on an average of several of these estimates scaled to 2010 dollars. This value is in the range of other
TX-0810	Decordova II Power Company LLC - Decordova Steam Electric Station (Decordova Station)	Combined Cycle and Cogeneration (25 MW)	Hood	TX	107569, PSDTX1432, GHGPSDTX124	10/04/2016	966	LB/MW H					BACT-PSD	good combustion practices and firing low carbon fuel.	NSPS TTTT
OH-0367	South Field Energy LLC - South Field Energy LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Columbiana	OH	P0119495	09/23/2016	481301	LB/H	NAT GAS, WITH DUCT BURNER. SEE NOTES.	2045634.5	T/YR	PER ROLLING 12 MONTH PERIOD.	BACT-PSD	High efficient combustion technology	481,301 lbs/hr for natural gas (maximum under any condition with duct firing). 546,182 lbs/hr for ultra low sulfur diesel (maximum under any condition with duct firing). Facility heat rate shall not exceed 7,165 Btu/net kW-hr energy output (at full load ISO conditions, natural gas firing, without duct firing).
PA-0310	CPV Fairview, LLC - CPV Fairview Energy Center	Combustion turbine and HRSG with duct burner NG only	Cambria	PA	11-00536A	09/02/2016	3352086	TONS	12-MONTH ROLLING BASIS				BACT-PSD	low sulfur fuel and good combustion practices	
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1A	St. Charles	LA	PSD-LA-804	08/31/2016							BACT-PSD	Thermally efficient combustion turbines and good combustion practices	BACT Limit = 1000 LB/MWh
LA-0313	Entergy Louisiana, LLC - St. Charles Power Station	SCPS Combined Cycle Unit 1B	St. Charles	LA	PSD-LA-804	08/31/2016							BACT-PSD	Thermally efficient combustion turbines and good combustion practices	BACT Limit = 1000 LB/MWh
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas with Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	888	LB/MW-H	BASED ON CONSECUTIVE 12 MONTH ROLLING				BACT-PSD	Use Of Natural Gas A Clean Burning Fuel	Compliance: Monitored By Calculations. GHG As CO2e<= 888 Lb/Mw-H (Gross Output) For Turbine And Its Assiciated Duct Burner Including Mwhs From Ulsd Firing And Steam Turbine

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
NJ-0085	Stonegate Power, LLC - Middlesex Energy Center, LLC	Combined Cycle Combustion Turbine firing Natural Gas without Duct Burner	Middlesex	NJ	19149/PCP150001	07/19/2016	888	LB/MW-H	BASED ON CONSECUTIVE 12 MONTH ROLLING				BACT-PSD	Use Of Natural Gas A Clean Burning Fuel	Compliance: Monitored By Calculations. GHG As CO2e<= 888 Lb/Mw-H (Gross Output) For Turbine And Its Assiciated Duct Burner Including Mwhs From Ulsd Firing And Steam Turbine
TX-0805	Eagle Mountain Power Company - Eagle Mountain Steam Electric Station	Combined Cycle & Cogeneration	Tarrant	TX	GHGPSDTX115, 107569, PSDTX1432	07/19/2016	917	LB/MW H					BACT-PSD	Good Combustion Practices	
VA-0325	Virginia Electric And Power Company - Greensville Power Station	Combustion Turbine Generator with Duct-Fired Heat Recovery Steam Generators (3)	Greensville	VA	52525	06/17/2016	890	LB/MWH	NET OUTPUT AFTER 30 YEARS OF OPERATION	1911596	TONS/YR		OTHER CASE-BY-CASE		
TN-0162	Tennessee Valley Authority - Johnsonville Cogeneration	Natural Gas-Fired Combustion Turbine with HRSG	Humphreys	TN	970816F	04/19/2016	1800	LB/MWH	12-MONTH MOVING AVERAGE				BACT-PSD	Good combustion design and practices	
TX-0788	Apex Texas Power LLC - Neches Station	Combined Cycle & Cogeneration	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	924	LB/MWH					BACT-PSD	Good Combustion Practices	
TX-0791	Rockwood Energy Center, LLC - Rockwood Energy Center	Combined Cycle & Cogeneration (25 megawatts (MW))	Colorado	TX	GHGPSDTX122, 122003, PSDTX1424	03/18/2016	901	LB/MWH					BACT-PSD	Good combustion practices	
TX-0791	Rockwood Energy Center, LLC - Rockwood Energy Center	Combined Cycle & Cogeneration (25 MW)	Colorado	TX	GHGPSDTX122, 122003, PSDTX1424	03/18/2016	865	LB/MWH					BACT-PSD	Good combustion practices	
TX-0791	Rockwood Energy Center, LLC - Rockwood Energy Center	Combined Cycle & Cogeneration (25 MW)	Colorado	TX	GHGPSDTX122, 122003, PSDTX1424	03/18/2016	944	LB/MWH					BACT-PSD	Good combustion practices	
TX-0791	Rockwood Energy Center, LLC - Rockwood Energy Center	Combined Cycle & Cogeneration (25 MW)	Colorado	TX	GHGPSDTX122, 122003, PSDTX1424	03/18/2016	929	LB/MWH					BACT-PSD	good combustion practices	
TX-0791	Rockwood Energy Center, LLC - Rockwood Energy Center	Combined Cycle & Cogeneration (25 MW)	Colorado	TX	GHGPSDTX122, 122003, PSDTX1424	03/18/2016	929	LB/MWH					BACT-PSD	good combustion practices	
TX-0791	Rockwood Energy Center, LLC - Rockwood Energy Center	Combined Cycle & Cogeneration (25 MW)	Colorado	TX	GHGPSDTX122, 122003, PSDTX1424	03/18/2016	965	LB/MWH					BACT-PSD	good combustion practices	
FL-0356	Florida Power & Light - Okeechobee Clean Energy Center	Combined-cycle electric generating unit	Okeechobee	FL	0930117-001-AC	03/09/2016	850	LB/MWH	FOR GAS OPERATION, 12-MO ROLLING	1210	LB/MWH	FOR ULSD OPERATION, 12-MO ROLLING	BACT-PSD	Use of low-emitting fuels and technologies	Also, limited to 500 hr/yr per turbine on ULSD. Standard is a weighted average of the gas and ULSD standards, depending on generation on the two fuels during the compliance period. Excludes startup, shutdown, and malfunction.
TX-0787	Southern Power - Trinidad Generating Facility	Combined Cycle & Cogeneration	Henderson	TX	GHGPSDTX125, 111393, PSDTX1368	03/01/2016	937	LB/MW HR					BACT-PSD	Good Combustion Practices	
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	504517	T/YR					BACT-PSD	Equipment specifications & work practices - Good combustion practices and use of low carbon fuel	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0790	Port Arthur LNG, LLC - Port Arthur LNG Export Terminal	Simple Cycle Electrical Generation Gas Turbines 15.210	Jefferson	TX	131769, PSDTX1456, GHGPSDTX134	02/17/2016	156912	T/YR		1060	LB/MW		BACT-PSD	Equipment specifications & work practices - Good combustion practices and use of low carbon, low sulfur fuel	
PA-0306	Tenaska PA Partners LLC - Tenaska PA Partners/Westmoreland Gen Fac	Large combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	1881905	TPY					BACT-PSD	Good combustion practices	
PA-0309	Lackawanna Energy Center, LLC - Lackawanna Energy Ctr/Jessup	Combustion turbine with duct burner	Lackawanna	PA	35-00069A	12/23/2015	1629115	TONS	YEAR				BACT-PSD		
MD-0045	Mattawoman Energy, LLC - Mattawoman Energy Center	2 Combined-cycle Combustion Turbines	Prince George's	MD	PSC CASE. NO. 9330	11/13/2015	865	LB/MW-H	12-MONTH ROLLING AVERAGE				BACT-PSD		With And Without Duct Firing At All Times
TX-0773	FGE Eagle Pines, LLC - FGE Eagle Pines Project	Combined Cycle Turbines (25 MW)	Cherokee	TX	131316, PSDTX1454, AND GHGPSDT	11/04/2015	886	LB/MW H	WITHOUT DUCT FIRING	816	LB/MW H	WITH DUCT FIRING	BACT-PSD	Low carbon fuel, good combustion, efficient combined cycle design	
TX-0766	Golden Pass Products, LLC - Golden Pass LNG Export Terminal	Refrigeration Compression Turbines	Jefferson	TX	116055, PSDTX1386, GHGPSDTX100	09/11/2015	614533	TPY					BACT-PSD	Equipment specifications & work practices - Good combustion practices and use of low carbon fuel	
PA-0311	Moxie Freedom LLC - Moxie Freedom Generation Plant	Combustion Turbine With Duct Burner	Luzerne	PA	40-00129A	09/01/2015	1000	LB CO2/MWH	GROSS ON A 12-MONTH ROLLING BASIS	1828492	TPY		BACT-PSD		
OH-0366	Clean Energy Future - Lordstown, LLC - Clean Energy Future - Lordstown, LLC	Combined Cycle Combustion Turbines (two, identical) (P001 and P002)	Trumbull	OH	P0117655	08/25/2015	833	LB/MW-H	WITHOUT DUCT BURNERS. SEE NOTES.	369700	LB/H	WITH DUCT BURNERS. SEE NOTES.	BACT-PSD	High efficient combustion technology	Carbon dioxide equivalent (CO2e) emissions shall not exceed 833 lb/MW-hr gross energy output (at full load ISO conditions without duct firing) and 369,700 lbs/hr (maximum under any condition with duct firing). 1,510,526.6 t/yr per rolling 12 month period for all operating modes, including startup periods.
KS-0029	The Empire District Electric Company - The Empire District Electric Company	Combined cycle combustion turbine	Cherokee	KS	C-12987	07/14/2015	1022755.9	TONS PER YEAR	12-MONTH ROLLING AVERAGE				BACT-PSD		
PA-0307	Calpine Mid-Merit, LLC - York Energy Center Block 2 Electricity Generation Project	Two Combine Cycle Combustion Turbine with Duct Burner	York	PA	67-05083D/F	06/15/2015	883	LB/MW-HR	EXPRESSED AS CO2E (NET)	2896556	TONS	YEAR (NET) EXPRESSED AS CO2E	BACT-PSD	Good combustion practices and oxidation catalyst	Tons per year limit is for cumulative emissions from both CCCT in any 12-month period expressed as CO2e
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 1 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	7471	BTU/KW-H	HHV NET PER EACH CCT BLOCK. SEE NOTES.	4898977	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	high efficiency	7,471 Btu/kW-hr (HHV, net) for each CCT block (ISO conditions corrected for plant elevation, without duct firing or inlet evaporative cooling, baseload, and not accounting for transformer losses). 4,898,977 tons of CO2e (total combined for the four CCTs) as a rolling, 12-month basis under Scenario 1.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM COMBINED CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
OH-0365	Rolling Hills Generating, LLC	Combustion Turbines, Scenario 2 (4, identical) (P001, P002, P004, P005)	Vinton	OH	P0110152	05/20/2015	7471	BTU/KW-H	HHV NET PER EACH CCT BLOCK. SEE NOTES.	5174943	T/YR	PER ROLLING 12 MONTH PERIOD. SEE NOTES.	BACT-PSD	high efficiency	7,471 Btu/kW-hr (HHV, net) for each CCT block (ISO conditions corrected for plant elevation, without duct firing or inlet evaporative cooling, baseload, and not accounting for transformer losses). 5,174,943 tons of CO2e (total combined for the four CCTs) as a rolling, 12-month basis under Scenario 1.
TX-0679	Corpus Christi Liquefaction LLC - Corpus Christi Liquefaction Plant	Refrigeration Compressor Turbine	Gregory	TX	GHGPSDTX123	02/27/2015	146754	TPY	12-MONTH ROLLING BASIS				BACT-PSD	install efficient turbines, follow the turbine manufacturerâ€™s emission-related written instructions for maintenance activities including prescribed maintenance intervals to assure good combustion and efficient operation. Compressors shall be inspected and maintained according to a written maintenance plan to maintain efficiency.	The limit is for each turbine.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR NOX EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGSC1-A nominally rated 667 MMBTU/hr natural gas-fired simple cycle CTG	Eaton	MI	74-18	12/21/2018	Nitrogen Oxides (NOx)	25	PPM	At 15%O2;4-Hr Roll Avg	60	LB/H	24-Hr Roll Avg	BACT-PSD	Dry low NOx burners (DLNB) (70-80% eff.) and good combustion practices.	Emission Limit 1 is 25 ppmvd at 15%O2 based on a 4-hour rolling average, except during operation less than 75 percent of peak load. Emission Limit 2 is 60.0 lb/h based on a 24-hour rolling average as determined each operating hour, except during startup and shutdown.
TX-0851	Rio Grande LNG LLC - Rio Bravo Pipeline Facility	Refrigeration Compression Turbines	Cameron	TX	140792, PSDTX1498, GHGPSDTX158	12/17/2018	Nitrogen Oxides (NOx)	9	PPMVD	15% O2				BACT-PSD	Dry Low NOx burners. Good combustion practices	
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	Nitrogen Oxides (NOx)	9	PPMV	30 Day Rolling Average				BACT-PSD	Dry Low NOx Combustor Design, Good Combustion Practices, and Natural Gas Combustion.	Units are in ppmv @ 15% O2; 30 day rolling average during normal operations.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 CO - Simple-Cycle Combustion Turbine 1 (Commissioning) [SCN0005]	Washington Parish	LA	PSD-LA-829	05/23/2018	Nitrogen Oxides (NOx)	240	LB/HR	Hourly Maximum	42	TONS/YR	Annual Average	BACT-PSD	Pipeline quality natural gas & dry-low-NOx burners	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 CO - Simple-Cycle Combustion Turbine 2 (Commissioning) [SCN0006]	Washington Parish	LA	PSD-LA-829	05/23/2018	Nitrogen Oxides (NOx)	240	LB/HR	Hourly Maximum	42	TONS/YR	Annual Average	BACT-PSD	Pipeline quality natural gas & dry-low-NOx burners	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 SUSD - Simple-Cycle Combustion Turbine 1 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0019]	Washington Parish	LA	PSD-LA-829	05/23/2018	Nitrogen Oxides (NOx)	86.38	LB/HR	Hourly Maximum				BACT-PSD	Pipeline quality natural gas & dry-low-NOx burners	NOx monitored with a Continuous Emissions Monitoring System (CEMS).
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 SUSD - Simple-Cycle Combustion Turbine 2 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0020]	Washington Parish	LA	PSD-LA-829	05/23/2018	Nitrogen Oxides (NOx)	86.38	LB/HR	Hourly Maximum				BACT-PSD	Pipeline quality natural gas & dry-low-NOx burners	NOx monitored with a Continuous Emissions Monitoring System (CEMS).
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 NO - Simple-Cycle Combustion Turbine 1 (Normal Operations) [EQT0017]	Washington Parish	LA	PSD-LA-829	05/23/2018	Nitrogen Oxides (NOx)	9	PPMVD @15%O2	30-Day Rolling Average	73.08	LB/HR	Hourly Maximum	BACT-PSD	Pipeline quality natural gas & dry-low-NOx burners	NOx monitored with a Continuous Emissions Monitoring System (CEMS).
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 NO - Simple-Cycle Combustion Turbine 2 (Normal Operations) [EQT0018]	Washington Parish	LA	PSD-LA-829	05/23/2018	Nitrogen Oxides (NOx)	9	PPMVD @15%O2	30-Day Rolling Average	73.08	LB/HR	Hourly Maximum	BACT-PSD	Pipeline quality natural gas & dry-low-NOx burners	NOx monitored with a Continuous Emissions Monitoring System (CEMS).
CA-1251	Palmdale Energy, LLC - Palmdale Energy Project	Combustion Turbines (GEN1 and GEN2)	Los Angeles	CA	SE 17-01	04/25/2018	Nitrogen Oxides (NOx)	2	PPM @ 15% O2	1-Hour				BACT-PSD	Selective Catalytic Reduction, Dry Low NOx Burners	Mass Emission Limits During Normal Operation: 18.5 lb/hr with duct burner (1-hr average) 17.1 lb/hr without duct burner (1-hr average) Startup and Shutdown Limits: Cold Start: 51.5 lb/event, 39 minutes Warm Start: 46.8 lb/event, 35 minutes Hot Start: 43.2 lb/event, 30 minutes Shutdown: 33.0 lb/event, 25 minutes Startup/Shutdown: 53.6 lb/hr (1-hr average) (used in modeling analysis)
WV-0028	Pleasants Energy LLC - Waverly Power Plant	GE 7FA.004 Turbine	Pleasants	WV	R14-0034A	03/13/2018	Nitrogen Oxides (NOx)	69	LB/HR		232.3	TONS/YEAR		BACT-PSD	Dry low NOx burners	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines	Jackson	TX	PSDTX1422	01/26/2018	Nitrogen Oxides (NOx)	9	PPMVD					BACT-PSD	Dry low NOx burners	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines MSS	Jackson	TX	PSDTX1422	01/26/2018	Nitrogen Oxides (NOx)	0.01	TON/YR					BACT-PSD	Minimizing duration of startup/shutdown, using good air pollution control practices and safe operating practices.	
TX-0826	Golden Spread Electric Cooperative, Inc. - Mustang Station	Simple Cycle Turbine	Yoakum	TX	72579, PSDTX1080M1, GHGPSDTX13	08/16/2017	Nitrogen Oxides (NOx)	9	PPMVD					BACT-PSD	Dry low-NOx burners	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Nitrogen Oxides (NOx)	9	PPMV	15% O2 3-H Avg				BACT-PSD	Dry low-NOx burners, natural gas, good combustion practices, limited operating hours	Operation of each turbine is limited to 2,000 hours per year.
IN-0261	Duke Energy Indiana, LLC Vermillion Generating Sta - Vermillion Generating Station	Simple Cycle, Natural Gas fired Combustion Turbines	Vermillion	IN	165-36956-00022	02/28/2017	Nitrogen Oxides (NOx)	250	LB/H	Each Turbine	25	Ton/12 Consec. Months	Compliance Determined End Of Each Month	BACT-PSD	Good Combustion Practices	Third Limit: Only Two (2) Turbines Will Operate During Low Load Operation
LA-0316	Cameron LNG LLC - Cameron LNG Facility	Gas turbines (9 units)	Cameron	LA	PSD-LA-766(M3)	02/17/2017	Nitrogen Oxides (NOx)	15	PPMVD	@15%O2				BACT-PSD	Good combustion practices and dry low nox burners	
TX-0816	Corpus Christi Liquefaction Stage III, LLC - Corpus Christi Liquefaction	Refrigeration compressor turbines	San Patricio	TX	139479, PSDTX1496, GHGPSDTX157	02/14/2017	Nitrogen Oxides (NOx)	25	PPMDV	@ 15% O2				BACT-PSD	Dry low emission burners	
WV-0026	Pleasants Energy, LLC - Waverly Facility	GE Model 7FA Turbine	Pleasants	WV	R14-0034	01/23/2017	Nitrogen Oxides (NOx)	9	PPM	Natural Gas	49	PPM	Fuel Oil	BACT-PSD	Dry Low-NOx Combustion System (DLNB), Water Injection	Additional emission limits are in the permit for use of turbocharging and startup/shutdown emissions.
IN-0264	AES Ohio Generation, LLC - Montpelier Generating Station	Pratt & Twin-Pac Simple cycle turbines	Wells	IN	179-37209-00026	01/06/2017	Nitrogen Oxides (NOx)	25	PPMV	At 15% O2 For Natural Gas	42	PPMV	At 15% O2 For Fuel Oil	BACT-PSD	Water Injection	0.14 LB/MMBTU For natural gas and 0.24 LB/MMBTU for fuel oil; each turbine limited To 4,555 hours of operation per 12-month Period
CA-1238	Puente Power	Gas turbine	Ventura	CA	00013-370	10/13/2016	Nitrogen Oxides (NOx)	2.5	PPMVD	1 Hour@15%O2				OTHER CASE-BY-CASE		
VA-0326	Doswell Limited Partnership Doswell Energy Center - Doswell Energy Center	Two (2) GE 7FA simple cycle combustion turbines	Hanover	VA	51018	10/04/2016	Nitrogen Oxides (NOx)	9	PPMVD	12 Mo Rolling Total	74.2	LB/H	12 Mo Rolling Total	BACT-PSD	Low NOx Burners/Combustion Technology	9.0 ppmvd at 15% O2 (GE Mode 6) at all times except during startup and shutdown
IL-0121	Invenergy - Invenergy Nelson Expansion LLC	Two Simple Cycle Combustion Turbines	Lee	IL	15060042	09/27/2016	Nitrogen Oxides (NOx)	0.033	LB/MMBTU		0.164	LB/MMBTU		BACT-PSD	Dry low-NOx combustion technology for natural gas and low-NOx combustion technology and water injection for ULSD.	Natural Gas: 9 ppmv at 15 percent O2 (equivalent to 0.033 lb/mmBtu, HHV). ULSD: 42 ppmv at 15 percent O2 (equivalent to 0.164 lb/mmBtu, HHV). During commissioning, NOx shall not exceed: Natural gas: 110 lb/hr, 110 lb/cycle ULSD: 349 lb/hr, 275 lb/cycle

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR NOX EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	NOx Limit	NOx Limit Unit	NOx Avg Time	NOx Limit 2	NOx Limit 2 Unit	NOx Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
NY-0106	Greenidge Generation LLC - Greenidge Station	Turbine - natural gas	Yates	NY	8-5736-00004/00017	09/07/2016	Nitrogen Oxides (NOx)	0.03	LB/MMBTU	12 Mo	0.0365	LB/MMBTU	1 H	LAER	Advanced low NOx burners, closed-coupled and staged over-fire air, Selective Non-Catalytic Reduction, and Selective Catalytic Reduction.	0.03 LB/MMBTU 12 MO; includes startups, shutdowns, malfunctions, and upsets. 0.0365 LB/MMBTU 1 H; does not include startups, shutdowns, malfunctions, and upsets.
NJ-0086	Bayonnne Energy Center LLC - Bayonnne Energy Center	Simple Cycle Stationary Turbines firing Natural gas	Hudson	NJ	12863-BOP150001	08/26/2016	Nitrogen Oxides (NOx)	2.5	PPMVD@15%O2	3 H Rolling Av Based On One H Block Av	5.92	LB/H	Avg Of three 1-hour stack tests every 5 years	LAER	Selective Catalytic Reduction, water injection, use of natural gas a low NOx emitting fuel; 90%	
TX-0794	Brazos Electric Cooperative - Hill County Generating Facility	Simple cycle turbine	Hill	TX	130051,PSDTX1450, GHGPSDTX131	04/07/2016	Nitrogen Oxides (NOx)	9	PPMVD @ 15% O2	3-Hr Rolling Average				BACT-PSD	Emission controls consist of dry low-NOx combustors	
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines; 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Nitrogen Oxides (NOx)	9	PPM					BACT-PSD	Dry low-NOx burners, good combustion practices	
LA-0307	Magnolia LNG, LLC - Magnolia LNG Facility	Gas Turbines (8 units)	Calcasieu	LA	PSD-LA-792	03/21/2016	Nitrogen Oxides (NOx)	25	PPMVD	@15 %O2				BACT-PSD	Dry Low NOX burners and good combustion practices	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP150001	03/10/2016	Nitrogen Oxides (NOx)	2	PPMVD@15%O2	3 H Rolling Av Based On One H Block	30.7	LB/H	Av Of Three One H Stack Tests	LAER	SCR and use of natural gas a clean burning fuel; 90%	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP150001	03/10/2016	Nitrogen Oxides (NOx)	2	PPMVD@15%O2	3 H Rolling Av Based On One H Block	25.4	LB/H	Av Of Three One H Stack Tests	LAER	Selective Catalytic Reduction (SCR) System; 92%	
NY-0103	Cricket Valley Energy Center LLC - Cricket Valley Energy Center	Turbines and duct burners	USA	NY	3-1326-00275/00009	02/03/2016	Nitrogen Oxides (NOx)	2	PPMVD @ 15% O2	1 H				LAER	Dry low NOx burners in combination with selective catalytic reduction	Applies to all operating loads, except during startup and shutdown.
TX-0777	Navasota South Peakers Operating Company I, LLC. - Union Valley Energy Center	Simple Cycle Turbine	Nixon	TX	120973 AND PSDTX1420	12/09/2015	Nitrogen Oxides (NOx)	9	PPMVD @ 15% O2	3-Hr Rolling Average Peak				BACT-PSD	Dry low NOx burners	
TX-0769	Navasota North Country Peakers Operating Company I - Van Alstyne Energy Center (VAEC)	Simple Cycle Turbine	Grayson	TX	121051 AND PSDTX1418	10/27/2015	Nitrogen Oxides (NOx)	9	PPMVD @ 15% O2	3-Hr Average				BACT-PSD	DLN burners	CTGs will operate at 2,500 hours of operation per year at baseload.
TX-0764	Nacogdoches Power, LLC - Nacogdoches Power Electric Generating Plant	Natural Gas Simple Cycle Turbine (25 MW)	Nacogdoches	TX	77679, PSDTX1061M1 & O-3455	10/14/2015	Nitrogen Oxides (NOx)	9	PPMVD @ 15% O2					BACT-PSD	Dry Low NOx burners, good combustion practices, limited operations	Operation of the turbine is limited to 2,500 hours on a 12-month rolling average.
TX-0768	Shawnee Energy Center, LLC - Shawnee Energy Center	Simple cycle turbines greater than 25 megawatts (MW)	Hill	TX	PSDTX1442, 125963	10/09/2015	Nitrogen Oxides (NOx)	9	PPMVD @ 15% O2					BACT-PSD	Dry Low NOx burners	Operation of the turbine is limited to 2,920 hours on a 12-month rolling average.
FL-0355	Florida Power & Light (FPL) - Fort Myers Plant	Combustion Turbines	Lee	FL	0710002-022-AC	09/10/2015	Nitrogen Oxides (NOx)	9	PPMVD@15% O2	Gas Firing, 24-Hr Block Avg	42	PPMVD@15 % O2	ULSD Firing, 4-Hr Rolling Avg	BACT-PSD	DLN and wet injection (for ULSD operation)	Compliance by NOx CEMS. Also subject to low-load (<75%) NOx limit.
FL-0354	Florida Power & Light - Lauderdale Plant	Five 200-MW combustion turbines	Broward	FL	0110037-013-AC	08/25/2015	Nitrogen Oxides (NOx)	9	PPMVD@15%O2	24-Hr Block Average	42	PPMVD@15 %O2	4-Hr Rolling	BACT-PSD	Dry-low-NOx combustion system. Wet injection when firing ULSD.	Compliance by NOx CEMS.
PA-0305	Shell Chemical Appalachia - Shell Chem Appalachia/Petrochemicals Complex	Combustion turbine wih duct burner and heat recovery steam generator	Beaver	PA	04-00740A	06/18/2015	Nitrogen Oxides (NOx)	2	PPMDV @ 15% O2	1 Hour Avg Ex During Startup And Shutdow	65.4	TONS	Any Consecutive 12 Month Period	LAER		113 lb/hr during startup and shutdown
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turnbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	Nitrogen Oxides (NOx)	2	PPMVD	@15% O2 Three Hour Rolling Average				BACT-PSD	SCR, low NOx burners; 90%	
TX-0733	Golden Spread Electric Cooperative, Inc. - Antelope Elk Energy Center	Simple Cycle Turbine & Generator	Hale	TX	109148, PSDTX1358M1	05/12/2015	Nitrogen Oxides (NOx)	9	PPMVD AT 15% O2					BACT-PSD	Dry Low NOx burners	Operation of each turbine is limited to 4,572 hours per year
TX-0734	Navasota South Peakers Operating Company II, LLC. - Clear Springs Energy Center (CSEC)	Simple Cycle Turbine	Guadalupe	TX	120849 AND PSDTX1414	05/08/2015	Nitrogen Oxides (NOx)	9	PPMVD @ 15% O2	3-Hr Average				BACT-PSD	dry low-NOx (DLN) burners	CTGs will operate at 2,500 hours of operation per year at baseload.
TX-0694	Indeck Wharton, L.L.C. - Indeck Wharton Energy Center	(3) combustion turbines	Wharton	TX	111724 PSDTX1374	02/02/2015	Nitrogen Oxides (NOx)	9	PPMVD	@15% O2, 3-Hr Rolling Average				BACT-PSD	DLN combustors	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGSC1-A nominally rated 667 MMBTU/hr natural gas-fired simple cycle CTG	Eaton	MI	74-18	12/21/2018	9	LB/H	Hourly Except During Startup/Shutdown				BACT-PSD	Dry low NOx burners and good combustion practices.	The use of combustion controls are considered technically feasible options for controlling CO emissions from the proposed natural gas-fired simple-cycle CTG, it is not economical in this case.
TX-0851	Rio Grande LNG LLC - Rio Bravo Pipeline Facility	Refrigeration Compression Turbines	Cameron	TX	140792, PSDTX1498, GHGPSDTX158	12/17/2018	25	PPMVD	15% O2				BACT-PSD	Dry Low NOx burners. Good combustion practices	
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	25	PPMV	30 Day Rolling Average				BACT-PSD	Proper Equipment Design, Proper Operation, and Good Combustion Practices.	Units are in ppmv @ 15% O2; 30 day rolling average during normal operations.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 CO - Simple-Cycle Combustion Turbine 1 (Commissioning) [SCN0005]	Washington Parish	LA	PSD-LA-829	05/23/2018	2000	LB/HR	Hourly Maximum	350	TONS/YR	Annual Average	BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 CO - Simple-Cycle Combustion Turbine 2 (Commissioning) [SCN0006]	Washington Parish	LA	PSD-LA-829	05/23/2018	2000	LB/HR	Hourly Maximum	350	TONS/YR	Annual Average	BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 SUSD - Simple-Cycle Combustion Turbine 1 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0019]	Washington Parish	LA	PSD-LA-829	05/23/2018	800.08	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices & use of pipeline quality natural gas	CO emissions will be monitored with a Continuous Emissions Monitoring System (CEMS).
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 SUSD - Simple-Cycle Combustion Turbine 2 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0020]	Washington Parish	LA	PSD-LA-829	05/23/2018	800.08	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices & use of pipeline quality natural gas	CO emissions will be monitored with a Continuous Emissions Monitoring System (CEMS).
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 NO - Simple-Cycle Combustion Turbine 1 (Normal Operations) [EQT0017]	Washington Parish	LA	PSD-LA-829	05/23/2018	6	PPMVD AT 15% OXYGEN	Annual Average	34.42	LB/HR	Hourly Maximum	BACT-PSD	Good combustion practices & use of pipeline quality natural gas	CO emissions will be monitored with a Continuous Emissions Monitoring System (CEMS).
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 NO - Simple-Cycle Combustion Turbine 2 (Normal Operations) [EQT0018]	Washington Parish	LA	PSD-LA-829	05/23/2018	6	PPMVD AT 15% O2	Annual Average	34.42	LB/HR	Hourly Maximum	BACT-PSD	Good combustion practices & use of pipeline quality natural gas	CO emissions will be monitored with a Continuous Emissions Monitoring System (CEMS).
CA-1251	Palmdale Energy, LLC - Palmdale Energy Project	Combustion Turbines (GEN1 and GEN2)	Los Angeles	CA	SE 17-01	04/25/2018	1.5	PPM @ 15% O2	1-Hr, Demo Limit, W/O Duct Firing	2	PPM @ 15% O2	1-Hr W/Duct Firing	BACT-PSD	Oxidation Catalyst	During demonstration period, limit without duct firing is 2.0 ppm Mass Emission Limits: w/o duct firing: 7.8 lb/hr (10.4 lb/hr during demonstration period) w/ ducting firing: 11.3 lb/hr Startup/Shutdown Limits: Cold Start: 416 lb/event, 39 minutes Warm Start: 378 lb/event, 35 minutes Hot Start: 305 lb/event, 30 minutes Shutdown: 75.9 lb/event, 25 minutes NAAQS modeling-based limit: 419 lb/hr during SU/SD

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
WV-0028	Pleasants Energy LLC - Waverly Power Plant	GE 7FA.004 Turbine	Pleasants	WV	R14-0034A	03/13/2018	33.9	LB/HR		235.54	TONS/YEAR		BACT-PSD	Combustion Controls	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines	Jackson	TX	PSDTX1422	01/26/2018	9	PPMVD					BACT-PSD	Dry low NOx burners	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines MSS	Jackson	TX	PSDTX1422	01/26/2018	0.01	TON/YR					BACT-PSD	Minimizing duration of startup/shutdown, using good air pollution control practices and safe operating practices.	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	9	PPMVD	3% O2 3-H Avg				BACT-PSD	Good combustion practices; limited operating hours	
IN-0261	Duke Energy Indiana, LLC Vermillion Generating Sta - Vermillion Generating Station	Simple Cycle, Natural Gas fired Combustion Turbines	Vermillion	IN	165-36956-00022	02/28/2017	525	LB/H	Each Turbine	52.5	TON/12 CONSEC. MONTH	Compliance Determined End Of Each Month	BACT-PSD	Good Combustion Practices	Third Limit: Only Two Turbines Will Operate During Low Load Operation
LA-0316	Cameron LNG LLC - Cameron LNG Facility	Gas turbines (9 units)	Cameron	LA	PSD-LA-766(M3)	02/17/2017	15	PPMVD	@15%O2				BACT-PSD	good combustion practices and fueled by natural gas	
TX-0816	Corpus Christi Liquefaction Stage III, LLC - Corpus Christi Liquefaction	Refrigeration compressor turbines	San Patricio	TX	139479, PSDTX1496, GHGPSDTX157	02/14/2017	29	PPMDV	@ 15% O2				BACT-PSD	Dry low emission burners	
WV-0026	Pleasants Energy, LLC - Waverly Facility	GE Model 7FA Turbine	Pleasants	WV	R14-0034	01/23/2017	9	PPM	Natural Gas	20	PPM	Fuel Oil	BACT-PSD	Good Combustion Practices	
IN-0264	AES Ohio Generation, LLC - Montpelier Generating Station	Pratt & Twin-Pac Simple Cycle Turbines	Wells	IN	179-37209-00026	01/06/2017	0.2	LB/MMBTU	Natural Gas	0.3	LB/MMBTU	Fuel Oil	BACT-PSD	Natural Gas As Primary Fuel; Good Combustion Practices	Each Turbine Limited To 4,555 Hours Of Operation Per 12 Month Period; Each Turbine Limited To 500 Hours Of Fuel Oil Combustion Per 12 Month Period
VA-0326	Doswell Limited Partnership Doswell Energy Center - Doswell Energy Center	Two (2) GE 7FA simple cycle combustion turbines	Hanover	VA	51018	10/04/2016	13.99	LB	H/12 Mo Rolling Total	0.0071	LB	Mmbtu/12 Mo Rolling Total	BACT-PSD	Pipeline Quality Natural Gas	7.13 x 10-3 lb/MMBtu (3-hour average) (GE Mode 6) at all times except during startup and shutdown
NY-0106	Greenidge Generation LLC - Greenidge Station	Turbine - natural gas	Yates	NY	8-5736-00004/00017	09/07/2016	0.095	LB/MMBTU	12 Mo	0.037	LB/MMBTU	24 H	BACT-PSD		Includes startups, shutdowns, malfunctions, and upsets.
NJ-0086	Bayonnne Energy Center LLC - Bayonnne Energy Center	Simple Cycle Stationary Turbines firing Natural gas	Hudson	NJ	12863-BOP150001	08/26/2016	5	PPMVD@15%O2	3 H Rolling Av Based On One H Block Av	7.21	LB/H	Av Of Three One H Stack Tests Every 5 Yr	OTHER CASE-BY-CASE	Add-on control is CO Oxidation Catalyst, and use of natural gas as fuel for pollution prevention; 90%	Not subject to PSD
TX-0794	Brazos Electric Cooperative - Hill County Generating Facility	Simple cycle turbine	Hill	TX	130051,PSDTX1450, GHGPSDTX131	04/07/2016	9	PPMVD @ 15% O2	3-Hr Average				BACT-PSD	Premixing of fuel and air enhances combustion efficiency and minimizes emissions.	
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines > 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	9	PPM					BACT-PSD	good combustion practices	
LA-0307	Magnolia LNG, LLC - Magnolia LNG Facility	Gas Turbines (8 units)	Calcasieu	LA	PSD-LA-792	03/21/2016	0.062	LB/MM BTU	Three One-Hour Test Average				BACT-PSD	good combustion practices and fueled by natural gas	
NJ-0084	PSEG Fossil LLC - PSEG Fossil Llc Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP150001	03/10/2016	2	PPMVD@15%O2	3 H Rolling Av Based On One H Block	18.7	LB/H	Av Of Three One H Stack Tests	BACT-PSD	Oxidation Catalyst and good combustion practices; 74%	
NJ-0084	PSEG Fossil LLC - PSEG Fossil Llc Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP150001	03/10/2016	2	PPMVD@15%O2	3 H Rolling Av Based On One H Block	15.4	LB/H	Av Of Three One H Stack Tests	BACT-PSD	Oxidation Catalyst And Good Combustion Practices; 74%	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO Limit	CO Limit Unit	CO Avg Time	CO Limit 2	CO Limit 2 Unit	CO Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
NY-0103	Cricket Valley Energy Center LLC - Cricket Valley Energy Center	Turbines and duct burners	USA	NY	3-1326-00275/00009	02/03/2016	2	PPMVD @ 15% O2	1 H				BACT-PSD	good combustion practice and oxidation catalyst	Applies to all operating loads, except during startup and shutdown.
TX-0777	Navasota South Peakers Operating Company I, LLC. - Union Valley Energy Center	Simple Cycle Turbine	Nixon	TX	120973 AND PSDTX1420	12/09/2015	9	PPMVD @ 15% O2	All Loads				BACT-PSD	dry low NOx burners and good combustion practices	CTGs will operate at 2,500 hours of operation per year at baseload.
TX-0769	Navasota North Country Peakers Operating Company I - Van Alstyne Energy Center (VAEC)	Simple Cycle Turbine	Grayson	TX	121051 AND PSDTX1418	10/27/2015	9	PPMVD @ 15% O2					BACT-PSD	DLN burners and good combustion practices	CTGs will operate at 2,500 hours of operation per year at baseload.
TX-0764	Nacogdoches Power, LLC - Nacogdoches Power Electric Generating Plant	Natural Gas Simple Cycle Turbine (25 MW)	Nacogdoches	TX	77679, PSDTX1061 M1 & O-3455	10/14/2015	9	PPMVD @ 15% O2					BACT-PSD	dry low NOx burners, good combustion practices, limited operation	Operation of the turbine is limited to 2,500 hours on a 12-month rolling average.
TX-0768	Shawnee Energy Center, LLC - Shawnee Energy Center	Simple cycle turbines greater than 25 megawatts (MW)	Hill	TX	PSDTX1442, 125963	10/09/2015	9	PPMVD @ 15% O2					BACT-PSD	dry low NOx burners and lmiited operation, clean fuel	
FL-0354	Florida Power & Light - Lauderdale Plant	Five 200-MW combustion turbines	Broward	FL	0110037-013-AC	08/25/2015	4	PPMVD@15%O2	Nat Gas, Three 1-Hr Runs	9	PPMVD@15%O2	ULSD, Three 1-Hr Runs	BACT-PSD	Good combustion minimizes CO formation	Initial and annual stack test. Also subject to 20 lb/hr CO on gas and 49.6 lb/hr on ULSD.
PA-0305	Shell Chemical Appalachia - Shell Chem Appalachia/Petrochemicals Complex	Combustion turbine wih duct burner and heat recovery steam generator	Beaver	PA	04-00740A	06/18/2015	2	PPMDV @ 15% O2	1 Hr Avg Ex During Startup And Shutdown	276	LB/HR	During Startup And Shutdown	BACT-PSD		
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turnbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	2	PPMVD	@15%O2 Based On 3-Hour Rolling Average				BACT-PSD	Catalytic Oxidation; 90%	
TX-0733	Golden Spread Electric Cooperative, Inc. - Antelope Elk Energy Center	Simple Cycle Turbine & Generator	Hale	TX	109148, PSDTX1358 M1	05/12/2015	9	PPMVD @ 15% O2	3-Hr Average				BACT-PSD	Good combustion practices; limited operating hours	Operation of each turbine is limited to 4,572 hours per year
TX-0734	Navasota South Peakers Operating Company II, LLC. - Clear Springs Energy Center (CSEC)	Simple Cycle Turbine	Guadalupe	TX	120849 AND PSDTX1414	05/08/2015	9	PPMVD @ 15% O2	All Loads				BACT-PSD	DLN burners and good combustion practices	CTGs will operate at 2,500 hours of operation per year at baseload.
TX-0694	Indeck Wharton, L.L.C. - Indeck Wharton Energy Center	(3) combustion turbines	Wharton	TX	111724 PSDTX1374	02/02/2015	4	PPMVD	@15% O2, 3-Hr Rolling Avg - Siemens	9	PPMVD	@15% O2, 3-Hr Rolling Avg - GE 7FA	BACT-PSD	DLN combustors	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGSC1-A nominally rated 667 MMBTU/hr natural gas-fired simple cycle CTG	Eaton	MI	74-18	12/21/2018	5	LB/H	Hourly Except During Startup/Shutdown				BACT-PSD	Good combustion practices.	The thermal oxidation and NSCR were considered not technically feasible for these applications.
TX-0851	Rio Grande LNG LLC - Rio Bravo Pipeline Facility	Refrigeration Compression Turbines	Cameron	TX	140792, PSDTX1498, GHGPSDTX158	12/17/2018	2	PPMVD	15% O2				BACT-PSD	Good combustion practices	
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	1.4	PPMV	3 Hour Average				BACT-PSD	Proper Equipment Design, Proper Operation, and Good Combustion Practices.	Units are in PPMV @ 15% O2; Averaging period is 3 hour average during normal operations.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 CO - Simple-Cycle Combustion Turbine 1 (Commissioning) [SCN0005]	Washington Parish	LA	PSD-LA-829	05/23/2018							BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 CO - Simple-Cycle Combustion Turbine 2 (Commissioning) [SCN0006]	Washington Parish	LA	PSD-LA-829	05/23/2018							BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 SUSD - Simple-Cycle Combustion Turbine 1 (Startup/Shutdown/ Maintenance/Tuning/ Runback) [EQT0019]	Washington Parish	LA	PSD-LA-829	05/23/2018							BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 SUSD - Simple-Cycle Combustion Turbine 2 (Startup/Shutdown/ Maintenance/Tuning/ Runback) [EQT0020]	Washington Parish	LA	PSD-LA-829	05/23/2018							BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 NO - Simple-Cycle Combustion Turbine 1 (Normal Operations) [EQT0017]	Washington Parish	LA	PSD-LA-829	05/23/2018							BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 NO - Simple-Cycle Combustion Turbine 2 (Normal Operations) [EQT0018]	Washington Parish	LA	PSD-LA-829	05/23/2018							BACT-PSD	Good combustion practices & use of pipeline quality natural gas	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines	Jackson	TX	PSDTX1422	01/26/2018	2	PPMVD					BACT-PSD	Good combustion practices	NSPS KKKK
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines MSS	Jackson	TX	PSDTX1422	01/26/2018	0.06	TON/YR					BACT-PSD	Minimizing duration of startup/shutdown, using good air pollution control practices and safe operating practices.	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	2	PPMVD	145% O2				BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices	
IN-0261	Duke Energy Indiana, LLC Vermillion Generating Sta - Vermillion Generating Station	Simple Cycle, Natural Gas fired Combustion Turbines	Vermillion	IN	165-36956-00022	02/28/2017	17.6	LB/H	Each Turbine	1.76	TON/12 CONSEC. MONTH	Compliance Determined End Of Each Month	BACT-PSD	Good Combustion Practices	Third Limit: Only Two Turbines Will Operate During Low Load Operation
LA-0316	Cameron LNG LLC - Cameron LNG Facility	Gas turbines (9 units)	Cameron	LA	PSD-LA-766(M3)	02/17/2017	1.6	PPMVD	@15%O2				BACT-PSD	good combustion practices and fueled by natural gas	
TX-0816	Corpus Christi Liquefaction Stage III, LLC - Corpus Christi Liquefaction	Refrigeration compressor turbines	San Patricio	TX	139479, PSDTX1496, GHGPSDTX157	02/14/2017	0.68	LB/H					BACT-PSD	Good combustion practices	
CA-1238	Puente Power	Gas turbine	Ventura	CA	00013-370	10/13/2016	2	PPMVD AS METHANE	1 Hour@15%O2				OTHER CASE-BY-CASE		

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR VOC EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	VOC Limit	VOC Limit Unit	VOC Avg Time	VOC Limit 2	VOC Limit 2 Unit	VOC Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
NJ-0086	Bayonnne Energy Center LLC - Bayonnne Energy Center	Simple Cycle Stationary Turbines firing Natural gas	Hudson	NJ	12863-BOP150001	08/26/2016	2	PPMVD@15 %O2	3 H Rolling Av Based On One H Block Av	1.65	LB/H	Av Of Three One H Stack Tests Every 5 Yr	OTHER CASE-BY-CASE	Add-on VOC control is Oxidation Catalyst, and use of natural gas as fuel for pollution prevention	
TX-0794	Brazos Electric Cooperative - Hill County Generating Facility	Simple cycle turbine	Hill	TX	130051,PSDTX1450 , GHGPSDTX131	04/07/2016	5.4	LB/H					BACT-PSD	Premixing of fuel and air enhances combustion efficiency and minimizes emissions.	
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	2	PPM					BACT-PSD	good combustion practices	
LA-0307	Magnolia LNG, LLC - Magnolia LNG Facility	Gas Turbines (8 units)	Calcasieu	LA	PSD-LA-792	03/21/2016							BACT-PSD	good combustion practices and fueled by natural gas	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP150001	03/10/2016	2	PPMVD	3 H Rolling Av Based On One H Block	10.7	LB/H	Av Of Three One H Stack Tests	LAER	Oxidation Catalyst and good combustion practices; 25%	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP150001	03/10/2016	1	PPMVD@15 %O2	3 H Rolling Av Based On One H Block	4.41	LB/H	Av Of Three One H Tests	LAER	Oxidation Catalyst and good combustion practices; 25%	
PA-0306	Tenaska Pa Partners LLC - Tenaska Pa Partners/Westmoreland Gen Fac	Large Combustion turbine	Westmoreland	PA	65-00990 C/E	02/12/2016	1.4	PPMVD @ 15% O2		9.4	LB/HR		LAER	Ox Cat and good combustion practices	
NY-0103	Cricket Valley Energy Center LLC - Cricket Valley Energy Center	Turbines and duct burners	USA	NY	3-1326-00275/00009	02/03/2016	0.7	PPMVD @ 15% O2	1 H				LAER	good combustion practices and oxidation catalyst	0.7 ppm @ 15% O2 without duct burners 1.8 ppm @ 15% O2 with duct burners Applies to all operating loads, except during startup and shutdown.
TX-0764	Nacogdoches Power, LLC - Nacogdoches Power Electric Generating Plant	Natural Gas Simple Cycle Turbine (25 MW)	Nacogdoches	TX	77679, PSDTX1061M1 & O-3455	10/14/2015	2	PPMVD @ 15% O2					BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	Operation of the turbine is limited to 2,500 hours on a 12-month rolling average.
TX-0768	Shawnee Energy Center, LLC - Shawnee Energy Center	Simple cycle turbines greater than 25 megawatts (MW)	Hill	TX	PSDTX1442, 125963	10/09/2015	1.4	PPMV					BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	Operation of the turbine is limited to 2,920 hours on a 12-month rolling average.
PA-0305	Shell Chemical Appalachia - Shell Chem Appalachia/Petrochemicals Complex	Combustion turbine wih duct burner and heat recovery steam generator	Beaver	PA	04-00740A	06/18/2015	1	PPMDV @ 15% O2	1 Hr Average				LAER		
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turnbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015							N/A	burn Pipeline quality Natural Gas	
TX-0733	Golden Spread Electric Cooperative, Inc. - Antelope Elk Energy Center	Simple Cycle Turbine & Generator	Hale	TX	109148, PSDTX1358M1	05/12/2015	2	PPMVD @ 15% O2					BACT-PSD	Good combustion practices	Operation of each turbine is limited to 4,572 hours per year

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR SO2 EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	SO2 Limit	SO2 Limit Unit	SO2 Avg Time	SO2 Limit 2	SO2 Limit 2 Unit	SO2 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	4	PPMV	Annual Average				BACT-PSD	Exclusive Combustion of low sulfur fuel - Fuel sulfur content <4 ppm, proper engineering practices.	Units are in ppmv H2S; Annual Average Sulfur Content in Fuel
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	1.54	GR/100 DSCF					BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices	KKKK
IN-0261	Duke Energy Indiana, LLC Vermillion Generating Sta - Vermillion Generating Station	Simple Cycle, Natural Gas fired Combustion Turbines	Vermillion	IN	165-36956-00022	02/28/2017	0.6	LB/H	Each Turbine	0.1	TON/12 CONSEC. MONTH	Compliance Determined End Of Each Month	BACT-PSD	Good Combustion Practices	Third Limit: Only Two Turbines Will Operate During Low Load.
NJ-0086	Bayonnne Energy Center LLC - Bayonnne Energy Center	Simple Cycle Stationary Turbines firing Natural gas	Hudson	NJ	12863-BOP150001	08/26/2016	0.77	LB/H	Av Of Three One H Stack Tests Every 5 Yr				OTHER CASE-BY-CASE	Use of natural gas a low sulfur fuel	
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	1	GR/100 SCF	Hourly	0.25	GR/100 SCF	Annual Average	BACT-PSD	good combustion practices, low sulfur fuel	NSPS KKKK and TTTT
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP150001	03/10/2016	10.3	LB/H	Av Of Three One H Stack Tests				OTHER CASE-BY-CASE	use of natural gas a low sulfur fuel	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP150001	03/10/2016	8.5	LB/H	Av Of Three One H Stack Tests				OTHER CASE-BY-CASE	Use of natural gas which is low sulfur fuel	
FL-0355	Florida Power & Light (FPL) - Fort Myers Plant	Combustion Turbines	Lee	FL	0710002-022-AC	09/10/2015	2	GR S / 100 SCF GAS	For Natural Gas	0.0015	% S IN ULSD	For ULSD	BACT-PSD	Use of clean fuels	Clean fuels prevent SO2 emission. No SO2 testing required. Compliance via recordkeeping of sulfur content in fuels (similar to Subpart KKKK).
FL-0354	Florida Power & Light - Lauderdale Plant	Five 200-MW combustion turbines	Broward	FL	0110037-013-AC	08/25/2015	2	GR. S / 100 SCF	Fuel Record Keeping	0.0015	% S IN ULSD	Fuel Record Keeping	BACT-PSD	Limitation on S in fuel	Limitation on sulfur in fuel, compliance by recordkeeping. No testing required. Also subject to NSPS Subpart KKKK.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR SO2 EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	SO2 Limit	SO2 Limit Unit	SO2 Avg Time	SO2 Limit 2	SO2 Limit 2 Unit	SO2 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turnbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	0.0027	LB/MMBTU	Three(3) Hour Rolling Average				BACT-PSD	The use of pipeline quality natural gas with a sulfur content of less than or equal to 1.0 grain/100 dscf	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGSC1-A nominally rated 667 MMBTU/hr natural gas-fired simple cycle CTG	Eaton	MI	74-18	12/21/2018	Particulate matter, total 2.5 µ (TPM2.5)	4.5	LB/H	Hourly				BACT-PSD	Pipeline quality natural gas, inlet air conditioning and good combustion practices.	Add-on control technology was not technically feasible; however, options were evaluated and it was determined they were not economically feasible.
*MI-0441	Lansing Board Of Water And Light - LBWL--Erickson Station	EUCTGSC1-A nominally rated 667 MMBTU/hr natural gas-fired simple cycle CTG	Eaton	MI	74-18	12/21/2018	Particulate matter, total 10 µ (TPM10)	4.5	LB/H	Hourly				BACT-PSD	Pipeline quality natural gas, inlet air conditioning and good combustion practices.	Add-on control technology was not technically feasible; however, options were evaluated and it was determined they were not economically feasible.
TX-0851	Rio Grande LNG LLC - Rio Bravo Pipeline Facility	Refrigeration Compression Turbines	Cameron	TX	140792, PSDTX1498, GHGPSDTX158	12/17/2018	Particulate matter, filterable 10 µ (FPM10)	7	LB/HR					BACT-PSD	Good combustion practices and use of pipeline quality natural gas.	
TX-0851	Rio Grande LNG LLC - Rio Bravo Pipeline Facility	Refrigeration Compression Turbines	Cameron	TX	140792, PSDTX1498, GHGPSDTX158	12/17/2018	Particulate matter, filterable 2.5 µ (FPM2.5)	7	LB/HR					BACT-PSD	Good combustion practices and use of pipeline quality natural gas.	
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	Particulate matter, total 10 µ (TPM10)	8	LB/H	3 Hour Average				BACT-PSD	Exclusive Combustion of Fuel Gas and Good Combustion Practices, Including Proper Burner Design.	Averaging time 3-hour Average during normal operations. Subject to 40 CFR 60 Subpart KKKK
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	Particulate matter, total 2.5 µ (TPM2.5)	8	LB/H	3 Hour Average				BACT-PSD	Exclusive Combustion of Fuel Gas and Good Combustion Practices, Including Proper Burner Design.	Averaging time is 3-hour average during normal operations. Subject to 40 CFR 60 Subpart KKKK
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 CO - Simple-Cycle Combustion Turbine 1 (Commissioning) [SCN0005]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 10 µ (TPM10)	6.3	LB/HR	Hourly Maximum	1.1	TONS/YR	Annual Average	BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 CO - Simple-Cycle Combustion Turbine 1 (Commissioning) [SCN0005]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.3	LB/HR	Hourly Maximum	1.1	TONS/YR	Annual Average	BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 CO - Simple-Cycle Combustion Turbine 2 (Commissioning) [SCN0006]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 10 µ (TPM10)	6.3	LB/HR	Hourly Maximum	1.1	TONS/YR	Annual Average	BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 CO - Simple-Cycle Combustion Turbine 2 (Commissioning) [SCN0006]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.3	LB/HR	Hourly Maximum	1.1	TONS/YR	Annual Average	BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 SUSD - Simple-Cycle Combustion Turbine 1 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0019]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 SUSD - Simple-Cycle Combustion Turbine 1 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0019]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 10 µ (TPM10)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 SUSD - Simple-Cycle Combustion Turbine 2 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0020]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 SUSD - Simple-Cycle Combustion Turbine 2 (Startup/Shutdown/ Maintenance/Tuning/Runback) [EQT0020]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 10 µ (TPM10)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 NO - Simple-Cycle Combustion Turbine 1 (Normal Operations) [EQT0017]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 10 µ (TPM10)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 NO - Simple-Cycle Combustion Turbine 1 (Normal Operations) [EQT0017]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices & use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 NO - Simple-Cycle Combustion Turbine 2 (Normal Operations) [EQT0018]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 10 µ (TPM10)	6.3	LB/HR	Hourly Maximum				BACT-PSD	Good combustion practices and the use of low sulfur fuels (pipeline quality natural gas)	
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 NO - Simple-Cycle Combustion Turbine 2 (Normal Operations) [EQT0018]	Washington Parish	LA	PSD-LA-829	05/23/2018	Particulate matter, total 2.5 µ (TPM2.5)	6.3	LB/HR	Houly Maximum				BACT-PSD	Good combustion practices & use of low sulfur fuels (pipeline quality natural gas)	
CA-1251	Palmdale Energy, LLC - Palmdale Energy Project	Combustion Turbines (GEN1 and GEN2)	Los Angeles	CA	SE 17-01	04/25/2018	Particulate matter, total 10 µ (TPM10)	0.0048	LB/MMBTU	Test Average	11.8	LB/H	Test Average	BACT-PSD	Clean fuel and good combustion practices	The sulfur content of the gas shall not exceed 0.20 grains per 100 dry standard cubic feet (dscf), based on a 12-month rolling average, and shall not exceed 1.0 grains per 100 dscf at any time.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
CA-1251	Palmdale Energy, LLC - Palmdale Energy Project	Combustion Turbines (GEN1 and GEN2)	Los Angeles	CA	SE 17-01	04/25/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.0048	LB/MMBTU	Test Average	11.8	LB/H	Test Average	BACT-PSD	Clean fuel and good combustion practices	The sulfur content of the gas shall not exceed 0.20 grains per 100 dry standard cubic feet (dscf), based on a 12-month rolling average, and shall not exceed 1.0 grains per 100 dscf at any time.
WV-0028	Pleasants Energy LLC - Waverly Power Plant	GE 7FA.004 Turbine	Pleasants	WV	R14-0034A	03/13/2018	Particulate matter, total 2.5 µ (TPM2.5)	15.09	LB/HR		41.65	TONS/YEAR		BACT-PSD	Inlet air filtration.	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines	Jackson	TX	PSDTX1422	01/26/2018	Particulate matter, total 10 µ (TPM10)	11.81	TON/YR					BACT-PSD	Use of pipeline quality natural gas and good combustion practices.	NSPS KKKK
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines	Jackson	TX	PSDTX1422	01/26/2018	Particulate matter, total 2.5 µ (TPM2.5)	11.81	TON/YR					BACT-PSD	Use of pipeline quality natural gas and good combustion practices.	NSPS KKKK
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines MSS	Jackson	TX	PSDTX1422	01/26/2018	Particulate matter, total 10 µ (TPM10)	0.01	TON/YR					BACT-PSD	Minimizing duration of startup/shutdown, using good air pollution control practices and safe operating practices.	
TX-0833	Southern Power - Jackson County Generators	Combustion Turbines MSS	Jackson	TX	PSDTX1422	01/26/2018	Particulate matter, total 2.5 µ (TPM2.5)	0.01	TON/YR					BACT-PSD	Minimizing duration of startup/shutdown, using good air pollution control practices and safe operating practices.	
TX-0826	Golden Spread Electric Cooperative, Inc. - Mustang Station	Simple Cycle Turbine	Yoakum	TX	72579, PSDTX1080M1, GHGPSDTX13	08/16/2017	Particulate matter, total 10 µ (TPM10)	27	T/YR					BACT-PSD	Pipeline quality natural gas and good combustion practices	NSPS KKKK MACT YYYY
TX-0826	Golden Spread Electric Cooperative, Inc. - Mustang Station	Simple Cycle Turbine	Yoakum	TX	72579, PSDTX1080M1, GHGPSDTX13	08/16/2017	Particulate matter, total 2.5 µ (TPM2.5)	27	T/YR					BACT-PSD	Pipeline quality natural gas and good combustion practices	NSPS KKKK MACT YYYY
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Particulate matter, total 10 µ (TPM10)	8.5	T/YR					BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices	
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	Particulate matter, total 2.5 µ (TPM2.5)	8.5	T/YR					BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices	
IN-0261	Duke Energy Indiana, LLC Vermillion Generating Sta - Vermillion Generating Station	Simple Cycle, Natural Gas fired Combustion Turbines	Vermillion	IN	165-36956-00022	02/28/2017	Particulate matter, total 10 µ (TPM10)	5	LB/H	Each Turbine	0.5	TON/12 CONSEC. MONTH	Compliance Determined End Of Each Month	BACT-PSD	Good Combustion Practices	Third Limit: Only Two Turbines Will Operate During Low Load Operation.
IN-0261	Duke Energy Indiana, LLC Vermillion Generating Sta - Vermillion Generating Station	Simple Cycle, Natural Gas fired Combustion Turbines	Vermillion	IN	165-36956-00022	02/28/2017	Particulate matter, total 2.5 µ (TPM2.5)	5	LB/H	Each Turbine	0.5	TON/12 CONSEC. MONTH	Compliance Determined End Of Each Month	BACT-PSD	Good Combustion Practices	Third Limit: Only Two Turbines Will Operate During Low Load Operation
LA-0316	Cameron LNG LLC - Cameron LNG Facility	Gas turbines (9 units)	Cameron	LA	PSD-LA-766(M3)	02/17/2017	Particulate matter, total 10 µ (TPM10)	0.0076	LB/MM BTU	Three One-Hour Test Average				BACT-PSD	good combustion practices and fueled by natural gas	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
LA-0316	Cameron LNG LLC - Cameron LNG Facility	Gas turbines (9 units)	Cameron	LA	PSD-LA-766(M3)	02/17/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0076	LB/MM BTU	Three One-Hour Test Average				BACT-PSD	good combustion practices and fueled by natural gas	
TX-0816	Corpus Christi Liquefaction Stage III, LLC - Corpus Christi Liquefaction	Refrigeration compressor turbines	San Patricio	TX	139479, PSDTX1496, GHGPSDTX157	02/14/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.75	LB/H					BACT-PSD		
WV-0026	Pleasants Energy, LLC - Waverly Facility	GE Model 7FA Turbine	Pleasants	WV	R14-0034	01/23/2017	Particulate matter, total 2.5 µ (TPM2.5)	15	LB/HR	Natural Gas	39	LB/HR	Fuel Oil	BACT-PSD	Inlet Air Filtration, Use of Natural Gas, Ultra-Low Sulfur Diesel	All PM emissions assumed to be PM2.5 or less. PM and PM10 emission limits are the same as above. Additional emission limits are in the permit for use of turbocharging and startup/shutdown emissions. Please contact if need additional information.
IN-0264	AES Ohio Generation, LLC - Montpelier Generating Station	Pratt & Twin-Pac Simple Cycle Turbines	Wells	IN	179-37209-00026	01/06/2017	Particulate matter, filterable 10 µ (FPM10)	0.0066	LB/MMBTU	3-Hr Avg For Natural Gas	0.012	LB/MMBTU	3-Hr Avg For Fuel Oil	BACT-PSD	Use Natural Gas As Primary Fuel; Good Combustion Practices	Each Of 8 Turbines Limited To 500 Hours Of Fuel Oil Combustion Per 12 Month Period
IN-0264	AES Ohio Generation, LLC - Montpelier Generating Station	Pratt & Twin-Pac Simple Cycle Turbines	Wells	IN	179-37209-00026	01/06/2017	Particulate matter, total 2.5 µ (TPM2.5)	0.0066	LB/MMBTU	3-Hr Avg For Natural Gas	0.012	LB/MMBTU	3-Hr Avg For Fuel Oil	BACT-PSD	Natural Gas Primary Fuel; Good Combustion Practices	Each Of 8 Turbines Limited To 500 Hours Fuel Oil Usage Per 12 Month Period
VA-0326	Doswell Limited Partnership Doswell Energy Center - Doswell Energy Center	Two (2) GE 7FA simple cycle combustion turbines	Hanaover	VA	51018	10/04/2016	Particulate matter, filterable 10 µ (FPM10)	12	LB	H/12 Mo Rolling Total	15	T	Y/12 Mo Rolling Total	BACT-PSD	Good combustion, operation and maintenance practices and use of pipeline quality natural gas	
VA-0326	Doswell Limited Partnership Doswell Energy Center - Doswell Energy Center	Two (2) GE 7FA simple cycle combustion turbines	Hanover	VA	51018	10/04/2016	Particulate matter, total 2.5 µ (TPM2.5)	12	LB	H/12 Mo Rolling Total	15	T	Yr/12 Mo Rolling Total	BACT-PSD	Good combustion, operation and maintenance practices and use of pipeline quality natural gas	6.12 x 10-2 lb/MMBtu (1-hour average) (Filterable only) at all times
IL-0121	Invenergy - Invenergy Nelson Expansion LLC	Two Simple Cycle Combustion Turbines	Lee	IL	15060042	09/27/2016	Particulate matter, total 10 µ (TPM10)	0.005	LB/MMBTU	3-Hour Block Average	0.02	LB/MMBTU	3-Hour Block Average	BACT-PSD	turbine design and good combustion practices	Emission 1 (natural gas): 0.0050 lb/mmbtu* Emission 2 (ULSD): 0.020 lb/mmbtu* *During an hour that includes a startup, the particulate emissions of the turbine shall not exceed 10.0 lb/hr (natural gas) and 42.7 lb/hr (ULSD).
IL-0121	Invenergy - Invenergy Nelson Expansion LLC	Two Simple Cycle Combustion Turbines	Lee	IL	15060042	09/27/2016	Particulate matter, total 2.5 µ (TPM2.5)	0.005	LB/MMBTU	3-Hour Block Average	0.02	LB/MMBTU	3-Hour Block Average	BACT-PSD	turbine design and good combustion practices	Emission 1 (natural gas): 0.0050 lb/mmbtu* Emission 2 (ULSD): 0.020 lb/mmbtu* *During an hour that includes a startup, the particulate emissions of the turbine shall not exceed 10.0 lb/hr (natural gas) and 42.7 lb/hr (ULSD).
NY-0106	Greenidge Generation LLC - Greenidge Station	Turbine - natural gas	Yates	NY	8-5736-00004/00017	09/07/2016	Particulate matter, filterable 2.5 µ (FPM2.5)	8.25	E-3 LB/MMBTU	1 H				BACT-PSD	Baghouse with leak detection system.	
NY-0106	Greenidge Generation LLC - Greenidge Station	Turbine - natural gas	Yates	NY	8-5736-00004/00017	09/07/2016	Particulate matter, filterable 10 µ (FPM10)	8.25	E-3 LB/MMBTU	1 H				BACT-PSD	Baghouse with leak detection system.	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
NJ-0086	Bayonnne Energy Center LLC - Bayonnne Energy Center	Simple Cycle Stationary Turbines firing Natural gas	Hudson	NJ	12863-BOP150001	08/26/2016	Particulate matter, total 10 µ (TPM10)	5	LB/H	Av Of Three One H Stack Tests Every 5 Yr				OTHER CASE-BY-CASE	Use of Natural gas a clean burning fuel	
NJ-0086	Bayonnne Energy Center LLC - Bayonnne Energy Center	Simple Cycle Stationary Turbines firing Natural gas	Hudson	NJ	12863-BOP150001	08/26/2016	Particulate matter, total 2.5 µ (TPM2.5)	5	LB/H	Av Of Three One H Stack Tests Every 5 Yr				OTHER CASE-BY-CASE	Use of natural gas a clean burning fuel	
TX-0794	Brazos Electric Cooperative - Hill County Generating Facility	Simple cycle turbine	Hill	TX	130051,PSDTX1450, GHGPSDTX131	04/07/2016	Particulate matter, total 10 µ (TPM10)	14	LB/H					BACT-PSD	Premixing of fuel and air enhances combustion efficiency and minimizes emissions.	
TX-0794	Brazos Electric Cooperative - Hill County Generating Facility	Simple cycle turbine	Hill	TX	130051,PSDTX1450, GHGPSDTX131	04/07/2016	Particulate matter, total 2.5 µ (TPM2.5)	14	LB/H					BACT-PSD	Premixing of fuel and air enhances combustion efficiency and minimizes emissions.	
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Particulate matter, total 10 µ (TPM10)	13.4	LB/H					BACT-PSD	good combustion practices, low sulfur fuel	NSPS KKKK and TTTT
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	Particulate matter, total 2.5 µ (TPM2.5)	13.4	LB/H					BACT-PSD	good combustion practices, low sulfur fuel	NSPS KKKK and TTTT
LA-0307	Magnolia LNG, LLC - Magnolia LNG Facility	Gas Turbines (8 units)	Calcasieu	LA	PSD-LA-792	03/21/2016	Particulate matter, total 10 µ (TPM10)							BACT-PSD	good combustion practices and fueled by natural gas	
LA-0307	Magnolia LNG, LLC - Magnolia LNG Facility	Gas Turbines (8 units)	Calcasieu	LA	PSD-LA-792	03/21/2016	Particulate matter, filterable 2.5 µ (FPM2.5)							BACT-PSD	good combustion practices and fueled by natural gas	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP150001	03/10/2016	Particulate matter, total 10 µ (TPM10)	22.6	LB/H	Av Of Three One H Stack Tests				BACT-PSD	Use of natural gas a clean burning fuel	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP150001	03/10/2016	Particulate matter, total 2.5 µ (TPM2.5)	22.6	LB/H	Av Of Three One H Stack Tests				BACT-PSD	Use of natural gas a clean burning fuel	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP150001	03/10/2016	Particulate matter, total 10 µ (TPM10)	14.4	LB/H	Av Of Three One H Stack Tests				BACT-PSD	Use of natural gas a clean burning fuel	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP150001	03/10/2016	Particulate matter, total 2.5 µ (TPM2.5)	14.4	LB/H	Av Of Three One H Stack Tests				BACT-PSD	Use of natural gas a clean burning fuel	
TX-0777	Navasota South Peakers Operating Company I, LLC. - Union Valley Energy Center	Simple Cycle Turbine	Nixon	TX	120973 AND PSDTX1420	12/09/2015	Particulate matter, total 10 µ (TPM10)	8.6	LB/H					BACT-PSD	pipeline quality natural gas, good combustion practices	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0777	Navasota South Peakers Operating Company I, LLC. - Union Valley Energy Center	Simple Cycle Turbine	Nixon	TX	120973 AND PSDTX1420	12/09/2015	Particulate matter, total 2.5 µ (TPM2.5)	8.6	LB/H					BACT-PSD	pipeline quality natural gas, good combustion practices	
TX-0769	Navasota North Country Peakers Operating Company I - Van Alstyne Energy Center (VAEC)	Simple Cycle Turbine	Grayson	TX	121051 AND PSDTX1418	10/27/2015	Particulate matter, total 10 µ (TPM10)	8.6	LB/H					BACT-PSD	Pipeline Quality Natural Gas	
TX-0769	Navasota North Country Peakers Operating Company I - Van Alstyne Energy Center (VAEC)	Simple Cycle Turbine	Grayson	TX	121051 AND PSDTX1418	10/27/2015	Particulate matter, total 2.5 µ (TPM2.5)	8.6	LB/H					BACT-PSD	Pipeline Quality Natural Gas	
TX-0764	Nacogdoches Power, LLC - Nacogdoches Power Electric Generating Plant	Natural Gas Simple Cycle Turbine (25 MW)	Nacogdoches	TX	77679, PSDTX1061M1 & O-3455	10/14/2015	Particulate matter, total 10 µ (TPM10)	12.09	LB/HR		12.94	TPY		BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	Operation of the turbine is limited to 2,500 hours on a 12-month rolling average.
TX-0764	Nacogdoches Power, LLC - Nacogdoches Power Electric Generating Plant	Natural Gas Simple Cycle Turbine (25 MW)	Nacogdoches	TX	77679, PSDTX1061M1 & O-3455	10/14/2015	Particulate matter, total 2.5 µ (TPM2.5)	12.09	LB/HR		12.94	TPY		BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	Operation of the turbine is limited to 2,500 hours on a 12-month rolling average.
TX-0768	Shawnee Energy Center, LLC - Shawnee Energy Center	Simple cycle turbines greater than 25 megawatts (MW)	Hill	TX	PSDTX1442, 125963	10/09/2015	Particulate matter, total 10 µ (TPM10)	84.1	LB/HR		152.96	TPY		BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	
TX-0768	Shawnee Energy Center, LLC - Shawnee Energy Center	Simple cycle turbines greater than 25 megawatts (MW)	Hill	TX	PSDTX1442, 125963	10/09/2015	Particulate matter, total 2.5 µ (TPM2.5)	84.1	LB/HR		152.96	TPY		BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	
FL-0355	Florida Power & Light (FPL) - Fort Myers Plant	Combustion Turbines	Lee	FL	0710002-022-AC	09/10/2015	Particulate matter, total 10 µ (TPM10)	2	GR S / 100 SCF GAS	For Natural Gas	0.0015	% S IN ULSD	For ULSD	BACT-PSD	Use of clean fuels	Clean fuels prevent PM formation. No PM testing required. Annual test for visible emissions.
FL-0355	Florida Power & Light (FPL) - Fort Myers Plant	Combustion Turbines	Lee	FL	0710002-022-AC	09/10/2015	Particulate matter, total 2.5 µ (TPM2.5)	2	GR S / 100 SCF GAS	For Natural Gas	0.0015	% S IN ULSD	For ULSD	BACT-PSD	Use of clean fuels	Clean fuels prevent PM formation. No PM testing required. Annual test for visible emissions.
FL-0354	Florida Power & Light - Lauderdale Plant	Five 200-MW combustion turbines	Broward	FL	0110037-013-AC	08/25/2015	Particulate matter, total 10 µ (TPM10)	2	GR. S / 100 SCF	Fuel Record Keeping	0.0015	% S IN ULSD	Fuel Record Keeping	BACT-PSD	Clean fuel prevents PM formation	Use of clean fuels prevents formation of particulate matter. Also, 10% VE limit with annual VE test is a proxy for PM.
FL-0354	Florida Power & Light - Lauderdale Plant	Five 200-MW combustion turbines	Broward	FL	0110037-013-AC	08/25/2015	Particulate matter, total 2.5 µ (TPM2.5)	2	GR. S / 100 SCF	Fuel Record Keeping	0.0015	% S IN ULSD	Fuel Record Keeping	BACT-PSD	Clean fuel prevents PM formation	Use of clean fuels prevents formation of particulate matter. Also, 10% VE limit with annual VE test is a proxy for PM.

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR PM EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	Pollutant	PM10/PM2.5 Limit	PM10/PM2.5 Limit Unit	PM10/PM2.5 Avg Time	PM10/PM2.5 Limit 2	PM10/PM2.5 Limit 2 Unit	PM10/PM2.5 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
PA-0305	Shell Chemical Appalachia - Shell Chem Appalachia/Petrochemicals Complex	Combustion turbine wih duct burner and heat recovery steam generator	Beaver	PA	04-00740A	06/18/2015	Particulate matter, total 10 µ (TPM10)	0.0066	LB/MMBTU					BACT-PSD		
PA-0305	Shell Chemical Appalachia - Shell Chem Appalachia/Petrochemicals Complex	Combustion turbine wih duct burner and heat recovery steam generator	Beaver	PA	04-00740A	06/18/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0066	LB/MMBTU					LAER		
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	Particulate matter, total 10 µ (TPM10)	0.0088	LB.MMBTU	Three(3) Hour Rolling Average				BACT-PSD	Combust only pipeline quality natural gas	
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	Particulate matter, total 2.5 µ (TPM2.5)	0.0088	LB/MMBTU	Three Hour Rolling Average				BACT-PSD	Combust pipeline quality natural gas only	
TX-0733	Golden Spread Electric Cooperative, Inc. - Antelope Elk Energy Center	Simple Cycle Turbine & Generator	Hale	TX	109148, PSDTX1358M1	05/12/2015	Particulate matter, total 2.5 µ (TPM2.5)							BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	Operation of each turbine is limited to 4,572 hours per year
TX-0733	Golden Spread Electric Cooperative, Inc. - Antelope Elk Energy Center	Simple Cycle Turbine & Generator	Hale	TX	109148, PSDTX1358M1	05/12/2015	Particulate matter, total 10 µ (TPM10)							BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices.	Operation of each turbine is limited to 4,572 hours per year
TX-0694	Indeck Wharton, L.L.C. - Indeck Wharton Energy Center	(3) combustion turbines	Wharton	TX	111724 PSDTX1374	02/02/2015	Particulate matter, total 2.5 µ (TPM2.5)							BACT-PSD		natural gas fuel, includes PM and PM10

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR H2SO4 EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	H2SO4 Limit	H2SO4 Limit Unit	H2SO4 Avg Time	H2SO4 Limit 2	H2SO4 Limit 2 Unit	H2SO4 Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX 111	03/24/2016	1	GR/100 SCF	Hourly	0.25	GR/100 SCF	Annual Average	BACT-PSD	good combustion practices, low sulfur fuel	NSPS KKKK and TTTT
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine with Duct Burner firing natural gas	Middlesex	NJ	18068/BOP1 50001	03/10/2016	6.6	LB/H	Av Of Three One H Stack Tests				BACT-PSD	Use of natural gas a low sulfur fuel	
NJ-0084	PSEG Fossil LLC - PSEG Fossil LLC Sewaren Generating Station	Combined Cycle Combustion Turbine without Duct Burner Firing Natural Gas	Middlesex	NJ	18068/BOP1 50001	03/10/2016	5.5	LB/H	Av Of Three One H Stack Tests				BACT-PSD	Use of natural gas which is low sulfur fuel	
NY-0103	Cricket Valley Energy Center LLC - Cricket Valley Energy Center	Turbines and duct burners	USA	NY	3-1326-00275/00009	02/03/2016	6.5	10-4 LB/MMBTU	1 H				BACT-PSD	low sulfur fuel	EPA approved method
FL-0354	Florida Power & Light - Lauderdale Plant	Five 200-MW combustion turbines	Broward	FL	0110037-013-AC	08/25/2015	2	GR. S / 100 SCF	Fuel Record Keeping	0.0015	% S IN ULSD	Fuel Record Keeping	BACT-PSD	Limitation on S in fuel	Limitation on sulfur in fuel, compliance by recordkeeping. No testing required.
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turnbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	0.0004	LB/MMBTU	Three(3) Hour Rolling Average				BACT-PSD	The use of pipeline quality natural gas with a sulfur content of less than or equal to 1.0 grain/100 dscf	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0851	Rio Grande LNG LLC - Rio Bravo Pipeline Facility	Refrigeration Compression Turbines	Cameron	TX	140792, PSDTX1498, GHGPSDTX158	12/17/2018							BACT-PSD	Good combustion practices and use of pipeline quality natural gas.	
LA-0331	Venture Global Calcasieu Pass, LLC - Calcasieu Pass LNG Project	Simple Cycle Combustion Turbines (SCCT1 to SCCT3)	Cameron	LA	PDS-LA-805	09/21/2018	1426146	T/YR	Annual Total				BACT-PSD	Exclusively combust low carbon fuel gas, good combustion practices, good operation and maintenance practices, and insulation	Annual Total for 3 simple cycle turbines. Subject to 40 CFR 60 Subpart KKKK.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 SUSD - Simple-Cycle Combustion Turbine 1 (Startup/Shutdown/ Maintenance/ Tuning/Runback) [EQT0019]	Washington Parish	LA	PSD-LA-829	05/23/2018	120	LB/MM BTU	Annual Average	50	KG/GJ	Annual Average	BACT-PSD	Facility-wide energy efficiency measures , such as improved combustion measures, and use of pipeline quality natural gas.	Monitor compliance by maintaining fuel purchase records for permitted fuels in accordance with 40 CFR 60.5525 Subpart TTTT.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 SUSD - Simple-Cycle Combustion Turbine 2 (Startup/Shutdown/ Maintenance/ Tuning/Runback) [EQT0020]	Washington Parish	LA	PSD-LA-829	05/23/2018	120	LB/MM BTU	Annual Average	50	KG/GJ	Annual Average	BACT-PSD	Facility-wide energy efficiency measures , such as improved combustion measures, and use of pipeline quality natural gas.	Monitor compliance by maintaining fuel purchase records for permitted fuels in accordance with 40 CFR 60.5525 Subpart TTTT.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG01 NO - Simple-Cycle Combustion Turbine 1 (Normal Operations) [EQT0017]	Washington Parish	LA	PSD-LA-829	05/23/2018	50	KG/GJ	Annual Average	120	LB/MM BTU	Annual Average	BACT-PSD	Facility-wide energy efficiency measures , such as improved combustion measures, and use of pipeline quality natural gas.	Monitor compliance by maintaining fuel purchase records for permitted fuels in accordance with 40 CFR 60.5525 Subpart TTTT.
*LA-0327	Washington Parish Energy Center One, LLC - Washington Parish Energy Center	CTG02 NO - Simple-Cycle Combustion Turbine 2 (Normal Operations) [EQT0018]	Washington Parish	LA	PSD-LA-829	05/23/2018	50	KG/GJ	Annual Average	120	LB/MM BTU	Annual Average	BACT-PSD	Facility-wide energy efficiency measures , such as improved combustion measures, and use of pipeline quality natural gas.	Monitor compliance by maintaining fuel purchase records for permitted fuels in accordance with 40 CFR 60.5525 Subpart TTTT.
WV-0028	Pleasants Energy LLC - Waverly Power Plant	GE 7FA.004 Turbine	Pleasants	WV	R14-0034A	03/13/2018							BACT-PSD	Use of natural gas & use of GE 7FA.004	
TX-0826	Golden Spread Electric Cooperative, Inc. - Mustang Station	Simple Cycle Turbine	Yoakum	TX	72579, PSDTX1080M1, GHGPSDTX13	08/16/2017	120	LB/MMBTU					BACT-PSD	Pipeline quality natural gas and good combustion practices	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0824	Southern Power - Jackson County Generating Facility	Simple Cycle Turbines	Jackson	TX	GHGPSDTX118	06/30/2017	1316	LB/MW HR					BACT-PSD	energy efficiency designs, practices, and procedures, CT inlet air cooling, periodic CT burner maintenance and tuning, reduction in heat loss, i.e., insulation of the CT, instrumentation and controls	NSPS TTTT
TX-0819	Southwestern Public Service Company - Gaines County Power Plant	Simple Cycle Turbine		TX	135322, PSDTX1470, AND GHGPSDT	04/28/2017	1300	LB/MW H					BACT-PSD	Pipeline quality natural gas; limited hours; good combustion practices	NSPS TTTT
LA-0316	Cameron LNG LLC - Cameron LNG Facility	Gas turbines (9 units)	Cameron	LA	PSD-LA-766(M3)	02/17/2017							BACT-PSD	good combustion practices and fueled by natural gas; Use high thermal efficiency turbines	
TX-0816	Corpus Christi Liquefaction Stage III, LLC - Corpus Christi Liquefaction	Refrigeration compressor turbines	San Patricio	TX	139479, PSDTX1496, GHGPSDTX157	02/14/2017	1793574	T/YR					BACT-PSD		This limit is a cap for all eight turbines.
VA-0326	Doswell Limited Partnership Doswell Energy Center - Doswell Energy Center	Two (2) GE 7FA simple cycle combustion turbines	Hanover	VA	51018	10/04/2016							BACT-PSD	Good combustion, maintenance and use of active combustion dynamic monitoring systems.	

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
IL-0121	Invenergy - Invenergy Nelson Expansion LLC	Two Simple Cycle Combustion Turbines	Lee	IL	15060042	09/27/2016							BACT-PSD	Turbine-generator design and proper operation	The GHG emissions of each affected turbine, as carbon dioxide equivalents (CO2e), as an annual average of 12 consecutive operating months, rolled monthly, shall not exceed a limit that is calculated as follows. Compliance with this limit shall be determined using the relevant procedures for quantification of GHG emissions in 40 CFR Part 98 Subpart D. E = {(Gng x Rng) + (Gulsd x Rulsd} Ã· (Gng + Gulsd) Where E = Limit on GHG emissions, as CO2e, pounds/MW-hr gross electrical output, annual average, rolled monthly. Gng = Gross electrical output of the affected turbine-generator from natural gas, in MW-hr, including output in hours when ultra-low-sulfur diesel provides less than 50 percent of the heat input of the turbine. Gulsd = Gross electrical output, of the affected turbine generator from ultra-low-sulfur diesel, in MW-hr, including output in hours when ultra-low-sulfur diesel provides 50 percent or more of the heat input of the turbine. Rng = 1367 lb/MW-hr gross output (allowable rate for natural gas). Rulsd = 1934 lb/MW-hr gross output
TX-0794	Brazos Electric Cooperative - Hill County Generating Facility	Simple cycle turbine	Hill	TX	130051,PSDTX1450, GHGPSDTX131	04/07/2016	1434	LB/MWH					BACT-PSD		NSPS TTTT
TX-0788	Apex Texas Power LLC - Neches Station	Large Combustion Turbines 25 MW	Cherokee	TX	122401, PSDTX1428, GHGPSDTX111	03/24/2016	1341	LB/MW H					BACT-PSD	good combustion practiceS	NSPS KKKK and TTTT
LA-0307	Magnolia LNG, LLC - Magnolia LNG Facility	Gas Turbines (8 units)	Calcasieu	LA	PSD-LA-792	03/21/2016							BACT-PSD	good combustion/operating /maintenance practices and fueled by natural gas; use intake air chiller	
TX-0786	Nacogdoches Power - Nacogdoches Power Electric Generating Plant	Combined Cycle & Cogeneration	Nacogdoches	TX	GHGPSDTX116, 77679, PSDTX1061M	03/01/2016	1316	LB/MW HR					BACT-PSD	Good Combustion Practices	NSPS TTTT
NY-0103	Cricket Valley Energy Center LLC - Cricket Valley Energy Center	Turbines and duct burners	USA	NY	3-1326-00275/00009	02/03/2016							BACT-PSD	max heat rate 7,604 btu/kw-h HHV without duct firing good combustion practice and burning natural gas	EPA approved method

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0778	Navasota South Peakers Operating Company II, LLC. - Union Valley Energy Center	Simple Cycle Turbine	Nixon	TX	GHGPSDTX117	12/16/2015	1461	LB/MW H					BACT-PSD		NSPS TTTT, SIMPLE CYCLE PEAKING TURBINE
TX-0775	Navasota South Peakers Operating Company II, LLC. - Clear Springs Energy Center (CSEC)	Simple Cycle Turbine	Guadalupe	TX	GHGPSDTX120, 120849, AND PSDTX	11/13/2015	1461	LB/MW H					BACT-PSD	Low carbon fuel, good combustion, efficient combined cycle design	NSPS TTTT, CTGs will operate at 2500 hours of operation per year at baseload.
TX-0771	Shawnee Energy Center, LLC - Shawnee Energy Center	Simple cycle turbines greater than 25 megawatts (MW)	Hill	TX	GHGPSDTX126, PSDTX1442, 125963	11/10/2015	1398	LB/MWH					BACT-PSD		Operation of the turbine is limited to 2,920 hours on a 12-month rolling average.
FL-0355	Florida Power & Light (FPL) - Fort Myers Plant	Combustion Turbines	Lee	FL	0710002-022-AC	09/10/2015	1374	LB CO2E / MWH	For Natural Gas Operation	1874	LB CO2E / MWH	For ULSD Operation	BACT-PSD	Use of low-emitting fuel and efficient turbine	GHG standard is a weighted average of standards for natural gas operation and fuel oil operation. Turbines grouped together for first 36 months, 12-month rolling average. After 36 months, each individual turbine is subject to limit on a 36-month rolling average.
PA-0305	Shell Chemical Appalachia - Shell Chem Appalachia/Petrochemicals Complex	Combustion turbine wih duct burner and heat recovery steam generator	Beaver	PA	04-00740A	06/18/2015	1030	CO2E/MWH	30 Day Rolling Avg*	340558	TONS	Any Consecutive 12 Month Period	BACT-PSD		
KY-0104	Cash Creek Generation, L.L.C - Cash Creek Generating Station	Combined cycle combustion turnbine with HRSG and duct firing	Henderson	KY	V-14-011	06/10/2015	884	LB/MWH	12 Month Rolling Average				BACT-PSD	Combust only pipeline quality natural gas	
TX-0735	Golden Spread Electric Cooperative, Inc. - Antelope Elk Energy Center	Simple Cycle Turbine & Generator	Hale	TX	GHGPSDTX41M1	05/20/2015	1304	LB CO2/MWHR					BACT-PSD	Energy efficiency, good design & combustion practices	Operation of each turbine is limited to 4,572 hours per year

RACT/BACT/LAER CLEARINGHOUSE SUMMARY FOR CO2e EMISSIONS FROM SIMPLE CYCLE COMBUSTION TURBINES

RBLCID	Company-Facility	Turbine Make/Model	County/ Parish	State	Permit No.	Permit Date	CO2e Limit	CO2e Limit Unit	CO2e Avg Time	CO2e Limit 2	CO2e Limit 2 Unit	CO2e Avg Time 2	Basis	Controls & Control Eff.	Other Limit & Misc. Info (Compliance Notes)
TX-0679	Corpus Christi Liquefaction LLC - Corpus Christi Liquefaction Plant	Refrigeration Compressor Turbines	Gregory	TX	GHGPSDTX123	02/27/2015	146754	TPY	Rolling 12-Month Basis				BACT-PSD	install efficient turbines, follow the turbine manufacturer's emission-related written instructions for maintenance activities including prescribed maintenance intervals to assure good combustion and efficient operation. Compressors shall be inspected and maintained according to a written maintenance plan to maintain efficiency.	The limit is for each turbine.

APPENDIX F TCEQ NSR WORKBOOK

I. Applicant Information

I acknowledge that I am submitting an authorized TCEQ application workbook and any necessary attachments. Except for inputting the requested data and adjusting row height and column width, I have not changed the TCEQ application workbook in any way, including but not limited to changing formulas, formatting, content, or protections.	I agree

A. Company Information

Company or Legal Name:	NRG Cedar Bayou 5, LLC

Permits are issued to either the facility owner or operator, commonly referred to as the applicant or permit holder. List the legal name of the company, corporation, partnership, or person who is applying for the permit. We will verify the legal name with the Texas Secretary of State at (512) 463-5555 or at:

https://www.sos.state.tx.us

Texas Secretary of State Charter/Registration Number (if given):	

B. Company Official Contact Information: must not be a consultant

Prefix (Mr., Ms., Dr., etc.):	Mr.
First Name:	Craig
Last Name:	Eckberg
Title:	Director, South Region, Regulatory & Environmental Services
Mailing Address:	910 Louisana Street
Address Line 2:	
City:	Houston
State:	Texas
ZIP Code:	77002
Telephone Number:	(713) 537-2776
Fax Number:	
Email Address:	craig.eckberg@nrg.com

C. Technical Contact Information: This person must have the authority to make binding agreements and representations on behalf of the applicant and may be a consultant. **Additional technical contact(s) can be provided in a cover letter.**

Prefix (Mr., Ms., Dr., etc.):	Ms.
First Name:	Colleen
Last Name:	Krenek
Title:	Environmental Specialist
Company or Legal Name:	NRG Cedar Bayou 5 LLC
Mailing Address:	910 Louisana Street
Address Line 2:	
City:	Houston
State:	Texas
ZIP Code:	77002
Telephone Number:	(713) 537-5742
Fax Number:	
Email Address:	colleen.krenek@nrg.com

D. Assigned Numbers

The CN and RN below are assigned when a Core Data Form is initially submitted to the Central Registry. The RN is also assigned if the agency has conducted an investigation or if the agency has issued an enforcement action. If these numbers have not yet been assigned, leave these questions blank and include a Core Data Form with your application submittal. See Section VI.B. below for additional information.

Enter the CN. The CN is a unique number given to each business, governmental body, association, individual, or other entity that owns, operates, is responsible for, or is affiliated with a regulated entity.	

Enter the RN. The RN is a unique agency assigned number given to each person, organization, place, or thing that is of environmental interest to us and where regulated activities will occur. The RN replaces existing air account numbers. The RN for portable units is assigned to the unit itself, and that same RN should be used when applying for authorization at a different location.	RN100825371

II. Delinquent Fees and Penalties

Does the applicant have unpaid delinquent fees and/or penalties owed to the TCEQ? This form will not be processed until all delinquent fees and/or penalties owed to the TCEQ or the Office of the Attorney General on behalf of the TCEQ are paid in accordance with the Delinquent Fee and Penalty Protocol. For more information regarding Delinquent Fees and Penalties, go to the TCEQ Web site at:	No

https://www.tceq.texas.gov/agency/financial/fees/delin

III. Permit Information

A. Permit and Action Type (multiple may be selected, leave no blanks)

Additional information regarding the different NSR authorizations can be found at:
https://www.tceq.texas.gov/permitting/air/guidance/authorize.html

Select from the drop-down the type of action being requested for each permit type. **If that permit type does not apply, you MUST select "Not applicable".**

Provide all assigned permit numbers relevant for the project. Leave blank if the permit number has not yet been assigned.

Permit Type	Action Type Requested (do not leave blank)	Permit Number (if assigned)
Minor NSR (can be a Title V major source): *Not applicable, Initial, Amendment, Renewal, Renewal Certification, Renewal/Amendment, Relocation/Alteration, Change of Location, Alteration, Extension to Start of Construction*	Initial	
Special Permit: *Not applicable, Amendment, Renewal, Renewal Certification, Renewal/Amendment, Alteration, Extension to Start of Construction*	Not applicable	
De Minimis: *Not applicable, Initial*	Not applicable	
Flexible: *Not applicable, Initial, Amendment, Renewal, Renewal Certification, Renewal/Amendment, Alteration, Extension to Start of Construction*	Not applicable	
PSD: *Not applicable, Initial, Major Modification*	Major Modification	
Nonattainment: *Not applicable, Initial, Major Modification*	Not applicable	
HAP Major Source [FCAA § 112(g)]: *Not applicable, Initial, Major Modification*	Not applicable	
PAL: *Not applicable, Initial, Amendment, Renewal, Renewal/Amendment, Alteration*	Not applicable	
GHG PSD: *Not applicable, Initial, Major Modification, Voluntary Update*	Initial	

GHG projects: List the non-GHG applications (pending or being submitted) that are associated with the project. Note: All preconstruction authorizations (including authorization for emissions of greenhouse gases, if applicable) must be obtained prior to start of construction.	

B. MSS Activities

How are/will MSS activities for sources associated with this project be authorized?	This permit

C. Consolidating NSR Permits

Will this permit be consolidated into another NSR permit with this action?	No
Will NSR permits be consolidated into this permit with this action?	No

D. Incorporation of Standard Permits, Standard Exemptions, and/or Permits By Rule (PBR)

To ensure protectiveness, previously issued authorizations (standard permits, standard exemptions, or PBRs) including those for MSS, are incorporated into a permit either by consolidation or by reference. At the time of renewal and/or amendment, consolidation (in some cases) may be voluntary and referencing is mandatory. More guidance regarding incorporation can be found in 30 TAC § 116.116(d)(2), 30 TAC § 116.615(3) and in this memo:

https://www.tceq.texas.gov/assets/public/permitting/air/memos/pbr_spc06.pdf

Are there any standard permits, standard exemptions, or PBRs to be incorporated by reference?	No
Are there any PBR, standard exemptions, or standard permits associated to be incorporated by consolidation? **Note:** Emission calculations, a BACT analysis, and an impacts analysis must be attached to this application at the time of submittal for any authorization to be incorporated by consolidation.	No

E. Associated Federal Operating Permits

Is this facility located at a site required to obtain a **site operating permit (SOP)** or **general operating permit (GOP)?**	Yes
Is a **SOP** or **GOP** review pending for this source, area, or site?	No
If required to obtain a **SOP** or **GOP**, list all associated permit number(s). If no associated permit number has been assigned yet, enter "TBD":	TBD

IV. Facility Location and General Information	
A. Location	
County: Enter the county where the facility is physically located.	Chambers
TCEQ Region	Region 12
County attainment status as of Sept. 23, 2019	Serious Ozone nonattainment
Street Address:	7705 West Bay Road
City: If the address is not located in a city, then enter the city or town closest to the facility, even if it is not in the same county as the facility.	Baytown
ZIP Code: Include the ZIP Code of the physical facility site, not the ZIP Code of the applicant's mailing address.	77523
Site Location Description: If there is no street address, provide written driving directions to the site. Identify the location by distance and direction from well-known landmarks such as major highway intersections.	
Use USGS maps, county maps prepared by the Texas Department of Transportation, or an online software application such as Google Earth to find the latitude and longitude.	
Latitude (in degrees, minutes, and nearest second (DDD:MM:SS)) for the street address or the destination point of the driving directions. Latitude is the angular distance of a location north of the equator and will always be between 25 and 37 degrees north (N) in Texas.	29° 44' 54"
Longitude (in degrees, minutes, and nearest second (DDD:MM:SS)) for the street address or the destination point of the driving directions. Longitude is the angular distance of a location west of the prime meridian and will always be between 93 and 107 degrees west (W) in Texas.	-94° 55' 38"
Is this a project for a lead smelter, concrete crushing facility, and/or a hazardous waste management facility?	No
B. General Information	
Site Name:	Cedar Bayou Electric Generating Station
Area Name: Must indicate the general type of operation, process, equipment or facility. Include numerical designations, if appropriate. Examples are Sulfuric Acid Plant and No. 5 Steam Boiler. Vague names such as Chemical Plant are not acceptable.	Electric Generating Unit 5
Are there any schools located within 3,000 feet of the site boundary?	No

C. Portable Facility	
Permanent or portable facility?	Permanent

D. Industry Type	
Principal Company Product/Business:	Electric Services
A list of SIC codes can be found at: https://www.naics.com/sic-codes-industry-drilldown/	
Principal SIC code:	4911
NAICS codes and conversions between NAICS and SIC Codes are available at: https://www.census.gov/eos/www/naics/	
Principal NAICS code:	221112

E. State Senator and Representative for this site	
This information can be found at (note, the website is not compatible to Internet Explorer): https://wrm.capitol.texas.gov/	
State Senator:	Brandon Creighton
District:	4
State Representative:	Mayes Middleton
District:	23

V. Project Information

A. Description	
Provide a brief description of the project that is requested. (Limited to 500 characters).	Construction of new gas turbine electric generating unit at existing Cedar Bayou site.

B. Project Timing	
Authorization must be obtained for many projects before beginning construction. Construction is broadly interpreted as anything other than site clearance or site preparation. Enter the date as "Month Date, Year" (e.g. July 4, 1776).	
Projected Start of Construction:	December 31, 2020
Projected Start of Operation:	June 1, 2022

C. Enforcement Projects	
Is this application in response to, or related to, an agency investigation, notice of violation, or enforcement action?	No

D. Operating Schedule	
Will sources in this project be authorized to operate 8760 hours per year?	Yes

VI. Application Materials

All representations regarding construction plans and operation procedures contained in the permit application shall be conditions upon which the permit is issued. (30 TAC § 116.116)

A. Confidential Application Materials	
Is confidential information submitted with this application?	No

B. Is the Core Data Form (Form 10400) attached?	Yes
https://www.tceq.texas.gov/assets/public/permitting/centralregistry/10400.docx	
C. Is a current area map attached?	Yes
Is the area map a current map with a true north arrow, an accurate scale, the entire plant property, the location of the property relative to prominent geographical features including, but not limited to, highways, roads, streams, and significant landmarks such as buildings, residences, schools, parks, hospitals, day care centers, and churches?	Yes
Does the map show a 3,000-foot radius from the property boundary?	Yes
D. Is a plot plan attached?	Yes
Does your plot plan clearly show a north arrow, an accurate scale, all property lines, all emission points, buildings, tanks, process vessels, other process equipment, and two bench mark locations?	Yes
Does your plot plan identify all emission points on the affected property, including all emission points authorized by other air authorizations, construction permits, PBRs, special permits, and standard permits?	Yes
Did you include a table of emission points indicating the authorization type and authorization identifier, such as a permit number, registration number, or rule citation under which each emission point is currently authorized?	Yes
E. Is a process flow diagram attached?	Yes
Is the process flow diagram sufficiently descriptive so the permit reviewer can determine the raw materials to be used in the process; all major processing steps and major equipment items; individual emission points associated with each process step; the location and identification of all emission abatement devices; and the location and identification of all waste streams (including wastewater streams that may have associated air emissions)?	Yes
F. Is a process description attached?	Yes
Does the process description emphasize where the emissions are generated, why the emissions must be generated, what air pollution controls are used (including process design features that minimize emissions), and where the emissions enter the atmosphere?	Yes
Does the process description also explain how the facility or facilities will be operating when the maximum possible emissions are produced?	Yes
G. Are detailed calculations attached? Calculations must be provided for each source with new or changing emission rates. For example, a new source, changing emission factors, decreasing emissions, consolidated sources, etc. You do not need to submit calculations for sources which are not changing emission rates with this project. Please note: the preferred format is an electronic workbook (such as Excel) with all formulas viewable for review. It can be emailed with the submittal of this application workbook.	Yes
Are emission rates and associated calculations for planned MSS facilities and related activities attached?	Yes
H. Is a material balance (Table 2, Form 10155) attached?	N/A

I. Is a list of MSS activities attached?	Yes
Are the MSS activities listed and discussed separately, each complete with the authorization mechanism or emission rates, frequency, duration, and supporting information if authorized by this permit?	Yes
J. Is a discussion of state regulatory requirements attached, addressing 30 TAC Chapters 101, 111, 112, 113, 115, and 117?	Yes
For all applicable chapters, does the discussion include how the facility will comply with the requirements of the chapter?	Yes
For all not applicable chapters, does the discussion include why the chapter is not applicable?	Yes
K. Are all other required tables, calculations, and descriptions attached?	Yes

VII. Signature

The owner or operator of the facility must apply for authority to construct. The appropriate company official (owner, plant manager, president, vice president, or environmental director) must sign all copies of the application. The applicant's consultant cannot sign the application. **Important Note: Signatures must be original in ink, not reproduced by photocopy, fax, or other means, and must be received before any permit is issued.**

The signature below confirms that I have knowledge of the facts included in this application and that these facts are true and correct to the best of my knowledge and belief. I further state that to the best of my knowledge and belief, the project for which application is made will not in any way violate any provision of the Texas Water Code (TWC), Chapter 7; the Texas Health and Safety Code, Chapter 382; the Texas Clean Air Act (TCAA); the air quality rules of the Texas Commission on Environmental Quality; or any local governmental ordinance or resolution enacted pursuant to the TCAA. I further state that I understand my signature indicates that this application meets all applicable nonattainment, prevention of significant deterioration, or major source of hazardous air pollutant permitting requirements. The signature further signifies awareness that intentionally or knowingly making or causing to be made false material statements or representations in the application is a criminal offense subject to criminal penalties.

Name:	Craig Eckberg
Signature:	C.R.Eckberg
	Original signature is required.
Date:	17 March 2020

VIII. Federal Regulatory Questions	
Indicate if any of the following requirements apply to the proposed facility. Note that some federal regulations apply to minor sources. Enter all applicable Subparts.	
A. Title 40 CFR Part 60	
Do NSPS subpart(s) apply to a facility in this application?	Yes
List applicable subparts you will demonstrate compliance with (e.g. Subpart M)	Dc, IIII, KKKK, TTTT

B. Title 40 CFR Part 61	
Do NESHAP subpart(s) apply to a facility in this application?	No

C. Title 40 CFR Part 63	
Do MACT subpart(s) apply to a facility in this application?	Yes
List applicable subparts you will demonstrate compliance with (e.g. Subpart VVVV)	DDDDD, ZZZZ, YYYY

IX. Emissions Review

A. Impacts Analysis

Any change that results in an increase in off-property concentrations of air contaminants requires an air quality impacts demonstration. Information regarding the air quality impacts demonstration must be provided with the application and show compliance with all state and federal requirements. Detailed requirements for the information necessary to make the demonstration are listed on the Impacts sheet of this workbook.

Does this project require an impacts analysis?	Yes

B. Disaster Review

If the proposed facility will handle sufficient quantities of certain chemicals which, if released accidentally, would cause off-property impacts that could be immediately dangerous to life and health, a disaster review analysis may be required as part of the application. Contact the appropriate NSR permitting section for assistance at (512) 239-1250. Additional Guidance can be found at:

https://www.tceq.texas.gov/assets/public/permitting/air/Guidance/NewSourceReview/disrev-factsheet.pdf

Does this application involve any air contaminants for which a disaster review is required?	No

C. Air Pollutant Watch List

Certain areas of the state have concentrations of specific pollutants that are of concern. The TCEQ has designated these portions of the state as watch list areas. Location of a facility in a watch list area could result in additional restrictions on emissions of the affected air pollutant(s) or additional permit requirements. The location of the areas and pollutants of interest can be found at:

https://www.tceq.texas.gov/toxicology/apwl/apwl.html

Is the proposed facility located in a watch list area?	No

D. Mass Emissions Cap and Trade

Is this facility located at a site within the Houston/Galveston nonattainment area (Brazoria, Chambers, Fort Bend, Galveston, Harris, Liberty, Montgomery, and Waller Counties)?	Yes
Is Mass Emissions Cap and Trade applicable to the new or modified facilities?	Yes
If MECT is applicable, does the application contain documentation demonstrating that the proposed facility, group of facilities, or account has obtained allowances to operate?	Yes

Texas Commission on Environmental Quality
Form PI-1 General Application
Unit Types - Emission Rates

Date: March 18, 2020
Permit #: ____________
Company: NRG Cedar Bayou 5, LLC

Permit primary industry (must be selected for workbook to function)	Combustion

Action Requested (only 1 action per FIN)	Include these emissions in annual (tpy) summary?	Facility ID Number (FIN)	Emission Point Number (EPN)	Source Name	Pollutant	Current Short-Term (lb/hr)	Current Long-Term (tpy)	Consolidated Current Short-Term (lb/hr)	Consolidated Current Long-Term (tpy)	Proposed Short-Term (lb/hr)	Proposed Long-Term (tpy)	Short-Term Difference (lb/hr)	Long-Term Difference (tpy)	Unit Type (Used for reviewing BACT and Monitoring Requirements)
New/Modified	Yes	CBY51	CBY51	Combustion Turbine 1 (Combined Cycle) (Normal Operating Emissions)	NOx					32.29		32.29	0	Turbine: Combined Cycle, Natural Gas
					CO					34.4		34.4	0	
					SO2					12.65		12.65	0	
					VOC					5.63		5.63	0	
					PM					36.57		36.57	0	
					PM10					36.57		36.57	0	
					PM2.5					36.57		36.57	0	
					H2SO4					9.16		9.16	0	
					NH3					41.83		41.83	0	
New/Modified	Yes	CBY51	CBY51	Combustion Turbine 1 (Combined Cycle) (MSS Operating Emissions)	NOx					43.96		43.96	0	Turbine: Combined Cycle, Natural Gas
					CO					533.4		533.4	0	
					SO2					76.83		76.83	0	
					VOC					76.83		76.83	0	
					PM					36.57		36.57	0	
					PM10					36.57		36.57	0	
					PM2.5					36.57		36.57	0	
					H2SO4					9.16		9.16	0	
					NH3					41.83		41.83	0	
New/Modified	Yes	CBY51	CBY51	Combustion Turbine 1 (Combined Cycle) (Normal and MSS Operating Emissions)	NOx						122.86	0	122.86	Turbine: Combined Cycle, Natural Gas
					CO						150.29	0	150.29	
					SO2						23.98	0	23.98	
					VOC						24.28	0	24.28	
					PM						93.25	0	93.25	
					PM10						93.25	0	93.25	
					PM2.5						93.25	0	93.25	
					H2SO4						16.17	0	16.17	
					NH3						156.99	0	156.99	
New/Modified	Yes	C-TOWER1	C-TOWER1	Cooling Tower	PM					24.21	106.03	24.21	106.03	Cooling Tower
					PM10					0.08	0.33	0.08	0.33	
					PM2.5					0.01	0.01	0.01	0.01	
New/Modified	Yes	AUX-BLR	AUX-BLR	Auxiliary Boiler	NOx					0.89	0.89	0.89	0.89	Boiler: Liquid and Gas Fuel, > 40 MMBtu/hr
					CO					3.29	3.29	3.29	3.29	
					SO2					0.25	0.12	0.25	0.12	
					VOC					0.48	0.48	0.48	0.48	
					PM					0.66	0.66	0.66	0.66	
					PM10					0.66	0.66	0.66	0.66	
					PM2.5					0.66	0.66	0.66	0.66	
New/Modified	Yes	GAS-HTR	GAS-HTR	Gas Heater	NOx					0.12	0.51	0.12	0.51	Heater ≤ 40 MMBtu/hr
					CO					0.36	1.57	0.36	1.57	
					SO2					0.027	0.06	0.027	0.06	
					VOC					0.03	0.14	0.03	0.14	
					PM					0.05	0.21	0.05	0.21	
					PM10					0.05	0.21	0.05	0.21	
					PM2.5					0.05	0.21	0.05	0.21	
New/Modified	Yes	EMGEN	EMGEN	Emergency Diesel Generator	NOx					42.48	2.12	42.48	2.12	Engine: Emergency, Diesel
					CO					3.5	0.17	3.5	0.17	
					SO2					0.03	0.01	0.03	0.01	
					VOC					0.91	0.05	0.91	0.05	
					PM					0.26	0.01	0.26	0.01	
					PM10					0.26	0.01	0.26	0.01	
					PM2.5					0.26	0.01	0.26	0.01	
New/Modified	Yes	DSL-TNK	DSL-TNK	Emergency Diesel Generator Tank	VOC					0.02	0.01	0.02	0.01	Storage Tank (1): Fixed roof with capacity < 25 Mgal or TVP < 0.50 psia
New/Modified	Yes	FUG-SCR	FUG-SCR	Ammonia Component Fugitive	NH3					0.02	0.0993	0.02	0.0993	Fugitives: Piping and Equipment Leak
New/Modified	Yes	FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	VOC					0.0024	0.0103	0.0024	0.0103	Fugitives: Piping and Equipment Leak
New/Modified	Yes	CBY51-LOV	CBY51-LOV	Unit 1 Lube Oil Vent	VOC					0.003	0.01	0.003	0.01	Other
					PM					0.003	0.01	0.003	0.01	
					PM10					0.003	0.01	0.003	0.01	
					PM2.5					0.003	0.01	0.003	0.01	

Action Requested (only 1 action per FIN)	Include these emissions in annual (tpy) summary?	Facility ID Number (FIN)	Emission Point Number (EPN)	Source Name	Pollutant	Current Short-Term (lb/hr)	Current Long-Term (tpy)	Consolidated Current Short-Term (lb/hr)	Consolidated Current Long-Term (tpy)	Proposed Short-Term (lb/hr)	Proposed Long-Term (tpy)	Short-Term Difference (lb/hr)	Long-Term Difference (tpy)	Unit Type (Used for reviewing BACT and Monitoring Requirements)
New/Modified	Yes	CBYST1-LOV	CBYST1-LOV	Steam Turbine Lube Oil Vents	VOC					0.003	0.01	0.003	0.01	Other
					PM					0.003	0.01	0.003	0.01	
					PM10					0.003	0.01	0.003	0.01	
					PM2.5					0.003	0.01	0.003	0.01	
New/Modified	Yes	FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	NOx					0.01	0.01	0.01	0.01	MSS Activities
					CO					0.01	0.01	0.01	0.01	
					VOC					0.12	0.01	0.12	0.01	
					PM					0.05	0.01	0.05	0.01	
					PM10					0.05	0.01	0.05	0.01	
					PM2.5					0.05	0.01	0.05	0.01	
					NH3					0.01	0.01	0.01	0.01	
New/Modified	Yes	CBY51	CBY51	Combustion Turbine 1 (Combined Cycle)	CO2 Equivalent						2,047,146.48	0	2047146.48	Turbine: Combined Cycle, Natural Gas
					CO2						2,045,067.78	0	2045067.78	
					CH4						37.93	0	37.93	
					N2O						3.79	0	3.79	
New/Modified	Yes	AUX-BLR	AUX-BLR	Auxiliary Boiler	CO2 Equivalent						10,425.48	0	10425.48	Boiler: Liquid and Gas Fuel, ≤ 40 MMBtu/hr
					CO2						10,414.71	0	10414.71	
					CH4						0.2	0	0.2	
					N2O						0.02	0	0.02	
New/Modified	Yes	GAS-HTR	GAS-HTR	Gas Heater	CO2 Equivalent						4,971.23	0	4971.23	Heater ≤ 40 MMBtu/hr
					CO2						4,966.10	0	4966.1	
					CH4						0.09	0	0.09	
					N2O						0.01	0	0.01	
New/Modified	Yes	FUG-NGAS	FUG-NGAS	Natural Gas Component Fugitives	CO2 Equivalent						55.21	0	55.21	Fugitives: Piping and Equipment Leak
					CO2						0.005	0	0.005	
					CH4						2.21	0	2.21	
New/Modified	Yes	FUG-MSS	FUG-MSS	Planned Maintenance Activities Fugitives	CO2 Equivalent						2.69	0	2.69	MSS Activities
					CO2						0.0002	0	0.0002	
					CH4						0.11	0	0.11	
New/Modified	Yes	EMGEN	EMGEN	Emergency Diesel Generator	CO2 Equivalent						155.79	0	155.79	Engine: Emergency, Diesel
					CO2						155.26	0	155.26	
					CH4						0.01	0	0.01	
					N2O						0.001	0	0.001	
New/Modified	Yes	SF6FUG	SF6FUG	SF6 Insulated Equipment	CO2 Equivalent						23.37	0	23.37	Other
					SF6						0.001	0	0.001	
New/Modified	Yes	CBY51SC	CBY51SC	Combustion Turbine 1 (Simple Cycle) (Normal Operating Emissions)	NOx					34.65		34.65	0	Turbine: Simple Cycle, Natural Gas
					CO					29.54		29.54	0	
					SO2					10.81		10.81	0	
					VOC					7.25		7.25	0	
					PM					19.28		19.28	0	
					PM10					19.28		19.28	0	
					PM2.5					19.28		19.28	0	
					H2SO4					7.12		7.12	0	
					NH3					51.31		51.31	0	
New/Modified	Yes	CBY51SC	CBY51SC	Combustion Turbine 1 (Simple Cycle) (MSS Operating Emissions)	NOx					38.1		38.1	0	Turbine: Simple Cycle, Natural Gas
					CO					256.7		256.7	0	
					SO2					10.81		10.81	0	
					VOC					62.83		62.83	0	
					PM					19.28		19.28	0	
					PM10					19.28		19.28	0	
					PM2.5					19.28		19.28	0	
					H2SO4					7.12		7.12	0	
					NH3					51.31		51.31	0	

Texas Commission on Environmental Quality
Form PI-1 General Application
Unit Types - Emission Rates

Action Requested (only 1 action per FIN)	Include these emissions in annual (tpy) summary?	Facility ID Number (FIN)	Emission Point Number (EPN)	Source Name	Pollutant	Current Short-Term (lb/hr)	Current Long-Term (tpy)	Consolidated Current Short-Term (lb/hr)	Consolidated Current Long-Term (tpy)	Proposed Short-Term (lb/hr)	Proposed Long-Term (tpy)	Short-Term Difference (lb/hr)	Long-Term Difference (tpy)	Unit Type (Used for reviewing BACT and Monitoring Requirements)
New/Modified	Yes	CBY51SC	CBY51SC	Combustion Turbine 1 (Simple Cycle) (Normal and MSS Operating Emissions)	NOx						65.14	0	65.14	Turbine: Simple Cycle, Natural Gas
					CO						113.53	0	113.53	
					SO2						10.16	0	10.16	
					VOC						24.33	0	24.33	
					PM						27.49	0	27.49	
					PM10						27.49	0	27.49	
					PM2.5						27.49	0	27.49	
					H2SO4						6.69	0	6.69	
					NH3						95.64	0	95.64	
New/Modified	Yes	GAS-HTRSC	GAS-HTRSC	Gas Heater	NOx					0.12	0.51	0.12	0.51	Heater ≤ 40 MMBtu/hr
					CO					0.36	1.57	0.36	1.57	
					SO2					0.027	0.06	0.027	0.06	
					VOC					0.03	0.14	0.03	0.14	
					PM					0.05	0.21	0.05	0.21	
					PM10					0.05	0.21	0.05	0.21	
					PM2.5					0.05	0.21	0.05	0.21	
New/Modified	Yes	EMGENSC	EMGENSC	Emergency Diesel Generator	NOx					14.34	0.72	14.34	0.72	Engine: Emergency, Diesel
					CO					1.01	0.05	1.01	0.05	
					SO2					0.01	0.01	0.01	0.01	
					VOC					0.27	0.01	0.27	0.01	
					PM					0.15	0.01	0.15	0.01	
					PM10					0.15	0.01	0.15	0.01	
					PM2.5					0.15	0.01	0.15	0.01	
New/Modified	Yes	DSL-TNKSC	DSL-TNKSC	Emergency Diesel Generator Tank	VOC					0.02	0.01	0.02	0.01	Storage Tank (1): Fixed roof with capacity < 25 Mgal or TVP < 0.50 psia
New/Modified	Yes	FUG-SCRSC	FUG-SCRSC	Ammonia Component Fugitive	NH3					0.02	0.0993	0.02	0.0993	Fugitives: Piping and Equipment Leak
New/Modified	Yes	FUG-NGASSC	FUG-NGASC	Natural Gas Component Fugitives	VOC					0.0024	0.0103	0.0024	0.0103	Fugitives: Piping and Equipment Leak
New/Modified	Yes	CBY51-LOVSC	CBY51-LOVSC	Unit 1 Lube Oil Vent	VOC					0.003	0.01	0.003	0.01	Other
					PM					0.003	0.01	0.003	0.01	
					PM10					0.003	0.01	0.003	0.01	
					PM2.5					0.003	0.01	0.003	0.01	

Action Requested (only 1 action per FIN)	Include these emissions in annual (tpy) summary?	Facility ID Number (FIN)	Emission Point Number (EPN)	Source Name	Pollutant	Current Short-Term (lb/hr)	Current Long-Term (tpy)	Consolidated Current Short-Term (lb/hr)	Consolidated Current Long-Term (tpy)	Proposed Short-Term (lb/hr)	Proposed Long-Term (tpy)	Short-Term Difference (lb/hr)	Long-Term Difference (tpy)	Unit Type (Used for reviewing BACT and Monitoring Requirements)
New/Modified	Yes	FUG-MSSSC	FUG-MSSSC	Planned Maintenance Activities Fugitives	NOx					0.01	0.01	*0.01*	*0.01*	MSS Activities
					CO					0.01	0.01	*0.01*	*0.01*	
					VOC					0.12	0.01	*0.12*	*0.01*	
					PM					0.05	0.01	*0.05*	*0.01*	
					PM10					0.05	0.01	*0.05*	*0.01*	
					PM2.5					0.05	0.01	*0.05*	*0.01*	
					NH3					0.01	0.01	*0.01*	*0.01*	
New/Modified	Yes	CBY51SC	CBY51SC	Combustion Turbine 1 (Combined Cycle)	CO2 Equivalent						865,715.66	0	*865715.66*	Turbine: Simple Cycle, Natural Gas
					CO2						864,836.60	0	*864836.6*	
					CH4						16.04	0	*16.04*	
					N2O						1.6	0	*1.6*	
New/Modified	Yes	GAS-HTRSC	GAS-HTRSC	Gas Heater	CO2 Equivalent						4,971.23	0	*4971.23*	Heater ≤ 40 MMBtu/hr
					CO2						4,966.10	0	*4966.1*	
					CH4						0.09	0	*0.09*	
					N2O						0.01	0	*0.01*	
New/Modified	Yes	FUG-NGASSC	FUG-NGASSC	Natural Gas Component Fugitives	CO2 Equivalent						55.21	0	*55.21*	Fugitives: Piping and Equipment Leak
					CO2						0.005	0	*0.005*	
					CH4						2.21	0	*2.21*	
New/Modified	Yes	FUG-MSSSC	FUG-MSSSC	Planned Maintenance Activities Fugitives	CO2 Equivalent						2.69	0	*2.69*	MSS Activities
					CO2						0.0002	0	*0.0002*	
					CH4						0.11	0	*0.11*	
New/Modified	Yes	EMGENSC	EMGENSC	Emergency Diesel Generator	CO2 Equivalent						61.3	0	*61.3*	Engine: Emergency, Diesel
					CO2						61.09	0	*61.09*	
					CH4						0.003	0	*0.003*	
					N2O						0.0005	0	*0.0005*	
New/Modified	Yes	SF6FUGSC	SF6FUGSC	SF6 Insulated Equipment	CO2 Equivalent						23.37	0	*23.37*	Other
					SF6						0.001	0	*0.001*	
												0	0	

Texas Commission on Environmental Quality
Form PI-1 General Application
Stack Parameters

Date: March 18, 2020
Permit #: ____________
Company: NRG Cedar Bayou 5, LLC

Emission Point Discharge Parameters													
EPN	**Included in EMEW?**	**UTM Coordinates Zone**	**East (Meters)**	**North (Meters)**	**Building Height (ft)**	**Height Above Ground (ft)**	**Stack Exit Diameter (ft)**	**Velocity (FPS)**	**Temperature (°F)**	**Fugitives - Length (ft)**	**Fugitives - Width (ft)**	**Fugitives - Axis Degrees**
CBY51	Yes											
C-TOWER1	Yes											
AUX-BLR	Yes											
GAS-HTR	Yes											
EMGEN	Yes											
DSL-TNK	Yes											
FUG-SCR	Yes											
FUG-NGAS	Yes											
CBY51-LOV	Yes											
CBYST1-LOV	Yes											
FUG-MSS	Yes											
SF6FUG	Yes											
CBY51SC	Yes											
GAS-HTRSC	Yes											
EMGENSC	Yes											
DSL-TNKSC	Yes											
FUG-SCRSC	Yes											
FUG-NGASC	Yes											
CBY51-LOVSC	Yes											
FUG-MSSSC	Yes											
FUG-NGASSC	Yes											
SF6FUGSC	Yes											

Date: March 18, 2020
Permit #: ____________
Company: NRG Cedar Bayou 5, LLC

I. Public Notice Applicability	
A. Application Type	
Is this an application for an initial permit?	Yes
Is this an application for a new or major modification of a PSD (including GHG), Nonattainment, or HAP permit?	Yes

B. Project Increases and Public Notice Thresholds (for Initial and Amendment Projects)

For public notice applicability, the agency does not include consolidation or incorporation of any previously authorized facility or activity (PBR, standard permits, etc.), changes to permitted allowable emission rates when exclusively due to changes to standardized emission factors, or reductions in emissions which are not enforceable through the amended permit. Thus, the total emissions increase would be the sum of emissions increases under the amended permit and the emissions decreases under the amended permit for each air contaminant.

The table below will generate emission increases based on the values represented on the "Unit Types - Emission Rates" sheet. Use the "yes" and "no" options in column B of the "Unit Types - Emission Rates" worksheet to indicate if a unit's proposed change of emissions should be included in these totals.

Notes:

1. Emissions of PM, PM10, and/or PM2.5 may have been previously quantified and authorized as PM, PM10,and/or PM2.5. These emissions will be speciated based on current guidance and policy to demonstrate compliance with current standards and public notice requirements may change during the permit review.

2. All renewals require public notice.

This row is optional. If you do not think the table below accurately represents public notice applicability increases for your project, provide discussion here (1000 characters).	
Do the facilities handle, load, unload, dry, manufacture, or process grain, seed, legumes, or vegetable fibers (agricultural facilities)?	No

Pollutant	Current Long-Term (tpy)	Consolidated Emissions (tpy)	Proposed Long-Term (tpy)	Project Change in Allowable (tpy)	PN Threshold	Notice required?
VOC	0.00	0.00	49.52	49.52	5	Yes
PM	0.00	0.00	227.92	227.92	5	Yes*
PM_{10}	0.00	0.00	122.22	122.22	5	Yes*
$PM_{2.5}$	0.00	0.00	121.90	121.90	5	Yes*
NO_x	0.00	0.00	192.77	192.77	5	Yes
CO	0.00	0.00	270.49	270.49	50	Yes
SO_2	0.00	0.00	34.40	34.40	10	Yes
Pb	0.00	0.00	0.00	0.00	0.6	No
H2SO4	0	0	22.86	22.86	5	Yes
NH3	0	0	252.8486	252.8486	5	Yes
CO2 Equivalent	0	0	2933609.71	2933609.71	**	Yes
CO2	0	0	2930467.65	2930467.65	5	Yes
CH4	0	0	59.003	59.003	5	Yes
N2O	0	0	5.4315	5.4315	5	Yes
SF6	0	0	0.002	0.002	5	No

* Notice is required for PM, PM10, and PM2.5 if one of these pollutants is above the threshold.

** Notice of a GHG action is determined by action type. Initial and major modification always require notice. Voluntary updates require a consolidated notice if there is a change to BACT. Project emission increases of CO2e (CO2 equivalent) are not relevant for determining public notice of GHG permit actions.

C. Is public notice required for this project as represented in this workbook? If no, proceed to Section III Small Business Classification. Note: public notice applicability for this project may change throughout the technical review.	Yes
D. Are any HAPs to be authorized/re-authorized with this project? The category "HAPs" must be specifically listed in the public notice if the project authorizes (reauthorizes for renewals) any HAP pollutants.	Yes

II. Public Notice Information

Complete this section if public notice is required (determined in the above section) or if you are not sure if public notice is required.

A. Contact Information

Enter the contact information for the **person responsible for publishing.** This is a designated representative who is responsible for ensuring public notice is properly published in the appropriate newspaper and signs are posted at the facility site. This person will be contacted directly when the TCEQ is ready to authorize public notice for the application.

Prefix (Mr., Ms., Dr., etc.):	Mr.
First Name:	Craig
Last Name:	Eckberg
Title:	Director, South Region, Regulatory & Environmental Services
Company Name:	NRG Texas Power LLC
Mailing Address:	910 Louisana Street
Address Line 2:	
City:	Houston
State:	Texas
ZIP Code:	77002
Telephone Number:	(713) 537-2776
Fax Number:	
Email Address:	craig.eckberg@nrg.com

Enter the contact information for the **Technical Contact.** This is the designated representative who will be listed in the public notice as a contact for additional information.

Prefix (Mr., Ms., Dr., etc.):	Ms.
First Name:	Colleen
Last Name:	Krenek
Title:	Environmental Specialist
Company Name:	NRG Cedar Bayou 5 LLC
Mailing Address:	910 Louisana Street
Address Line 2:	
City:	Houston
State:	Texas
ZIP Code:	77002
Telephone Number:	(713) 537-5742
Fax Number:	
Email Address:	colleen.krenek@nrg.com

B. Public place

Place a copy of the full application (including all of this workbook and all attachments) at a public place in the county where the facilities are or will be located. You must state where in the county the application will be available for public review and comment. The location must be a public place and described in the notice. A public place is a location which is owned and operated by public funds (such as libraries, county courthouses, city halls) and cannot be a commercial enterprise. You are required to pre-arrange this availability with the public place indicated below. The application must remain available from the first day of publication through the designated comment period.

If this is an application for a PSD, nonattainment, or FCAA §112(g) permit, the public place must have internet access available for the public as required in 30 TAC § 39.411(f)(3).

If the application is submitted to the agency with information marked as Confidential, you are required to indicate which specific portions of the application are not being made available to the public. These portions of the application must be accompanied with the following statement: ***Any request for portions of this application that are marked as confidential must be submitted in writing, pursuant to the Public Information Act, to the TCEQ Public Information Coordinator, MC 197, P.O. Box 13087, Austin, Texas 78711-3087.***

Name of Public Place:	West Chambers County Branch Library
Physical Address:	10616 Eagle Drive
Address Line 2:	
City:	Mont Belvieu
ZIP Code:	77523
County:	Chambers
Has the public place granted authorization to place the application for public viewing and copying?	Yes
Does the public place have Internet access available for the public?	Yes

C. Alternate Language Publication

In some cases, public notice in an alternate language is required. If an elementary or middle school nearest to the facility is in a school district required by the Texas Education Code to have a bilingual program, a bilingual notice will be required. If there is no bilingual program required in the school nearest the facility, but children who would normally attend those schools are eligible to attend bilingual programs elsewhere in the school district, the bilingual notice will also be required. If it is determined that alternate language notice is required, you are responsible for ensuring that the publication in the alternate language is complete and accurate in that language.

Is a bilingual program required by the Texas Education Code in the School District?	Yes
Are the children who attend either the elementary school or the middle school closest to your facility eligible to be enrolled in a bilingual program provided by the district?	Yes
If yes to either question above, list which language(s) are required by the bilingual program?	Spanish

D. PSD and Nonattainment Permits Only

If this is an application for emissions of GHGs, select either "Separate Public Notice" or "Consolidated Public Notice". Note: Separate public notices requires a separate application.	Consolidated Public Notice

We must notify the applicable county judge and presiding officer when a PSD or Nonattainment permit or modification application is received. This information can be obtained at:

https://www.txdirectory.com

Provide the information for the **County Judge** for the location where the facility is or will be located.

The Honorable:	Jimmy Sylvia
Mailing Address:	P.O. Box 939
Address Line 2:	
City:	Anahuac
State:	Texas
ZIP Code:	77514

Provide the information for the **Presiding Officer(s)** of the municipality for this facility site. This is frequently the Mayor.

First Name:	Brandon
Last Name:	Capetillo
Title:	Mayor of Baytown
Mailing Address:	P.O. Box 424
Address Line 2:	
City:	Baytown
State:	Texas
ZIP Code:	77522
Are the proposed facilities located within 100 km or less of an affected state or Class I Area?	No

III. Small Business Classification	
Complete this section to determine small business classification. If a small business requests a permit, agency rules (30 TAC § 39.603(f)(1)(A)) allow for alternative public notification requirements if all of the following criteria are met. If these requirements are met, public notice does not have to include publication of the prominent (12 square inch) newspaper notice.	
Does the company (including parent companies and subsidiary companies) have fewer than 100 employees or less than $6 million in annual gross receipts?	No
Small business classification:	**No**

Texas Commission on Environmental Quality
Form PI-1 General Application
Federal Applicability

I. County Classification

Does the project require retrospective review?	No
County (completed for you from your response on the General sheet)	Chambers
This project will be located in an area that is in serious nonattainment for ozone as of Sept. 23, 2019. Select from the drop-down list to the right if you would like the project to be reviewed under a different classification.	
Determination:	**This project will be located in a county with a Serious Ozone nonattainment classification. Complete the nonattainment section below and provide an analysis with the application.**

II. PSD and GHG PSD Applicability Summary

Is netting required for the PSD analysis for this project?	**Yes**
If yes, the project increases listed below should be after netting has been performed. Attach the netting information to the application.	

Pollutant	Project Increase (after netting)	Threshold	PSD Review Required?
CO	155.33	100	Yes
NO_x		40	
PM	200.19	25	Yes
PM_{10}	94.5	15	Yes
$PM_{2.5}$	94.16	10	Yes
SO_2	24.17	40	No
Pb		0.6	
H_2S		10	
TRS		10	
Reduced sulfur compounds (including H_2S)		10	
H_2SO_4	16.17	7	Yes
Fluoride (excluding HF)		3	
CO2e	2,062,780	75,000	Yes

III. Nonattainment Applicability Summary

Is netting required for the nonattainment analysis for this project?	**Yes**
If yes, the project increases listed below should be after netting has been performed. Attach the netting information to the application.	

Pollutant	Project Increase (after netting)	Threshold	NA Review Required?
Ozone (as VOC)	24.99	25	No
Ozone (as NO_x)			

IV. Offset Summary (for Nonattainment Permits)			
Pollutant	**Offset Ratio**	**Offset Quantity Required (tpy)**	**Where is the offset coming from?**
Ozone (as NO_x)	1.20 : 1		

Date: March 18, 2020
Permit #: ____________
Company: NRG Cedar Bayou 5, LLC

I. General Information - Non-Renewal	
Is this project for new facilities controlled and operated directly by the federal government? (30 TAC § 116.141(b)(1) and 30 TAC § 116.163(a))	No
A fee of $75,000 shall be required if no estimate of capital project cost is included with the permit application. (30 TAC § 116.141(d)) Select "yes" here to use this option. Then skip sections II and III.	Yes
Select Application Type	Major Application

In signing the "General" sheet with this fee worksheet attached, I certify that the total estimated capital cost of the project as defined in 30 TAC §116.141 is equal to or less than the above figure. I further state that I have read and understand Texas Water Code § 7.179, which defines Criminal Offenses for certain violations, including intentionally or knowingly making, or causing to be made, false material statements or representations.

Your estimated capital cost:	Maximum fee appies.
Permit Application Fee:	**$75,000.00**

VI. Total Fees	
Note: fees can be paid together with one payment or as two separate payments.	
Non-Renewal Fee	$75,000.00
Total	$75,000.00

VII. Payment Information	
A. Payment One (required)	
Was the fee paid online?	No
Enter the fee amount:	$ 75,000.00
Enter the check, money order, ePay Voucher, or other transaction number:	
Enter the Company name as it appears on the check:	NRG Texas Power LLC
C. Total Paid	**$75,000.00**

VIII. Professional Engineer Seal Requirement	
Is the estimated capital cost of the project above $2 million?	Yes
Is this project subject to an exemption contained in the Texas Engineering Practice Act (TEPA)? (30 TAC § 116.110(f))	No
Is the application required to be submitted under the seal of a Texas licensed P.E.? Note: an electronic PE seal is acceptable.	Yes

Date: March 18, 2020
Permit #: ___________
Company: NRG Cedar Bayou 5, LLC

Pollutant	Does this pollutant require PSD review?	How will you demonstrate that this project meets all applicable requirements?	Notes	Additional Notes (optional)
Ozone	No	Not applicable	This pollutant is not a part of this project or does not require an impacts analysis.	
VOC	No	Not applicable	This pollutant is not a part of this project or does not require an impacts analysis.	
NOx	No	Not applicable	This pollutant is not a part of this project or does not require an impacts analysis.	
CO	Yes	Protocol (required for all PSD projects, excluding GHG PSD)	Attach a protocol meeting all requirements listed on the TCEQ website.	
SO2	No	Modeling: screen or refined	Attach a completed "Electronic Modeling Evaluation Workbook" (EMEW).	
PM	Yes	Protocol (required for all PSD projects, excluding GHG PSD)	Attach a protocol meeting all requirements listed on the TCEQ website.	
PM10	Yes	Protocol (required for all PSD projects, excluding GHG PSD)	Attach a protocol meeting all requirements listed on the TCEQ website.	
PM2.5	Yes	Protocol (required for all PSD projects, excluding GHG PSD)	Attach a protocol meeting all requirements listed on the TCEQ website.	
H2SO4	Yes	Protocol (required for all PSD projects, excluding GHG PSD)	Attach a protocol meeting all requirements listed on the TCEQ website.	
NH3	No	Modeling: screen or refined	Attach a completed "Electronic Modeling Evaluation Workbook" (EMEW).	
CO2 Equivalent	Yes	None (GHG-PSD Only)	An air quality analysis for GHGs (i.e., air dispersion modeling, ambient air monitoring, additional impacts, or Class I area impacts) is not required.	
CO2	Yes	None (GHG-PSD Only)	An air quality analysis for GHGs (i.e., air dispersion modeling, ambient air monitoring, additional impacts, or Class I area impacts) is not required.	
CH4	Yes	None (GHG-PSD Only)	An air quality analysis for GHGs (i.e., air dispersion modeling, ambient air monitoring, additional impacts, or Class I area impacts) is not required.	
N2O	Yes	None (GHG-PSD Only)	An air quality analysis for GHGs (i.e., air dispersion modeling, ambient air monitoring, additional impacts, or Class I area impacts) is not required.	
SF6	Yes	None (GHG-PSD Only)	An air quality analysis for GHGs (i.e., air dispersion modeling, ambient air monitoring, additional impacts, or Class I area impacts) is not required.	

Texas Commission on Environmental Quality
Form PI-1 General Application
BACT

Date: March 18, 2020
Permit #: ____________
Company: NRG Cedar Bayou 5, LLC

Plant Type	Current Tier I BACT	Confirm	Additional Notes

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
New/Modified	CBY51	Turbine: Combined Cycle, Natural Gas	NOx	2.0 ppmvd at 15% O2, 24-hour average, typically achieved with dry low NOX burner, water/steam injection, limiting fuel consumption, or SCR. Specify numeric value and proposed technique.	Yes	DLN and SCR
			CO	2-4 ppmvd at 15% O2, typically achieved with good combustion practices and/or oxidation catalyst. Specify numeric value and control technique. A detailed analysis is required if >4 ppmvd is proposed.	Yes	Oxidation Catalyst and Good Combustion Practices
			SO2	Good combustion practices. Fuel limited to firing pipeline quality natural gas (low sulfur fuel). Sulfur content of fuel will not exceed 5 grains per 100 scf on an hourly basis and 1 gr/100 scf on an annual basis.	Yes	See Application
			VOC	2 ppmvd at 15% O2 if no duct burner, 4 ppmvd with duct burner. Achieved through good combustion practices.	Yes	See Application
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Good combustion practices. Fuel limited to firing pipeline quality natural gas.	Yes	See Application
			H2SO4	Good combustion practices. Fuel limited to firing pipeline quality natural gas (low sulfur fuel). Sulfur content of fuel will not exceed 5 grains per 100 scf on an hourly basis and 1 gr/100 scf on an annual basis.	Yes	See Application
			NH3	7-10 ppmvd at 15% O, achieved by controlling the ammonia injection system to minimize ammonia slip	Yes	See Application
			MSS	Minimizing the duration of MSS activities and minimizing the amount of time the turbine is outside the performance mode where the controls can be used. Operating the facility in accordance with best management practices and good air pollution control practices.	Yes	See Application
New/Modified	C-TOWER1	Cooling Tower	PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Drift < 0.001% achieved by drift eliminators	Yes	Drift < 0.0005%
			MSS	Same as normal operation BACT requirements.	Yes	
New/Modified	AUX-BLR	Boiler: Liquid and Gas Fuel, > 40 MMBtu/hr	NOx	Specify fuel type(s) to be fired. When firing natural gas: 0.01 lb/MMBtu When firing plant fuel gas: 0.015 lb/MMBtu Note: plant fuel gas may contain up to 75% natural gas. Specifics: <50% H2; > 920 Btu/dscf. Emission limits typically achieved using dry-low NOx combustors, limiting fuel consumption, SCR, and/or water or steam injection. Specify technique(s). Fuel oil firing limited to 760 hours/yr.	Yes	NOx is 0.01 lb/MMBtu with DLN burners.

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
			CO	50 ppmv at 3% O2 achieved by good combustion practices, oxidation catalyst, and/or maintenance of the boiler. Specify technique(s).	Yes	CO is 50 ppm with good combustion practices.
			SO2	Firing pipeline quality natural gas When firing fuel gas, fuel must contain no more than 10 grains of total sulfur per 100 dry standard cubic feet. When firing liquid fuel, fuel must contain no more than 0.05% sulfur by weight with a limit of 720hrs/yr. Good combustion practices.	Yes	See Application
			VOC	Good combustion practices.	Yes	See Application
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Less than 5% opacity. Good combustion practices.	Yes	See Application
			MSS	Minimizing the duration of these activities and operating the facility in accordance with best management practices and good air pollution control practices	Yes	Minimize duration of MSS activity
New/Modified	GAS-HTR	Heater ≤ 40 MMBtu/hr	NOx	Burners with the best NOx performance given the burner configuration and gaseous fuel used. Specify the proposed emission rate (performance is an annual average) and provide justification if NOx>0.01 lb/MMBtu.	Yes	Nox is 0.012 lb/MMBtu with DLN burners.
			CO	50 ppmv corrected to 3% O2	Yes	See Application
			SO2	Maximum 0.6% sulfur content any liquid fuel or 5 grains for pipeline quality sweet natural gas. Provide details.	Yes	Pipeline quality natural gas at 0.5 gr/100 scf.
			VOC	Firing pipeline quality natural gas and good combustion practices. Specify if firing a different fuel.	Yes	Pipeline natural gas.
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Maximum opacity 5%	Yes	See Application
			MSS	Same as normal operation BACT requirements.	Yes	Minimize duration of MSS activity
New/Modified	EMGEN	Engine: Emergency, Diesel	NOx	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			CO	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			SO2	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			VOC	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter. No visible emissions shall leave the property. Visible emissions shall be determined by a standard of no visible emissions exceeding 30 seconds in duration in any six-minute period as determined using EPA TM 22 or equivalent	Yes	See Application
			MSS	Minimize duration and occurrence of MSS activities.	Yes	Minimize duration of MSS activity
New/Modified	DSL-TNK	Storage Tank (1): Fixed roof with capacity < 25 Mgal or TVP < 0.50 psia	VOC	See additional notes:	Yes	See Application
			MSS	See additional notes:	Yes	This tank is very small (750 gallons). Tanks this size would normally not be drained. If they had to be drained, the diesel would be sent to a covered vessel.
New/Modified	FUG-SCR	Fugitives: Piping and Equipment Leak	NH3	AVO inspection	Yes	See Application

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
			MSS	Same as normal operation BACT requirements. Best management practices (BMPs) will be used to minimize emissions, including using proper design of fuel delivery and handling, good air pollution control practices, and safe operating practices. Estimate fugitive emissions of sources such as natural gas, diesel, and ammonia. Leak detection and repair program as required for minimizing VOC leaks.	Yes	BMP
New/Modified	FUG-NGAS	Fugitives: Piping and Equipment Leak	VOC	Provide details about applicable option: 1. Uncontrolled VOC emissions < 10 tpy - no control required 2. 10 tpy < uncontrolled VOC emissions < 25 tpy - 28M LDAR program. 75% credit. 3. Uncontrolled VOC emissions > 25 tpy - 28VHP LDAR program. 97% credit for valves, 85% for pumps and compressors. 4. VOC vapor pressure < 0.002 psia - no inspection required, no fugitive emissions expected. For emissions of chlorine and other approved odorous compounds: AVO inspection twice per shift.	Yes	Uncontrolled VOC < 10 tpy - no controls required.
			MSS	Same as normal operation BACT requirements. Best management practices (BMPs) will be used to minimize emissions, including using proper design of fuel delivery and handling, good air pollution control practices, and safe operating practices. Estimate fugitive emissions of sources such as natural gas, diesel, and ammonia. Leak detection and repair program as required for minimizing VOC leaks.	Yes	BMP
New/Modified	CBY51-LOV	Other	VOC	See additional notes:	Yes	Oil vents have mist eliminators to decrease emissions
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. See additional notes:	Yes	Oil vents have mist eliminators to decrease emissions
			MSS	See additional notes:	Yes	Minimize duration of MSS activity
New/Modified	CBYST1-LOV	Other	VOC	See additional notes:	Yes	Oil vents have mist eliminators to decrease emissions
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. See additional notes:	Yes	Oil vents have mist eliminators to decrease emissions

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
			MSS	See additional notes:	Yes	Minimize duration of MSS activity
New/Modified	FUG-MSS	MSS Activities	NOx	See Additional Notes:	Yes	Minimize duration of MSS activity
			CO	See Additional Notes:	Yes	Minimize duration of MSS activity
			VOC	See Additional Notes:	Yes	Minimize duration of MSS activity
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. See Additional Notes:	Yes	Minimize duration of MSS activity
			NH3	See Additional Notes:	Yes	Minimize duration of MSS activity
			MSS	Use of good air pollution control practices and safe operating practices. Limiting the frequency and duration of activities.	Yes	Minimize duration of MSS activity
New/Modified	SF6FUG	Other	CO2 Equivalent	See additional notes:	Yes	The use of state-of-the-art enclosed-pressure SF6 circuit breakers with leak detection is BACT
			SF6	See additional notes:	Yes	The use of state-of-the-art enclosed-pressure SF6 circuit breakers with leak detection is BACT
			MSS	See additional notes:	Yes	Minimize duration of MSS activity
New/Modified	CBY51SC	Turbine: Simple Cycle, Natural Gas	NOx	5.0 to 9.0 ppmvd at 15% O2, typically achieved with dry low NOX burner, water/steam injection, limiting fuel consumption, or SCR. Specify numeric value and proposed technique.	Yes	DLN and SCR
			CO	9-25 ppmvd at 15% O2, typically achieved with good combustion practices and/or oxidation catalyst. Specify numeric value and control technique. A detailed analysis is required if >9 ppmvd is proposed.	Yes	Oxidation Catalyst and Good Combustion Practices
			SO2	Good combustion practices. Fuel limited to firing pipeline quality natural gas (low sulfur fuel). Sulfur content of fuel will not exceed 2 to 5 grains per 100 scf on an hourly basis and 0.5 to 1 gr/100 scf on an annual basis.	Yes	See Application
			VOC	2 ppmvd at 15% O2 achieved through good combustion practices.	Yes	See Application
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Good combustion practices. Fuel limited to firing pipeline quality natural gas.	Yes	See Application
			H2SO4	Good combustion practices. Fuel limited to firing pipeline quality natural gas (low sulfur fuel). Sulfur content of fuel will not exceed 5 grains per 100 scf on an hourly basis and 1 gr/100 scf on an annual basis.	Yes	See Application
			NH3	7-10 ppmvd at 15% O, achieved by controlling the ammonia injection system to minimize ammonia slip	Yes	See Application

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
			MSS	Minimizing the duration of MSS activities and operating the facility in accordance with best management practices and good air pollution control practices.	Yes	Minimize duration of MSS activity
New/Modified	GAS-HTRSC	Heater ≤ 40 MMBtu/hr	NOx	Burners with the best NOx performance given the burner configuration and gaseous fuel used. Specify the proposed emission rate (performance is an annual average) and provide justification if NOx>0.01 lb/MMBtu.	Yes	Nox is 0.012 lb/MMBtu with DLN burners.
			CO	50 ppmv corrected to 3% O2	Yes	See Application
			SO2	Maximum 0.6% sulfur content any liquid fuel or 5 grains for pipeline quality sweet natural gas. Provide details.	Yes	Pipeline quality natural gas at 0.5 gr/100 scf.
			VOC	Firing pipeline quality natural gas and good combustion practices. Specify if firing a different fuel.	Yes	Pipeline natural gas.
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Maximum opacity 5%	Yes	See Application
			MSS	Same as normal operation BACT requirements.	Yes	Minimize duration of MSS activity
New/Modified	EMGENSC	Engine: Emergency, Diesel	NOx	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			CO	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			SO2	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			VOC	Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter.	Yes	See Application
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. Meeting the requirements of 40 CFR Part 60, Subpart IIII. Firing ultra-low sulfur diesel fuel (no more than 15 ppm sulfur by weight). Limited to 100 hrs./yr. of non-emergency operation. Have a non-resettable runtime meter. No visible emissions shall leave the property. Visible emissions shall be determined by a standard of no visible emissions exceeding 30 seconds in duration in any six-minute period as determined using EPA TM 22 or equivalent	Yes	See Application
			MSS	Minimize duration and occurrence of MSS activities.	Yes	Minimize duration of MSS activity
New/Modified	DSL-TNKSC	Storage Tank (1): Fixed roof with capacity < 25 Mgal or TVP < 0.50 psia	VOC	See additional notes:	Yes	See Application

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
			MSS	See additional notes:	Yes	This tank is very small (750 gallons). Tanks this size would normally not be drained. If they had to be drained, the diesel would be sent to a covered vessel.
New/Modified	FUG-SCRSC	Fugitives: Piping and Equipment Leak	NH3	AVO inspection	Yes	See Application
			MSS	Same as normal operation BACT requirements. Best management practices (BMPs) will be used to minimize emissions, including using proper design of fuel delivery and handling, good air pollution control practices, and safe operating practices. Estimate fugitive emissions of sources such as natural gas, diesel, and ammonia. Leak detection and repair program as required for minimizing VOC leaks.	Yes	BMP
New/Modified	FUG-NGASSC	Fugitives: Piping and Equipment Leak	VOC	Provide details about applicable option: 1. Uncontrolled VOC emissions < 10 tpy - no control required 2. 10 tpy < uncontrolled VOC emissions < 25 tpy - 28M LDAR program. 75% credit. 3. Uncontrolled VOC emissions > 25 tpy - 28VHP LDAR program. 97% credit for valves, 85% for pumps and compressors. 4. VOC vapor pressure < 0.002 psia - no inspection required, no fugitive emissions expected. For emissions of chlorine and other approved odorous compounds: AVO inspection twice per shift.	Yes	Uncontrolled VOC < 10 tpy - no controls required.
			MSS	Same as normal operation BACT requirements. Best management practices (BMPs) will be used to minimize emissions, including using proper design of fuel delivery and handling, good air pollution control practices, and safe operating practices. Estimate fugitive emissions of sources such as natural gas, diesel, and ammonia. Leak detection and repair program as required for minimizing VOC leaks.	Yes	BMP

Date: March 18, 2020
Permit #: ___________
Company: NRG Cedar Bayou 5, LLC

Action Requested	FINs	Unit Type	Pollutant	Current Tier I BACT	Confirm	Additional Notes
New/Modified	CBY51-LOVSC	Other	VOC	See additional notes:	Yes	Oil vents have mist eliminators to decrease emissions
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. See additional notes:	Yes	Oil vents have mist eliminators to decrease emissions
			MSS	See additional notes:	Yes	Minimize duration of MSS activity
New/Modified	FUG-MSSSC	MSS Activities	NOx	See Additional Notes:	Yes	Minimize duration of MSS activity
			CO	See Additional Notes:	Yes	Minimize duration of MSS activity
			VOC	See Additional Notes:	Yes	Minimize duration of MSS activity
			PM	The emission reduction techniques for PM10 and PM2.5 will follow the technique for PM. See Additional Notes:	Yes	Minimize duration of MSS activity
			NH3	See Additional Notes:	Yes	Minimize duration of MSS activity
			MSS	Use of good air pollution control practices and safe operating practices. Limiting the frequency and duration of activities.	Yes	Minimize duration of MSS activity
New/Modified	SF6FUGSC	Other	CO2 Equivalent	See additional notes:	Yes	The use of state-of-the-art enclosed-pressure SF6 circuit breakers with leak detection is BACT
			SF6	See additional notes:	Yes	The use of state-of-the-art enclosed-pressure SF6 circuit breakers with leak detection is BACT
			MSS	See additional notes:	Yes	Minimize duration of MSS activity

Texas Commission on Environmental Quality
Form PI-1 General Application
Monitoring

Date: March 18, 2020
Permit #: ___________
Company: NRG Cedar Bayou 5, LLC

Monitoring

This sheet provides the minimum acceptable requirements to demonstrate compliance through monitoring for each pollutant proposed to be emitted from each FIN. This sheet also includes measuring techniques for sources of significant emissions in the project.

Instructions:
1. The unit types listed under Unit Type (column B) include all new, modified, consolidated, and/or renewed sources as indicated on the "Unit Types - Emission Rates" sheet. Each new, modified, consolidated, and/or renewed source must address how compliance will be demonstrated.
2. The pollutants listed in Pollutant (column C) include the pollutants indicated on the "Unit Types - Emission Rates" sheet.

Monitoring (30 TAC § 116.111(a)(2)(G))
3. The minimum acceptable monitoring is automatically populated for each unit type and pollutant.
  - Additional monitoring may be required, particularly for Title V sources, and will be included in the NSR and/or Title V permits.
4. Fully expand the Minimum Monitoring Requirements (column D) by increasing the row heights so all text is visible. (Place the cursor on the bottom of the number line to the far left of the screen, click and drag downward until all text is visible.)
5. Review the monitoring and confirm that you will meet all representations listed on the sheet and any additional attachments by entering or selecting "Yes" in Confirm (column E).
6. Add additional notes as necessary in Additional Notes for Monitoring (column F), limited to 500 characters or fewer. Examples include the following:
  - Proposed monitoring for pollutants or units that list "See additional notes:";
  - Details requested in the populated data;
  - Alternative monitoring you are proposing; and
  - Any additional information relevant to the minimization of emissions.
7. Cap EPNs do not need monitoring (leave those rows blank).

Measurement of Emissions (30 TAC § 116.111(a)(2)(B))
Note: this section will be greyed out if this project does not require PSD or nonattainment review, as represented on the General sheet.
7. For each pollutant with a project increase **greater** than the PSD significant emission rate, select the proposed measurement technique using the dropdown (column G).
8. For each pollutant with a project increase **less** than the PSD significant emission rate: leave blank.
9. If selecting "other", provide details in Additional Notes for Measuring (column H).
10. You may also use the Additional Notes for Measuring (column H) to provide more details on a selection.

Click here to return to Cover Sheet.

Important Note: The permit holder shall maintain a copy of the permit along with records containing the information and data sufficient to demonstrate compliance with the permit, including production records and operating hours. All required records must be maintained in a file at the plant site. If, however, the facility normally operates unattended, records shall be maintained at the nearest staffed location within Texas specified in the application. The site must make the records available at the request of personnel from the commission or any air pollution control program having jurisdiction in a timely manner. The applicant must comply with any additional recordkeeping requirements specified in special conditions in the permit. All records must be retained in the file for at least two years following the date that the information or data is obtained. Some permits are required to maintain records for five years. [30 TAC § 116.115(b)(2)(E)]

FIN	Unit Type	Pollutant	Minimum Monitoring Requirements	Confirm	Additional Notes for Monitoring	Proposed Measurement Technique (only complete for pollutants with a project increase above the PSD threshold)	Additional Notes for Measuring:
CBY51	Turbine: Combined Cycle,	NOx	CEMS. Data collected four times per hour and averaged hourly.	Yes	CEMS		
		CO	CEMS. Data collected four times per hour and averaged hourly.	Yes	CEMS		
		SO2	Continuous fuel flow monitor data used to calculate emission rate.	Yes	Fuel use monitoring		
		VOC	Continuous fuel flow monitor data used to calculate emission rate.	Yes	Fuel use monitoring		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Fuel use monitoring		
		H2SO4	If this pollutant is applicable, quarterly visible emission observations	Yes	Fuel use monitoring		
		NH3	Monthly AVO inspections of the ventilation ductwork.	Yes	An AVO is not appropriate as Tier I BACT for this type of source.		
C-TOWER1	Cooling Tower	PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	TDS and water circulation rate will be monitored		
AUX-BLR	Boiler: Liquid and Gas Fuel.	NOx	totalizing fuel flow meter record monthly	Yes	Fuel use monitoring		
		CO	totalizing fuel flow meter record monthly	Yes	Fuel use monitoring		
		SO2	totalizing fuel flow meter record monthly	Yes	Fuel use monitoring		
		VOC	totalizing fuel flow meter record monthly	Yes	Fuel use monitoring		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Fuel use monitoring		
GAS-HTR	Heater ≤ 40 MMBtu/hr	NOx	Stack sampling, fuel usage monitoring, and recordkeeping.	Yes	Fuel use monitoring		
		CO	Stack sampling, fuel usage monitoring, and recordkeeping.	Yes	Fuel use monitoring		
		SO2	Stack sampling if other than natural gas 5 gr S/100 dscf factor	Yes	Fuel use monitoring		
		VOC	Stack sampling if other than natural gas AP42 factor initially	Yes	Fuel use monitoring		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Fuel use monitoring		

EMGEN	Engine: Emergency, Diesel	NOx	Use of portable analyzer designed to measure the concentration in	Yes	Monitoring required by NSPS Subpart IIII will be conducted instead		
		CO	Use of portable analyzer designed to measure the concentration in	Yes	Monitoring required by NSPS Subpart IIII will be conducted instead		
		SO2	Records of fuel delivery indicating date and quantity of fuel delivered	Yes	Fuel use monitoring		
		VOC	Fuel usage monitoring, and recordkeeping.	Yes	Fuel use monitoring		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Fuel use monitoring		
DSL-TNK	Storage Tank (1): Fixed roof	VOC	See additional notes:	Yes	Fuel use will be monited		
FUG-SCR	Fugitives: Piping and	NH3	May be applicable depending on process. If so, use AVO fugitive	Yes	Standard ammonia AVO will be conducted.		
FUG-NGAS	Fugitives: Piping and	VOC	Fugitive Programs (i.e. AVO, 28VHP, 28MID, etc.)	Yes	BMP will be used for components that need to be replaced. Fugitives		
CBY51-LOV	Other	VOC	See additional notes:	Yes	The lube oil vents will be visually observed each time they are filled.		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	The lube oil vents will be visually observed each time they are filled.		
CBYST1-LOV	Other	VOC	See additional notes:	Yes	The lube oil vents will be visually observed each time they are filled.		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	The lube oil vents will be visually observed each time they are filled.		
FUG-MSS	MSS Activities	NOx	Yearly emissions check via calculations and/or monitoring.	Yes	Monitoring will vary based upon the MSS activity.		
		CO	Yearly emissions check via calculations and/or monitoring.	Yes	Monitoring will vary based upon the MSS activity.		
		VOC	Yearly emissions estimate checks via calculations.	Yes	Monitoring will vary based upon the MSS activity.		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Monitoring will vary based upon the MSS activity.		
		NH3	If applicable, yearly emissions check via calculations and/or	Yes	Monitoring will vary based upon the MSS activity.		

Texas Commission on Environmental Quality
Form PI-1 General Application
Monitoring

SF6FUG	Other	CO2 Equivalent	See additional notes:	Yes	The proposed SF_6 circuit breakers will each have a low pressure alarm and a low pressure lockout. This alarm will function as an early leak detector that will bring potential fugitive SF_6 emissions leaks to the att		
		SF6	See additional notes:	Yes	The proposed SF_6 circuit breakers will each have a low pressure alarm and a low pressure lockout. This alarm will function as an early leak detector that will bring potential fugitive SF_6 emissions leaks to the att		
CBY51SC	Turbine: Simple Cycle,	NOx	CEMS. Data collected four times per hour and averaged hourly.	Yes	CEMS		
		CO	CEMS. Data collected four times per hour and averaged hourly.	Yes	CEMS		
		SO2	Continuous fuel flow monitor data used to calculate emission rate.	Yes	Yes		
		VOC	Continuous fuel flow monitor data used to calculate emission rate.	Yes	Yes		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Yes		
		H2SO4	If this pollutant is applicable, quarterly visible emission observations	Yes	Yes		
		NH3	If this pollutant is applicable, monthly AVO inspections of the	Yes	An AVO is not appropriate as Tier I BACT for this type of source.		
GAS-HTRSC	Heater ≤ 40 MMBtu/hr	NOx	Stack sampling, fuel usage monitoring, and recordkeeping.	Yes	Fuel use monitoring		
		CO	Stack sampling, fuel usage monitoring, and recordkeeping.	Yes	Fuel use monitoring		
		SO2	Stack sampling if other than natural gas 5 gr S/100 dscf factor	Yes	Fuel use monitoring		
		VOC	Stack sampling if other than natural gas AP42 factor initially	Yes	Fuel use monitoring		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Fuel use monitoring		
EMGENSC	Engine: Emergency, Diesel	NOx	Use of portable analyzer designed to measure the concentration in	Yes	Monitoring required by NSPS Subpart IIII will be conducted instead		
		CO	Use of portable analyzer designed to measure the concentration in	Yes	Monitoring required by NSPS Subpart IIII will be conducted instead		
		SO2	Records of fuel delivery indicating date and quantity of fuel delivered	Yes	Fuel use monitoring		
		VOC	Fuel usage monitoring, and recordkeeping.	Yes	Fuel use monitoring		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Fuel use monitoring		
DSL-TNKSC	Storage Tank (1): Fixed roof	VOC	See additional notes:	Yes	Fuel use monitoring		
FUG-SCRSC	Fugitives: Piping and	NH3	May be applicable depending on process. If so, use AVO fugitive	Yes	Standard ammonia AVO will be conducted.		
FUG-NGASSC	Fugitives: Piping and	VOC	Fugitive Programs (i.e. AVO, 28VHP, 28MID, etc.)	Yes	BMP will be used for components that need to be replaced. Fugitives		
CBY51-LOVSC	Other	VOC	See additional notes:	Yes	The lube oil vents will be visually observed each time they are filled.		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	The lube oil vents will be visually observed each time they are filled.		

FUG-MSSSC	MSS Activities	NOx	Yearly emissions check via calculations and/or monitoring.	Yes	Monitoring will vary based upon the MSS activity.		
		CO	Yearly emissions check via calculations and/or monitoring.	Yes	Monitoring will vary based upon the MSS activity.		
		VOC	Yearly emissions estimate checks via calculations.	Yes	Monitoring will vary based upon the MSS activity.		
		PM	The emission monitoring techniques for PM10 and PM2.5 will follow	Yes	Monitoring will vary based upon the MSS activity.		
		NH3	If applicable, yearly emissions check via calculations and/or	Yes	Monitoring will vary based upon the MSS activity.		
SF6FUGSC	Other	CO2 Equivalent	See additional notes:	Yes	The proposed SF6 circuit breakers will each have a low pressure		
		SF6	See additional notes:	Yes	The proposed SF_6 circuit breakers will each have a low pressure alarm and a low pressure lockout. This alarm will function as an early leak detector that will bring potential fugitive SF_6 emissions leaks to the att		

Texas Commission on Environmental Quality
Form PI-1 General Application
Materials

Date: March 18, 2020
Permit #: ____________
Company: NRG Cedar Bayou 5, LLC

Item	How submitted	Date submitted
A. Administrative Information		
Form PI-1 General Application	Email	03/18/2020
Hard copy of the General sheet with original (ink) signature	Hand delivered	03/18/2020
Professional Engineer Seal	Email	03/18/2020
B. General Information		
Copy of current permit (both Special Conditions and MAERT)		
Core Data Form	Email	03/18/2020
Area map	Email	03/18/2020
Plot plan	Email	03/18/2020
Process description	Email	03/18/2020
Process flow diagram	Email	03/18/2020
List of MSS activities	Email	03/18/2020
State regulatory requirements discussion	Email	03/18/2020
C. Federal Applicability		
Summary and project emission increase determination - Tables 1F and 2F	Email	03/18/2020
Netting analysis (if required) - Tables 3F and 4F as needed	Not applicable	
D. Technical Information		
BACT discussion, if additional details are attached	Email	03/18/2020
Monitoring information, if additional details are attached	Email	03/18/2020
Material Balance (if applicable)		
Calculations	Email	03/18/2020
E. Impacts Analysis		
Qualitative impacts analysis		
MERA analysis		
Electronic Modeling Evaluation Workbook: SCREEN3	Email	03/18/2020
Electronic Modeling Evaluation Workbook: NonSCREEN3	Not applicable	
PSD modeling protocol	Email	03/18/2020
F. Additional Attachments		

APPENDIX G TCEQ EMEW WORKBOOK

SIMPLE CYCLE TURBINE

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

General

EMEW Version No.: Version 2.3

Purpose Statement:
This workbook is completed by the applicant and submitted to the Texas Commission on Environmental Quality (TCEQ), specifically, the Air Dispersion Modeling Team (ADMT) for review. This workbook is a tool available for all projects using AERSCREEN, AERMOD, or ISC/ISCPrime for an impacts review and its use is required starting June 1, 2019. Provide the workbook with the permit application submittal for any Minor New Source Review project requiring a modeling impacts demonstration.

This workbook follows the guidance outlined in the Air Quality Modeling Guidelines (APDG 6232) which can be found here:

https://www.tceq.texas.gov/assets/public/permitting/air/Modeling/guidance/airquality-mod-guidelines6232.pdf

Workbook Instructions:
1. Save a copy of the workbook to your computer or desktop prior to entering data.
2. Complete all required sections leaving no blanks. You may use the "tab" button or the arrow keys to move to the next available cell. Use "enter" to move down a line. Note: drop-downs are case-sensitive.
3. Fill in the workbook in order, do not skip around as this will cause errors. Use caution if changing a previously entered entry.
4. Not applicable sections of this workbook will be hidden as data is entered. For example, answering "No" to "Is downwash applicable? " will hide these sections of the workbook required only for downwash entry.
5. Email the workbook electronic file (EMEW) and any attachments to the Air Permits Initial Review Team. The subject line should read "Company Name - Permit Number (if known) - NSR Permit Application". Email address: apirt@tceq.texas.gov
6. If printing the EMEW, follow the directions below to create a workbook header.
7. Printing the EMEW is not required for submitting to the Air Permits Division (APD); however, you may need to print it for sending to the regional offices, local programs, and for public access if notice is required. To print the workbook, follow the instructions below. Please be aware, several sheets contain large amounts of data and caution should be taken if printing, such as the Speciated Emissions sheet.
8. Updates may be necessary throughout the review process. Updated workbooks must be submitted in electronic format to APD. For submittal to regional offices, local programs, or public places you only have to print sheets that had updates. Be sure to change the headers accordingly.

Note: Since this will be part of the permit application, follow the instructions in the Form PI-1 General Application on where to send copies of your EMEW and permit application. The Form PI-1 General Application can be found here:
https://www.tceq.texas.gov/permitting/air/guidance/newsourcereview/nsrapp-tools.html

Create Headers Before Printing:
1. Right-click one of the workbook's sheet tabs and "Select All Sheets."
2. Enter the "Page Layout View" by using the navigation ribbon's View > Workbook Views > Page Layout, or by clicking the page layout icon in the lower-right corner of Excel.
3. Add the date, company name, and permit number (if known) to the upper-right header. Note that this may take up to a minute to update your spreadsheet. Select any tab to continue working on the spreadsheet.

Printing Tips:
While APD does not need a hard copy of the full workbook, you may need to print it for sending to the regional offices, local programs, and for public access if notice is required.
1. The default printing setup for each sheet in the workbook is set for the TCEQ preferred format. The print areas are set up to not include the instructions on each sheet.
2. You have access to change all printing settings to fit your needs and printed font size. Some common options include:
   - Change what area you are printing (whole active sheet or a selection);
   - Change the orientation (portrait or landscape);
   - Change the margin size; and
   - Change the scaling (all columns on one sheet, full size, your own custom selection, etc.).

Final Modeling Submittal:
Anytime final modeling files are being submitted the applicant should notify the following that modeling files are being sent: permit reviewer assigned, permit reviewer's supervisor, and the modeler assigned from the initial submittal.
The following options are available for an applicant to provide modeling (or any other files):
1. Applicant can mail or hand deliver the files on an external storage device.
2. Applicant can email files smaller than 25mb.
3. Applicant can transfer files through an FTP site:
   a. Applicant may have their own FTP site and can share the files with TCEQ staff.
   b. Applicants can use the TCEQ FTP site.

Instructions for setting up an account on the TCEQ FTP site are located at:
https://ftps.tceq.texas.gov/help/

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

General

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Acknowledgement:	Select from the drop down:
I acknowledge that I am submitting an authorized TCEQ Electronic Modeling Evaluation Workbook and any necessary attachments. Except for inputting the requested data, I have not changed the TCEQ Electronic Modeling Evaluation Workbook in any way, including but not limited to changing formulas, formatting, content, or protections.	I agree

Administrative Information:	
Data Type:	**Facility Information:**
Project Number (6 digits):	
Permit Number:	
Regulated Entity ID (9 digits):	100825371
Facility Name:	Cedar Bayou Electric Generating Station
Facility Address:	7705 West Bay Road
Facility County (select one):	Chambers
Company Name:	NRG Cedar Bayou 5 LLC
Company Contact Name:	Ms. Colleen Krenek
Company Contact Number:	713-537-5742
Company Contact Email:	colleen.crenek@nrg.com
Modeling Company Name, as applicable:	Power Engineers, Inc.
Modeling Contact Name:	David Castro
Modeling Contact Number:	512-579-3820
Modeling Contact Email:	david.castro@powereng.com
New/Existing Site (select one):	Existing Site
Modeling Date (MM/DD/YYYY):	3/18/2020
Datum Used (select one):	NAD 83
UTM Zone (select one):	15

Sheet Instructions: Indicate in the Table of Contents which sections are applicable and included for this modeling demonstration. Select "X" from the drop down if the item below is included in the workbook. Note: This workbook is only for the following air dispersion models: AERSCREEN, ISC/ISCPrime, and/or AERMOD. If SCREEN3 is used, please use the separate Electronic Modeling Evaluation Workbook (EMEW) for SCREEN3 workbook.

Table of Contents:

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

General

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Included Attachments Instructions: The following are attachments that must be included with any modeling analysis. If providing the plot plan and area map with the permit application, ensure there is also a copy with the EMEW. The copy can be electronic.	**Select an X from the dropdown menu if included:**
Plot Plan: Instructions: Mark all that apply in the attached plot plan. For larger properties or dense source areas, provide multiple zoomed in plot plans that are legible.	
Property/Fence Lines all visible and marked.	X
North arrow included.	X
Clearly marked scale.	X
All sources and buildings are clearly labeled.	Choose an item
Area Map:	
Instructions: Mark all that apply in the attached area map.	
Annotate schools within 3,000ft of source's nearest property line.	X
All property lines are included.	X
Non-industrial receptors are identified.	X
Additional Attachments (as applicable): *Note: These are just a few examples of attachments that may need to be included. There may be others depending on the scope of the modeling analysis.*	**Select an X from the dropdown menu if included:**
Processed Met Data Information	
Excel spreadsheet of processed meteorology data.	Choose an item
Meteorological Files (all input and outputs).	Choose an item
Source Group Descriptions	
Description of modeling source groups (could be in a tabulated format).	X
Modeling Techniques and Scenarios *Provide all justification and discussion on modeling scenarios used for the modeling analyses. The following boxes are examples of approaches that should be provided but is not all inclusive.*	
Discussion on modeling techniques not discussed in workbook.	Choose an item
Justification for exceedance refinements, as applicable.	Choose an item
Discussion and images for worst-case determination, as applicable.	Choose an item
Single Property Line Designation, as applicable	
Include Agreement, Order, and map defining each petitioner.	Choose an item
Post Processing using Unit Impact Multipliers (UIMs)	
Include documentation on any calculations used with the UIMs (i.e., Step 3 of the MERA).	X
Tier 3 NO_2 analysis *If OLM or PVMRM are used, provide all justification and documentation on using this approach.*	
Description of model setup.	Choose an item
Description and justification of model options selected (i.e., NO_2 to NO_x in-stack ratios).	Choose an item
Other Attachments *Provide a list in the box below of additional attachments being provided that are not listed above:*	
PSD Modeling Protocol and State NSR Initial Modeling Summary (includes the "Addtitional Attachments noted above)	X

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

I. Project Information

A. Project Overview: In the box below, give a brief Project Overview. To type or insert text in box, double click in the box below. *Please limit your response to 2000 characters.*

NRG Texas Power LLC (NRG Texas) owns and operates the Cedar Bayou Electric Generating Station (Cedar Bayou Station) in Baytown, Chambers County, Texas. Air emission sources at the Cedar Bayou Station are authorized by several TCEQ Air Permits, various permits by rules (PBRs), and plantwide applicability limit (PAL) authorizations. This PSD/NSR air quality permit application is being submitted to authorize a new electric generating unit and associated equipment. The new facility will operate under the name NRG Cedar Bayou 5 LLC (CB5). The new facility will be either a simple cycle turbine generating unit or a combined cycle generating unit with supplemental fired (duct burners) heat recovery steam generator (HRSG) and one steam turbine.

II. Air Dispersion Modeling Preliminary Information

Instructions: Fill in the information below based on your modeling setup. The selections chosen in this sheet will carry throughout the sheet and workbook. Based on selections below, only portions of the sheet and workbook will be available. Therefore, it is vital the sheet and workbook are filled out in order, do NOT skip around.

For larger text boxes, double click to type or insert text.

A. Type of Model Used: *Select "X" in all that apply*

	AERSCREEN	X	AERMOD

19191 Enter in all applicable Model Version(s).

B. Building Downwash

Yes	Is downwash applicable? *(Select "Yes" or "No")*
4274	Enter BPIP version (AERMOD and ISCPrime only).

C. Type of Analyses: (Select "X" in all that apply)
*PSD projects should submit a protocol and not utilize this form.

X	Minor NSR NAAQS	X	State Property Line
X	Health Effects		

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Company Name: _NRG Cedar Bayou 5 LLC_

D. Constituents Evaluating: (Select "X" in all that apply)

NAAQS: List all pollutants that require a modeling review. *(Select "X" in all that apply)*

X	SO_2		PM_{10}
	CO		$PM_{2.5}$
	Pb	X	NO_2

Both	Identify which averaging periods are being evaluated for NO_2.
Tier 2: ARM 2	Identify the 1-hr NO_2 tier used for the AERMOD or AERSCREEN analyses.
Tier 2: ARM 2	Identify the annual NO_2 tier used for the AERMOD or AERSCREEN analyses.

State Property Line: List all pollutants that require a modeling review. *(Select "X" in all that apply)*

	H_2S	X	SO_2
X	H_2SO_4		

Health Effects: Fill in the Speciated Emissions sheet with all applicable pollutants, CAS numbers, and ESLs.

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

E. Dispersion Options: *If "Urban" has been selected and this project is using AERMOD or AERSCREEN, include the population used. Select "X" in the box to select an option.*

	Urban
X	Rural

Provide any additional justification on the dispersion option selected above:

Default AERMOD option - does not require justification

F. Determination of Surface Roughness: *If AERSCREEN or AERMOD is used, fill out the section below.*

Select basis for surface roughness: AERSURFACE

Select "X" in one of the three surface roughness categories:

	Low	X	Medium
			High

If you are using AERSURFACE, please complete the following section:

13016	AERSURFACE Version Number		
314227	Center UTM Easting (meters)	3292889	Center UTM Northing (meters)
1	Study Radius (km)		
No	Airport? (Select Yes or No)		
No	Continuous Snow Cover (Select Yes or No)		
Average	Surface Moisture (Select Wet, Dry, or Average)		
No	Arid Region? (Select Yes or No)		
Default	Month/Season Assignment		

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Company Name: _NRG Cedar Bayou 5 LLC_

G. Meteorological Data:			
If AERMOD and/or ISC/ISCPrime are selected, please complete the following section:			
3937		Surface Station	
12917		Upper Air Station	
4.9	Meters (m)	Profile Base Elevation (AERMOD only)	
19191		AERMET Version Number	
Yes	Was TCEQ pre-processed data used?	5 Years	Years used
Please enter the year(s) selected for this meteorological data:			
		2011-2015	5 Years
Provide any other justification for Meteorological Data, as applicable.			

H. Receptor Grid:		
For AERMOD or ISC/ISCPrime, fill in the following information on your modeled receptor grid. Note: Receptor grid resolution (tight, fine, medium, coarse) are based on recommended receptor grid spacing per the AQMG, if something outside of this is used, fully describe it below.		
25	Meters (m)	Tight Receptor Spacing
300	Meters (m)	Tight Receptor Distance
100	Meters (m)	Fine Receptor Spacing
1000	Meters (m)	Fine Receptor Distance
500	Meters (m)	Medium Receptor Spacing
5000	Meters (m)	Medium Receptor Distance
1000	Meters (m)	Coarse Receptor Spacing
30000	Meters (m)	Coarse Receptor Distance
Describe any other receptor grid designs (over water, GLC_{ni}, SPLD etc.):		

I. Terrain:		
X	Elevated	
18081	AERMAP Version.	
For additional justification on terrain selection, fill in the box below:		

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Building Downwash

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

Downwash Type	Modeled Building ID	Tank Diameter (m)	Number of Tiers	Maximum Height (m)	Tier 1 Height (m)	Tier 2 Height (m)	Tier 3 Height (m)	Tier 4 Height (m)	Tier 5 Height (m)
Tank	CTNKDW	13.716	1	10.668	10.668				
Tank	CTNKSW	13.716	1	10.668	10.668				
Tank	CTNKRW	10.0584	1	10.668	10.668				
Building	BOIL1_2		1	66.4464	66.4464				
Building	BOIL3		1	64.4652	64.4652				
Building	HRSG42		1	26.0604	26.0604				
Building	HRSG41		1	25.146	25.146				
Building	CT41		1	11.55192	11.55192				
Building	CT42		1	11.55192	11.55192				
Building	STG		1	16.6116	16.6116				
Building	CNTRL4		1	6.096	6.096				
Building	AIRFLT41		2	24.384	11.55192	24.384			
Building	AIRFLT42		2	24.384	11.55192	24.384			
Building	CWT01		1	4.8768	4.8768				
Building	CWT02		1	4.8768	4.8768				
Building	CWT04		1	13.716	13.716				
Building	Unit4A		1	9.144	9.144				
Building	Unit4B		1	9.144	9.144				
Building	SGEN101		1	10.9728	10.9728				
Building	STURB2		1	10.9728	10.9728				
Building	STURB3		3	23.98776	8.9916	16.48968	23.98776		
Building	SGEN353		1	4.572	4.572				
Building	STNKNH3		1	3.048	3.048				
Building	STNKDSL		1	4.572	4.572				
Building	SBLD43		1	6.096	6.096				

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Building Downwash

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Tier 6 Height (m)	Tier 7 Height (m)	Tier 8 Height (m)	Tier 9 Height (m)	Tier 10 Height (m)

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Source Description	Point Source Type	Point Source Justification	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Height [m]	Exit Temperature [K]	Exit Velocity [m/s]
CBY51	SCBY51100	Base	Combustion Turbine 1 (Simple Cycle)	POINT	vertical stack	314227.29	3292888.66	5.18	60.96	713.725	33.108
CBY51	SCBY51080	Medium	Combustion Turbine 1 (Simple Cycle)	POINT	vertical stack	314227.29	3292888.66	5.18	60.96	713.725	29.798
CBY51	SCBY51050	Low	Combustion Turbine 1 (Simple Cycle)	POINT	vertical stack	314227.29	3292888.66	5.18	60.96	713.725	25.034
CBY51	SCBYMS51	MSS	Combustion Turbine 1 (Simple Cycle)	POINT	vertical stack	314227.29	3292888.66	5.18	60.96	713.725	23.654
GAS-HTR	SHTR_GAS	Routine	Gas Heater	POINT	vertical stack	314149.02	3292824.24	4.94	15.24	394.261	7.152
EMGENSC	SCBYEDG5	Readiness	Emergency Diesel Generator	POINT	vertical stack	314261.27	3292782.34	6.35	4.57	726.094	155.968
CBY51-LOV	SCBYLV51	Routine	Unit 1 Lube Oil Vent	POINT	vertical stack	314241.17	3292819.98	3.93	9.14	0.000	0.001
FUG-MSS	SMSSCEMS	Routine	Planned Maintenance Activities Fugitives, CEMS	POINT	vertical stack	314227.29	3292888.66	5.18	60.96	713.725	23.529
FUG-MSS	SMSSFILT	Routine	Planned Maintenance Activities Fugitives, Filter	POINT	ground level fugitive	314210.60	3292822.70	3.39	1.00	0.000	0.001
FUG-MSS	SMSSCAT	Routine	Planned Maintenance Activities Fugitives, Catalyst	POINT	ground level fugitive	314236.50	3292880.57	5.31	1.00	0.000	0.001
CBY1	CBY1	Routine	Unit 1 Steam Boiler, Natural Gas	POINT	vertical stack	313716.60	3292665.10	5.41	65.53	414.817	21.245
CBY2	CBY2	Routine	Unit 2 Steam Boiler, Natural Gas	POINT	vertical stack	313805.10	3292679.30	5.34	65.53	414.817	21.272
CB1-LOV	CBYLOV01	Routine	Lube Oil Vent, Unit 1	POINT	vertical stack	313698.83	3292650.76	5.39	9.14	310.928	1.524
CB2-LOV	CBYLOV02	Routine	Lube Oil Vent, Unit 2	POINT	vertical stack	313827.00	3292673.60	5.34	9.14	310.928	1.524
CBY1EDG	CBYEDG1	Readiness	Emergency Diesel Generator #1	POINT	vertical stack	313759.60	3292673.00	5.38	4.57	783.150	16.154
CBY2EDG	CBYEDG2	Readiness	Emergency Diesel Generator #2	POINT	vertical stack	313776.80	3292676.10	5.36	4.57	783.150	16.154
ACT1	CWT1	Routine	Cooling Tower, Unit 1	POINT	vertical stack	313666.75	3292732.45	5.42	5.11	0.000	10.363
ACT2	CWT2	Routine	Cooling Tower, Unit 2	POINT	vertical stack	313850.65	3292762.35	5.49	5.11	0.000	10.363
CBY FUG	FUG_NH31	Routine	CBY Ammonia Fugitives	POINT	ground level fugitive	313827.00	3292673.60	5.34	1.00	0.000	0.001
MSSFUG	MSSFUG1	Routine	MSS Activities, Units 1&2	POINT	ground level fugitive	313762.92	3292662.18	5.31	1.00	0.000	0.001
CBY41, CBY4CAP	CBY41	Routine	Combustion Turbine 41	POINT	vertical stack	314034.26	3292869.64	6.23	45.72	394.261	26.213
CBY42, CBY4CAP	CBY42	Routine	Combustion Turbine 42	POINT	vertical stack	313991.78	3292865.13	5.88	45.72	394.261	26.213
CBY41, CBY4CAP	CBYMSS41	MSS	Combustion Turbine 41	POINT	vertical stack	314040.05	3292819.44	5.38	45.72	394.261	26.213
CBY42, CBY4CAP	CBYMSS42	MSS	Combustion Turbine 42	POINT	vertical stack	313996.93	3292811.72	6.14	45.72	394.261	26.213
CBY41-LOV	CBYLOV41	Routine	Lube Oil Vent, Turbine 41	POINT	vertical stack	314040.05	3292819.44	5.38	9.14	310.928	1.524
CBY42-LOV	CBYLOV42	Routine	Lube Oil Vent, Turbine 42	POINT	vertical stack	313996.93	3292811.72	6.14	9.14	310.928	1.524
U4ST-LOV	CBYLVST4	Routine	Lube Oil Vent, Unit 4 Steam Turbine	POINT	vertical stack	314087.03	3292806.57	4.89	9.14	310.928	1.524
BS-GEN	GEN_BS	Routine	Black Start Generator	POINT	vertical stack	314082.20	3292741.10	5.74	4.57	783.150	16.154
C-Tower1	CWT4	Routine	Cooling Tower, Unit 4	POINT	vertical stack	313935.58	3292827.90	5.32	13.72	0.000	8.839
FUG-SCR	FUG_NH34	Routine	Fugitives, SCR Piping	POINT	ground level fugitive	314014.10	3292861.06	6.21	1.00	0.000	0.001
MSSFUG	MSSFUG4	Routine	MSS Activities, Unit 4	POINT	ground level fugitive	313987.00	3292861.10	5.84	1.00	0.000	0.001
AB1	AB1	Routine	Auxiliary Boiler 1	POINT	vertical stack	313717.00	3292676.00	5.43	65.53	633.150	7.285
CBAB2N	AB2N	Routine	Auxiliary Boiler 2	POINT	vertical stack	313717.00	3292676.00	5.43	65.53	633.150	7.285
CBAB3N	AB3N	Routine	Auxiliary Boiler 3	POINT	vertical stack	313717.00	3292676.00	5.43	65.53	633.150	7.285

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Source Description	Point Source Type	Point Source Justification	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Height [m]	Exit Temperature [K]	Exit Velocity [m/s]
SCRMSS	MSSSCR4	Routine	MSS Activities - SCR, Unit 4	POINT	ground level fugitive	313827.00	3292673.60	5.34	1.00	0.000	0.001

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Diameter [m]
9.550
9.550
9.550
9.550
0.610
0.305
0.001
9.754
0.001
0.001
7.925
7.925
0.152
0.152
0.229
0.229
4.267
4.267
0.001
0.001
5.486
5.486
5.486
5.486
0.152
0.152
0.152
0.229
4.267
0.001
0.001
4.237
4.237
4.237

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Point Source Parameters

Diameter [m]
0.001

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Calculations

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Footprint of Source Length (m)	Footprint of Source Width (m)	Length of Side (making it a square) SQRT(L * W)	Type of Volume Source (sigma y) *Pick from drop-down*	**Sigma Y** (m)	Vertical Span Min Release (m)	Vertical Span Max Release (m)	Vertical Dimension (m)
FUG-SCR	SFUG_NH35	14.94	33.22	22.28	Single Volume Source	5.18	0.00	25.15	25.15
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
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				0.00		Incomplete			0.00

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Calculations

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Type of Volume Source (sigma z) *Pick from drop-down*	Release Height (middle point of vertical span) (m)	Building Name (if on/adjacent to a building) *Pick from drop-down*	Adjacent Building Height, if applicable (m)	**Sigma Z** (m)
Surface-Based Source	12.57			11.70
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
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	0.00			Incomplete
	0.00			Incomplete

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Parameters

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeled Release Height [m]	Modeled Length X [m]	Lateral Dimension SigmaY [m]	Vertical Dimension SigmaZ [m]	Modeling Scenario	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Source Description
FUG-SCR	SFUG_NH35	12.57	22.28	5.18	11.70	Routine	314230.90	3292864.89	5.38	Ammonia Component Fugitives

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Parameters

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Volume Source Size Justification
Piping surrounding SCR structure

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
CBY51	SCBY51100	Base	Generic	1-hr			No	1.00
CBY51	SCBY51080	Medium	Generic	1-hr			No	1.00
CBY51	SCBY51050	Low	Generic	1-hr			No	1.00
FUG-MSS	SMSSCAT	Routine	Generic	1-hr			No	1.00
CBY51	SCBY51100	Base	NOx	1-hr	NAAQS	SIL analysis	No	34.65
CBY51	SCBY51080	Medium	NOx	1-hr	NAAQS	SIL analysis	No	30.16
CBY51	SCBY51050	Low	NOx	1-hr	NAAQS	SIL analysis	No	21.29
CBY51	SCBYMS51	MSS	NOx	1-hr	NAAQS	SIL analysis	No	38.10
GAS-HTR	SHTR_GAS	Routine	NOx	1-hr	NAAQS	SIL analysis	No	0.116
EMGENSC	SCBYEDG5	Readiness	NOx	1-hr	NAAQS	SIL analysis	Yes	0.0131
FUG-MSS	SMSSCEMS	Routine	NOx	1-hr	NAAQS	SIL analysis	No	1.19E-04
CBY51	SCBY51100	Base	NOx	Annual	NAAQS	SIL analysis	No	14.45
CBY51	SCBYMS51	MSS	NOx	Annual	NAAQS	SIL analysis	No	0.420
GAS-HTR	SHTR_GAS	Routine	NOx	Annual	NAAQS	SIL analysis	No	0.116
EMGENSC	SCBYEDG5	Readiness	NOx	Annual	NAAQS	SIL analysis	No	0.164
FUG-MSS	SMSSCEMS	Routine	NOx	Annual	NAAQS	SIL analysis	No	2.73E-07
CBY51	SCBY51100	Base	SO2	1-hr	NAAQS	SIL analysis	No	10.81
CBY51	SCBY51080	Medium	SO2	1-hr	NAAQS	SIL analysis	No	9.44
CBY51	SCBY51050	Low	SO2	1-hr	NAAQS	SIL analysis	No	6.64
GAS-HTR	SHTR_GAS	Routine	SO2	1-hr	NAAQS	SIL analysis	No	0.0270
EMGENSC	SCBYEDG5	Readiness	SO2	1-hr	NAAQS	SIL analysis	Yes	1.14E-05
CBY51	SCBY51100	Base	SO2	3-hr	NAAQS	SIL analysis	No	10.81
CBY51	SCBY51080	Medium	SO2	3-hr	NAAQS	SIL analysis	No	9.44
CBY51	SCBY51050	Low	SO2	3-hr	NAAQS	SIL analysis	No	6.64
GAS-HTR	SHTR_GAS	Routine	SO2	3-hr	NAAQS	SIL analysis	No	0.0270
EMGENSC	SCBYEDG5	Readiness	SO2	3-hr	NAAQS	SIL analysis	No	0.00208
CBY51	SCBY51100	Base	SO2	1-hr	State Property Line	Site Wide	No	10.81
CBY51	SCBY51080	Medium	SO2	1-hr	State Property Line	Site Wide	No	9.44
CBY51	SCBY51050	Low	SO2	1-hr	State Property Line	Site Wide	No	6.64
GAS-HTR	SHTR_GAS	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.0270
EMGENSC	SCBYEDG5	Readiness	SO2	1-hr	State Property Line	Site Wide	No	0.00625
CBY1	CBY1	Routine	SO2	1-hr	State Property Line	Site Wide	No	112.00
CBY2	CBY2	Routine	SO2	1-hr	State Property Line	Site Wide	No	112.00
CBY1EDG	CBYEDG1	Readiness	SO2	1-hr	State Property Line	Site Wide	No	0.190
CBY2EDG	CBYEDG2	Readiness	SO2	1-hr	State Property Line	Site Wide	No	0.190
CBY41, CBY4CAP	CBY41	Routine	SO2	1-hr	State Property Line	Site Wide	No	17.70
CBY42, CBY4CAP	CBY42	Routine	SO2	1-hr	State Property Line	Site Wide	No	17.70
BS-GEN	GEN_BS	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.190
MSSFUG	MSSFUG4	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.0100
AB1	AB1	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.150
CBAB2N	AB2N	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.210
CBAB3N	AB3N	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.210
CBY51	SCBY51100	Base	H2SO4	1-hr	State Property Line	Site Wide	No	7.12
CBY51	SCBY51080	Medium	H2SO4	1-hr	State Property Line	Site Wide	No	6.22

Texas Commission on Environmental Quality

Date: _03/18/20_
Permit #: ___TBD__

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
CBY51	SCBY51050	Low	H2SO4	1-hr	State Property Line	Site Wide	No	4.37
CBY41, CBY4CAP	CBY41	Routine	H2SO4	1-hr	State Property Line	Site Wide	No	2.70

Texas Commission on Environmental Quality

Date: _03/18/20_
Permit #: ___TBD__

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
CBY42, CBY4CAP	CBY42	Routine	H2SO4	1-hr	State Property Line	Site Wide	No	2.70
CBY51	SCBY51100	Base	H2SO4	24-hr	State Property Line	Site Wide	No	7.12
CBY51	SCBY51080	Medium	H2SO4	24-hr	State Property Line	Site Wide	No	6.22
CBY51	SCBY51050	Low	H2SO4	24-hr	State Property Line	Site Wide	No	4.37
CBY41, CBY4CAP	CBY41	Routine	H2SO4	24-hr	State Property Line	Site Wide	No	2.70
CBY42, CBY4CAP	CBY42	Routine	H2SO4	24-hr	State Property Line	Site Wide	No	2.70

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
CBY51	SCBY51100	Generic Modeling	No	
CBY51	SCBY51080	Generic Modeling	No	
CBY51	SCBY51050	Generic Modeling	No	
FUG-MSS	SMSSCAT	Generic Modeling	No	
CBY51	SCBY51100	Project increase	No	
CBY51	SCBY51080	Project increase	No	
CBY51	SCBY51050	Project increase	No	
CBY51	SCBYMS51	Project increase	No	
GAS-HTR	SHTR_GAS	Project increase	No	
EMGENSC	SCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
FUG-MSS	SMSSCEMS	Project increase	No	
CBY51	SCBY51100	Project increase	No	
CBY51	SCBYMS51	Project increase	No	
GAS-HTR	SHTR_GAS	Project increase	No	
EMGENSC	SCBYEDG5	Project increase	No	
FUG-MSS	SMSSCEMS	Project increase	No	
CBY51	SCBY51100	Project increase	No	
CBY51	SCBY51080	Project increase	No	
CBY51	SCBY51050	Project increase	No	
GAS-HTR	SHTR_GAS	Project increase	No	
EMGENSC	SCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
CBY51	SCBY51100	Project increase	No	
CBY51	SCBY51080	Project increase	No	
CBY51	SCBY51050	Project increase	No	
GAS-HTR	SHTR_GAS	Project increase	No	
EMGENSC	SCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
CBY51	SCBY51100	Sitewide total	No	
CBY51	SCBY51080	Sitewide total	No	
CBY51	SCBY51050	Sitewide total	No	
GAS-HTR	SHTR_GAS	Sitewide total	No	
EMGENSC	SCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
CBY1	CBY1	Sitewide total	No	
CBY2	CBY2	Sitewide total	No	
CBY1EDG	CBYEDG1	Emergency engine tested once per month no more than 30 min	No	
CBY2EDG	CBYEDG2	Emergency engine tested once per month no more than 30 min	No	
CBY41, CBY4CAP	CBY41	Sitewide total	No	
CBY42, CBY4CAP	CBY42	Sitewide total	No	
BS-GEN	GEN_BS	Sitewide total	No	
MSSFUG	MSSFUG4	Sitewide total	No	
AB1	AB1	Sitewide total	No	
CBAB2N	AB2N	Sitewide total	No	
CBAB3N	AB3N	Sitewide total	No	
CBY51	SCBY51100	Sitewide total	No	
CBY51	SCBY51080	Sitewide total	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
CBY51	SCBY51050	Sitewide total	No	
CBY41, CBY4CAP	CBY41	Sitewide total	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
CBY42, CBY4CAP	CBY42	Sitewide total	No	
CBY51	SCBY51100	Sitewide total	No	
CBY51	SCBY51080	Sitewide total	No	
CBY51	SCBY51050	Sitewide total	No	
CBY41, CBY4CAP	CBY41	Sitewide total	No	
CBY42, CBY4CAP	CBY42	Sitewide total	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
FUG-SCR	SFUG_NH35	Routine	Generic	1-hr			No	1.00

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Volume Source Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
FUG-SCR	SFUG_NH35	Generic Modeling	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Speciated Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Speciated Emissions by Model ID

CAS #	Chemical Species	Other Species	Short-Term ESL (µg/m³)	Long-Term ESL (µg/m³)				
7664-41-7	ammonia		180	92				
7783-20-2	ammonium sulfate		Must Meet NAAQS	Must Meet NAAQS				

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Speciated Emissions

Speciated Emissions b

CAS #																
7664-41-7																
7783-20-2																

Texas Commission on Environmental Quality

Date: _03/18/20_
Permit #: ___TBD__

Electronic Modeling Evaluation Workbook (EMEW)

Combined Emissions

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent
CBY51	SCBY51100	Base	Generic	1-hr			No
CBY51	SCBY51080	Medium	Generic	1-hr			No
CBY51	SCBY51050	Low	Generic	1-hr			No
FUG-MSS	SMSSCAT	Routine	Generic	1-hr			No
CBY51	SCBY51100	Base	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	SCBY51080	Medium	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	SCBY51050	Low	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	SCBYMS51	MSS	NOx	1-hr	NAAQS	SIL analysis	No
GAS-HTR	SHTR_GAS	Routine	NOx	1-hr	NAAQS	SIL analysis	No
EMGENSC	SCBYEDG5	Readiness	NOx	1-hr	NAAQS	SIL analysis	Yes
FUG-MSS	SMSSCEMS	Routine	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	SCBY51100	Base	NOx	Annual	NAAQS	SIL analysis	No
CBY51	SCBYMS51	MSS	NOx	Annual	NAAQS	SIL analysis	No
GAS-HTR	SHTR_GAS	Routine	NOx	Annual	NAAQS	SIL analysis	No
EMGENSC	SCBYEDG5	Readiness	NOx	Annual	NAAQS	SIL analysis	No
FUG-MSS	SMSSCEMS	Routine	NOx	Annual	NAAQS	SIL analysis	No
CBY51	SCBY51100	Base	SO2	1-hr	NAAQS	SIL analysis	No
CBY51	SCBY51080	Medium	SO2	1-hr	NAAQS	SIL analysis	No
CBY51	SCBY51050	Low	SO2	1-hr	NAAQS	SIL analysis	No
GAS-HTR	SHTR_GAS	Routine	SO2	1-hr	NAAQS	SIL analysis	No
EMGENSC	SCBYEDG5	Readiness	SO2	1-hr	NAAQS	SIL analysis	Yes
CBY51	SCBY51100	Base	SO2	3-hr	NAAQS	SIL analysis	No
CBY51	SCBY51080	Medium	SO2	3-hr	NAAQS	SIL analysis	No
CBY51	SCBY51050	Low	SO2	3-hr	NAAQS	SIL analysis	No
GAS-HTR	SHTR_GAS	Routine	SO2	3-hr	NAAQS	SIL analysis	No
EMGENSC	SCBYEDG5	Readiness	SO2	3-hr	NAAQS	SIL analysis	No
CBY51	SCBY51100	Base	SO2	1-hr	State Property Line	Site Wide	No
CBY51	SCBY51080	Medium	SO2	1-hr	State Property Line	Site Wide	No
CBY51	SCBY51050	Low	SO2	1-hr	State Property Line	Site Wide	No
GAS-HTR	SHTR_GAS	Routine	SO2	1-hr	State Property Line	Site Wide	No
EMGENSC	SCBYEDG5	Readiness	SO2	1-hr	State Property Line	Site Wide	No
CBY1	CBY1	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY2	CBY2	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY1EDG	CBYEDG1	Readiness	SO2	1-hr	State Property Line	Site Wide	No
CBY2EDG	CBYEDG2	Readiness	SO2	1-hr	State Property Line	Site Wide	No
CBY41, CBY4CAP	CBY41	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY42, CBY4CAP	CBY42	Routine	SO2	1-hr	State Property Line	Site Wide	No
BS-GEN	GEN_BS	Routine	SO2	1-hr	State Property Line	Site Wide	No
MSSFUG	MSSFUG4	Routine	SO2	1-hr	State Property Line	Site Wide	No
AB1	AB1	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBAB2N	AB2N	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBAB3N	AB3N	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY51	SCBY51100	Base	H2SO4	1-hr	State Property Line	Site Wide	No
CBY51	SCBY51080	Medium	H2SO4	1-hr	State Property Line	Site Wide	No
CBY51	SCBY51050	Low	H2SO4	1-hr	State Property Line	Site Wide	No
CBY41, CBY4CAP	CBY41	Routine	H2SO4	1-hr	State Property Line	Site Wide	No
CBY42, CBY4CAP	CBY42	Routine	H2SO4	1-hr	State Property Line	Site Wide	No
CBY51	SCBY51100	Base	H2SO4	24-hr	State Property Line	Site Wide	No
CBY51	SCBY51080	Medium	H2SO4	24-hr	State Property Line	Site Wide	No
CBY51	SCBY51050	Low	H2SO4	24-hr	State Property Line	Site Wide	No
CBY41, CBY4CAP	CBY41	Routine	H2SO4	24-hr	State Property Line	Site Wide	No
CBY42, CBY4CAP	CBY42	Routine	H2SO4	24-hr	State Property Line	Site Wide	No
FUG-SCR	SFUG_NH35	Routine	Generic	1-hr			No

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Combined Emissions

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Source Type	Modeled Emission Rate [lb/hr]
Point	1.00
Point	1.00
Point	1.00
Point	1.00
Point	34.65
Point	30.16
Point	21.29
Point	38.10
Point	0.12
Point	0.01
Point	0.00
Point	14.45
Point	0.42
Point	0.12
Point	0.16
Point	0.00
Point	10.81
Point	9.44
Point	6.64
Point	0.03
Point	0.00
Point	10.81
Point	9.44
Point	6.64
Point	0.03
Point	0.00
Point	10.81
Point	9.44
Point	6.64
Point	0.03
Point	0.01
Point	112.00
Point	112.00
Point	0.19
Point	0.19
Point	17.70
Point	17.70
Point	0.19
Point	0.01
Point	0.15
Point	0.21
Point	0.21
Point	7.12
Point	6.22
Point	4.37
Point	2.70
Point	2.70
Point	7.12
Point	6.22
Point	4.37
Point	2.70
Point	2.70
Volume	1.00

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Intermittent Sources

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Pollutant	Review Context	Modeling Scenario	Modeled Emission Rate (lb/hr)	Emergency Engine?	Maximum Emission Rate (lb/hr)	# Events per year	Hours per Event	Hours per Year
EMGENSC	SCBYEDG5	NOx	SIL analysis	Readiness	0.0131	Yes	14.34	12	0.5	6
EMGENSC	SCBYEDG5	SO2	SIL analysis	Readiness	1.14E-05	Yes	0.0125	12	0.5	6
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Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Intermittent Sources

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Calculated emission rate (lb/hr)	List Intermittent Sources operating simultaneously	Describe any other justification for intermittent
EMGENSC	SCBYEDG5	0.0131	no other intermittent sources operating	
EMGENSC	SCBYEDG5	1.14E-05	no other intermittent sources operating	
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Date: _03/18/20_
Permit #: ___TBD__

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Modeling Scenarios

Company Name: _NRG Cedar Bayou 5 LLC_

Modeling Scenario	Scenario Description:
Base	Noted turbine at full load
Low	Noted turbine at low load
Medium	Noted turbine at medium load
MSS	Noted turbine at startup/shutdown
Readiness	Noted emergency engine at testing
Routine	Project and existing sources at normal operations

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

NAAQS-SPL Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Table 1. Project-Related Modeling Results for State Property Line

Pollutant	Averaging Time	GLCmax (µg/m^3)	De Minimis (µg/m^3)
SO_2	1-hr		20.42
H_2SO_4	1-hr		1
H_2SO_4	24-hr		0.3
H_2S	1-hr		2.16 *(If property is residential, recreational, business, or commercial)*
H_2S	1-hr		3.24 *(If property is not residential, recreational, business, or commercial)*

Table 2. Site-wide Modeling Results for State Property Line

Pollutant	Averaging Time	GLCmax (µg/m^3)	Standard (µg/m^3)
SO_2	1-hr	105.35363	1021
H_2SO_4	1-hr	0.869	50
H_2SO_4	24-hr	0.467	15
H_2S	1-hr		108 *(If property is residential, recreational, business, or commercial)*
H_2S	1-hr		162 *(If property is not residential, recreational, business, or commercial)*

Table 3. Modeling Results for Minor NSR De Minimis

Pollutant	Averaging Time	GLCmax (µg/m^3)	De Minimis (µg/m^3)
SO_2	1-hr	0.653	7.8*
SO_2	3-hr	0.461	25
SO_2	24-hr		5
SO_2	Annual		1
PM_{10}	24-hr		5
NO_2	1-hr	2.53355	7.5**
NO_2	Annual	0.0881	1
CO	1-hr		2000
CO	8-hr		500

Additional information for the De Minimis values listed above can be found at:
* https://www.epa.gov/sites/production/files/2015-07/documents/appwso2.pdf
** https://www.tceq.texas.gov/assets/public/permitting/air/memos/guidance_1hr_no2naaqs.pdf

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

NAAQS-SPL Modeling Results

Table 4. $PM_{2.5}$ Modeling Results for Minor NSR De Minimis

Pollutant	Averaging Time	GLCmax (µg/m³)	Secondary $PM_{2.5}$ Contribution (µg/m³)	Total Conc. = Secondary $PM_{2.5}$ + GLCmax (µg/m³)
$PM_{2.5}$	24-hr		0	0.00000
$PM_{2.5}$	Annual		0	0.00000

Additional information for the De Minimis values listed above can be found at:
* https://www.tceq.texas.gov/permitting/air/modeling/epa-mod-guidance.html

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

NAAQS-SPL Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Table 5. Total Concentrations for Minor NSR NAAQS (Concentrations > De Minimis)

Pollutant	Averaging Time	GLCmax (µg/m^3)	Background (µg/m^3)	Total Conc. = [Background + GLCmax] (µg/m^3)
SO_2	1-hr		0	0
SO_2	3-hr		0	0
SO_2	24-hr		0	0
SO_2	Annual		0	0
PM_{10}	24-hr		0	0
Pb	3-mo		0	0
NO_2	1-hr		0	0
NO_2	Annual		0	0
CO	1-hr		0	0
CO	8-hr		0	0

De Minimis ($\mu g/m^3$)
1.2*
0.2*

Standard (µg/m^3)
196
1300
365
80
150
0.15
188
100
40000
10000

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

NAAQS-SPL Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Table 6. Total Concentrations for Minor NSR NAAQS (Concentrations > De Minimis)

Pollutant	Averaging Time	GLCmax (μg/m^3)	Secondary $PM_{2.5}$ Contribution (μg/m^3)	Background (μg/m^3)
$PM_{2.5}$	24-hr		0	0
$PM_{2.5}$	Annual		0	0

Total Conc. = [Background + Secondary + GLCmax] (µg/m³)	Standard (µg/m³)
0	35
0	12

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Unit Impact Multipliers

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Averaging Time	GLCmax ($\mu g/m^3$ per lb/hr)	GLCmax ($\mu g/m^3$ per tpy)
CBY51	SCBY51100	Base	1-hr	0.0225	1.50E-07
CBY51	SCBY51080	Medium	1-hr	0.0253	1.70E-07
CBY51	SCBY51050	Low	1-hr	0.0325	2.15E-07
FUG-MSS	SMSSCAT	Routine	1-hr	566.02	0.00775
FUG-SCR	SFUG_NH35	Routine	1-hr	123.84	0.00219

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Health Effect Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

Modeled Health Effect Results (MERA Guidance):				Step 3	Step 4: Production		Step 4: MSS
Chemical Species	CAS Number	Averaging Time	ESL [µg/m^3]	10% ESL Step 3 Modeled GLCmax [µg/m^3]	25 % ESL Step 4 Production GLCmax since most recent site wide modeling [µg/m^3]	10% ESL Step 4 Production Project Only GLCmax [µg/m^3]	50% ESL Step 4 MSS GLCmax since most recent site wide modeling [µg/m^3]
ammonia	7664-41-7	1-hr	180	6.50			

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Health Effect Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

Modeled Hea		Step 5: MSS Only	Step 5: Hours of Exceedance				Step 6
Chemical Species	25% ESL Step 4 MSS Project Only GLCmax [μg/m^3]	Full ESL Step 5 GLCmax [μg/m^3]	*1X ESL GLCmax* Step 5 MSS Hours of Exceedance	*2X ESL GLCmax* Step 5 MSS Hours of Exceedance	*4X ESL GLCmax* Step 5 MSS Hours of Exceedance	*10X ESL GLCmax* Step 5 MSS Hours of Exceedance	Was Step 6 relied on to fall out of the MERA?
ammonia							Yes (Verify with Permit Reviewer)

COMBINED CYCLE TURBINE

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

General

EMEW Version No.: Version 2.3

Purpose Statement:
This workbook is completed by the applicant and submitted to the Texas Commission on Environmental Quality (TCEQ), specifically, the Air Dispersion Modeling Team (ADMT) for review. This workbook is a tool available for all projects using AERSCREEN, AERMOD, or ISC/ISCPrime for an impacts review and its use is required starting June 1, 2019. Provide the workbook with the permit application submittal for any Minor New Source Review project requiring a modeling impacts demonstration.

This workbook follows the guidance outlined in the Air Quality Modeling Guidelines (APDG 6232) which can be found here:

https://www.tceq.texas.gov/assets/public/permitting/air/Modeling/guidance/airquality-mod-guidelines6232.pdf

Workbook Instructions:
1. Save a copy of the workbook to your computer or desktop prior to entering data.
2. Complete all required sections leaving no blanks. You may use the "tab" button or the arrow keys to move to the next available cell. Use "enter" to move down a line. Note: drop-downs are case-sensitive.
3. Fill in the workbook in order, do not skip around as this will cause errors. Use caution if changing a previously entered entry.
4. Not applicable sections of this workbook will be hidden as data is entered. For example, answering "No" to "Is downwash applicable? " will hide these sections of the workbook required only for downwash entry.
5. Email the workbook electronic file (EMEW) and any attachments to the Air Permits Initial Review Team. The subject line should read "Company Name - Permit Number (if known) - NSR Permit Application". Email address: apirt@tceq.texas.gov
6. If printing the EMEW, follow the directions below to create a workbook header.
7. Printing the EMEW is not required for submitting to the Air Permits Division (APD); however, you may need to print it for sending to the regional offices, local programs, and for public access if notice is required. To print the workbook, follow the instructions below. Please be aware, several sheets contain large amounts of data and caution should be taken if printing, such as the Speciated Emissions sheet.
8. Updates may be necessary throughout the review process. Updated workbooks must be submitted in electronic format to APD. For submittal to regional offices, local programs, or public places you only have to print sheets that had updates. Be sure to change the headers accordingly.

Note: Since this will be part of the permit application, follow the instructions in the Form PI-1 General Application on where to send copies of your EMEW and permit application. The Form PI-1 General Application can be found here: https://www.tceq.texas.gov/permitting/air/guidance/newsourcereview/nsrapp-tools.html

Create Headers Before Printing:
1. Right-click one of the workbook's sheet tabs and "Select All Sheets."
2. Enter the "Page Layout View" by using the navigation ribbon's View > Workbook Views > Page Layout, or by clicking the page layout icon in the lower-right corner of Excel.
3. Add the date, company name, and permit number (if known) to the upper-right header. Note that this may take up to a minute to update your spreadsheet. Select any tab to continue working on the spreadsheet.

Printing Tips:
While APD does not need a hard copy of the full workbook, you may need to print it for sending to the regional offices, local programs, and for public access if notice is required.
1. The default printing setup for each sheet in the workbook is set for the TCEQ preferred format. The print areas are set up to not include the instructions on each sheet.
2. You have access to change all printing settings to fit your needs and printed font size. Some common options include:
   - Change what area you are printing (whole active sheet or a selection);
   - Change the orientation (portrait or landscape);
   - Change the margin size; and
   - Change the scaling (all columns on one sheet, full size, your own custom selection, etc.).

Final Modeling Submittal:
Anytime final modeling files are being submitted the applicant should notify the following that modeling files are being sent: permit reviewer assigned, permit reviewer's supervisor, and the modeler assigned from the initial submittal.
The following options are available for an applicant to provide modeling (or any other files):
1. Applicant can mail or hand deliver the files on an external storage device.
2. Applicant can email files smaller than 25mb.
3. Applicant can transfer files through an FTP site:
   a. Applicant may have their own FTP site and can share the files with TCEQ staff.
   b. Applicants can use the TCEQ FTP site.

Instructions for setting up an account on the TCEQ FTP site are located at:
https://ftps.tceq.texas.gov/help/

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

General

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Acknowledgement:	Select from the drop down:
I acknowledge that I am submitting an authorized TCEQ Electronic Modeling Evaluation Workbook and any necessary attachments. Except for inputting the requested data, I have not changed the TCEQ Electronic Modeling Evaluation Workbook in any way, including but not limited to changing formulas, formatting, content, or protections.	I agree

Administrative Information:	
Data Type:	**Facility Information:**
Project Number (6 digits):	
Permit Number:	
Regulated Entity ID (9 digits):	100825371
Facility Name:	Cedar Bayou Electric Generating Station
Facility Address:	7705 West Bay Road
Facility County (select one):	Chambers
Company Name:	NRG Cedar Bayou 5 LLC
Company Contact Name:	Ms. Colleen Krenek
Company Contact Number:	713-537-5742
Company Contact Email:	colleen.crenek@nrg.com
Modeling Company Name, as applicable:	Power Engineers, Inc.
Modeling Contact Name:	David Castro
Modeling Contact Number:	512-579-3820
Modeling Contact Email:	david.castro@powereng.com
New/Existing Site (select one):	Existing Site
Modeling Date (MM/DD/YYYY):	3/18/2020
Datum Used (select one):	NAD 83
UTM Zone (select one):	15

Sheet Instructions: Indicate in the Table of Contents which sections are applicable and included for this modeling demonstration. Select "X" from the drop down if the item below is included in the workbook. Note: This workbook is only for the following air dispersion models: AERSCREEN, ISC/ISCPrime, and/or AERMOD. If SCREEN3 is used, please use the separate Electronic Modeling Evaluation Workbook (EMEW) for SCREEN3 workbook.

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Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

General

Date: _03/18/20_
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Company Name: _NRG Cedar Bayou 5 LLC_

Included Attachments Instructions: The following are attachments that must be included with any modeling analysis. If providing the plot plan and area map with the permit application, ensure there is also a copy with the EMEW. The copy can be electronic.	**Select an X from the dropdown menu if included:**
Plot Plan: Instructions: Mark all that apply in the attached plot plan. For larger properties or dense source areas, provide multiple zoomed in plot plans that are legible.	
Property/Fence Lines all visible and marked.	X
North arrow included.	X
Clearly marked scale.	X
All sources and buildings are clearly labeled.	Choose an item
Area Map:	
Instructions: Mark all that apply in the attached area map.	
Annotate schools within 3,000ft of source's nearest property line.	X
All property lines are included.	X
Non-industrial receptors are identified.	X
Additional Attachments (as applicable): *Note: These are just a few examples of attachments that may need to be included. There may be others depending on the scope of the modeling analysis.*	**Select an X from the dropdown menu if included:**
Processed Met Data Information	
Excel spreadsheet of processed meteorology data.	Choose an item
Meteorological Files (all input and outputs).	Choose an item
Source Group Descriptions	
Description of modeling source groups (could be in a tabulated format).	X
Modeling Techniques and Scenarios *Provide all justification and discussion on modeling scenarios used for the modeling analyses. The following boxes are examples of approaches that should be provided but is not all inclusive.*	
Discussion on modeling techniques not discussed in workbook.	Choose an item
Justification for exceedance refinements, as applicable.	Choose an item
Discussion and images for worst-case determination, as applicable.	Choose an item
Single Property Line Designation, as applicable	
Include Agreement, Order, and map defining each petitioner.	Choose an item
Post Processing using Unit Impact Multipliers (UIMs)	
Include documentation on any calculations used with the UIMs (i.e., Step 3 of the MERA).	X
Tier 3 NO_2 analysis *If OLM or PVMRM are used, provide all justification and documentation on using this approach.*	
Description of model setup.	Choose an item
Description and justification of model options selected (i.e., NO_2 to NO_x in-stack ratios).	Choose an item
Other Attachments *Provide a list in the box below of additional attachments being provided that are not listed above:*	
PSD Modeling Protocol and State NSR Initial Modeling Summary (includes the "Addtitional Attachments noted above)	X

Texas Commission on Environmental Quality

Date: _03/18/20_
Permit #: ___TBD__

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Company Name: _NRG Cedar Bayou 5 LLC_

I. Project Information

A. Project Overview: In the box below, give a brief Project Overview. To type or insert text in box, double click in the box below. *Please limit your response to 2000 characters.*

NRG Texas Power LLC (NRG Texas) owns and operates the Cedar Bayou Electric Generating Station (Cedar Bayou Station) in Baytown, Chambers County, Texas. Air emission sources at the Cedar Bayou Station are authorized by several TCEQ Air Permits, various permits by rules (PBRs), and plantwide applicability limit (PAL) authorizations. This PSD/NSR air quality permit application is being submitted to authorize a new electric generating unit and associated equipment. The new facility will operate under the name NRG Cedar Bayou 5 LLC (CB5). The new facility will be either a simple cycle turbine generating unit or a combined cycle generating unit with supplemental fired (duct burners) heat recovery steam generator (HRSG) and one steam turbine.

II. Air Dispersion Modeling Preliminary Information

Instructions: Fill in the information below based on your modeling setup. The selections chosen in this sheet will carry throughout the sheet and workbook. Based on selections below, only portions of the sheet and workbook will be available. Therefore, it is vital the sheet and workbook are filled out in order, do NOT skip around.

For larger text boxes, double click to type or insert text.

A. Type of Model Used: *Select "X" in all that apply*

	AERSCREEN	X	AERMOD
19191	Enter in all applicable Model Version(s).		

B. Building Downwash

Yes	Is downwash applicable? *(Select "Yes" or "No")*
4274	Enter BPIP version (AERMOD and ISCPrime only).

C. Type of Analyses: (Select "X" in all that apply)
*PSD projects should submit a protocol and not utilize this form.

X	Minor NSR NAAQS	X	State Property Line
X	Health Effects		

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Company Name: _NRG Cedar Bayou 5 LLC_

D. Constituents Evaluating: (Select "X" in all that apply)			
NAAQS: List all pollutants that require a modeling review. *(Select "X" in all that apply)*			
X	SO_2		PM_{10}
	CO		$PM_{2.5}$
	Pb	X	NO_2
Both	Identify which averaging periods are being evaluated for NO_2.		
Tier 2: ARM 2	Identify the 1-hr NO_2 tier used for the AERMOD or AERSCREEN analyses.		
Tier 2: ARM 2	Identify the annual NO_2 tier used for the AERMOD or AERSCREEN analyses.		
State Property Line: List all pollutants that require a modeling review. *(Select "X" in all that apply)*			
	H_2S	X	SO_2
X	H_2SO_4		
Health Effects: Fill in the Speciated Emissions sheet with all applicable pollutants, CAS numbers, and ESLs.			

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Company Name: _NRG Cedar Bayou 5 LLC_

E. Dispersion Options: *If "Urban" has been selected and this project is using AERMOD or AERSCREEN, include the population used. Select "X" in the box to select an option.*

	Urban
X	Rural

Provide any additional justification on the dispersion option selected above:

Default AERMOD option - does not require justification

F. Determination of Surface Roughness: *If AERSCREEN or AERMOD is used, fill out the section below.*

Select basis for surface roughness: AERSURFACE

Select "X" in one of the three surface roughness categories:

	Low	X	Medium
			High

If you are using AERSURFACE, please complete the following section:

13016	AERSURFACE Version Number		
314227	Center UTM Easting (meters)	3292889	Center UTM Northing (meters)
1	Study Radius (km)		
No	Airport? (Select Yes or No)		
No	Continuous Snow Cover (Select Yes or No)		
Average	Surface Moisture (Select Wet, Dry, or Average)		
No	Arid Region? (Select Yes or No)		
Default	Month/Season Assignment		

G. Meteorological Data:			
If AERMOD and/or ISC/ISCPrime are selected, please complete the following section:			
3937		Surface Station	
12917		Upper Air Station	
4.9	Meters (m)	Profile Base Elevation (AERMOD only)	
19191		AERMET Version Number	
Yes	Was TCEQ pre-processed data used?	5 Years	Years used
Please enter the year(s) selected for this meteorological data:			
		2011-2015	5 Years
Provide any other justification for Meteorological Data, as applicable.			

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Model Options

Company Name: _NRG Cedar Bayou 5 LLC_

H. Receptor Grid:		
For AERMOD or ISC/ISCPrime, fill in the following information on your modeled receptor grid. Note: Receptor grid resolution (tight, fine, medium, coarse) are based on recommended receptor grid spacing per the AQMG, if something outside of this is used, fully describe it below.		
25	Meters (m)	Tight Receptor Spacing
300	Meters (m)	Tight Receptor Distance
100	Meters (m)	Fine Receptor Spacing
1000	Meters (m)	Fine Receptor Distance
500	Meters (m)	Medium Receptor Spacing
5000	Meters (m)	Medium Receptor Distance
1000	Meters (m)	Coarse Receptor Spacing
30000	Meters (m)	Coarse Receptor Distance
Describe any other receptor grid designs (over water, GLC_{ni}, SPLD etc.):		

I. Terrain:		
X	Elevated	
18081	AERMAP Version.	
For additional justification on terrain selection, fill in the box below:		

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Building Downwash

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

Downwash Type	Modeled Building ID	Tank Diameter (m)	Number of Tiers	Maximum Height (m)	Tier 1 Height (m)	Tier 2 Height (m)	Tier 3 Height (m)	Tier 4 Height (m)	Tier 5 Height (m)
Tank	CTNKDW	13.716	1	10.668	10.668				
Tank	CTNKSW	13.716	1	10.668	10.668				
Tank	CTNKRW	10.0584	1	10.668	10.668				
Building	BOIL1_2		1	66.4464	66.4464				
Building	BOIL3		1	64.4652	64.4652				
Building	HRSG42		1	26.0604	26.0604				
Building	HRSG41		1	25.146	25.146				
Building	CT41		1	11.55192	11.55192				
Building	CT42		1	11.55192	11.55192				
Building	STG		1	16.6116	16.6116				
Building	CNTRL4		1	6.096	6.096				
Building	AIRFLT41		2	24.384	11.55192	24.384			
Building	AIRFLT42		2	24.384	11.55192	24.384			
Building	CWT01		1	4.8768	4.8768				
Building	CWT02		1	4.8768	4.8768				
Building	CWT04		1	13.716	13.716				
Building	Unit4A		1	9.144	9.144				
Building	Unit4B		1	9.144	9.144				
Building	CGEN101		1	12.00912	12.00912				
Building	CHRSG		3	33.9852	10.9728	22.479	33.9852		
Building	CGEN353		1	4.572	4.572				
Building	CAUX353		1	4.572	4.572				
Building	CTNKDSL		1	4.572	4.572				
Building	CADMN351		1	6.096	6.096				
Building	CCWT5		1	12.192	12.192				

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Electronic Modeling Evaluation Workbook (EMEW)

Building Downwash

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Tier 6 Height (m)	Tier 7 Height (m)	Tier 8 Height (m)	Tier 9 Height (m)	Tier 10 Height (m)

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Source Description	Point Source Type	Point Source Justification	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Height [m]	Exit Temperature [K]	Exit Velocity [m/s]
CBY51	CCBY51100	Base	Combustion Turbine 1 (Combined Cycle)	POINT	vertical stack	314224.63	3292886.62	5.18	60.96	345.775	19.729
CBY51	CCBY51075	Medium	Combustion Turbine 1 (Combined Cycle)	POINT	vertical stack	314224.63	3292886.62	5.18	60.96	352.287	17.364
CBY51	CCBY51050	Low	Combustion Turbine 1 (Combined Cycle)	POINT	vertical stack	314224.63	3292886.62	5.18	60.96	348.699	13.454
CBY51	CCBYMS51	MSS	Combustion Turbine 1 (Combined Cycle)	POINT	vertical stack	314224.63	3292886.62	5.18	60.96	347.119	12.532
C-TOWER1	CCWT51	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314267.47	3292909.99	5.27	13.72	310.928	4.572
C-TOWER1	CCWT52	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314270.00	3292895.11	5.33	13.72	310.928	4.572
C-TOWER1	CCWT53	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314272.53	3292880.22	5.28	13.72	310.928	4.572
C-TOWER1	CCWT54	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314275.07	3292865.33	5.15	13.72	310.928	4.572
C-TOWER1	CCWT55	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314277.60	3292850.45	4.74	13.72	310.928	4.572
C-TOWER1	CCWT56	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314280.13	3292835.56	4.17	13.72	310.928	4.572
C-TOWER1	CCWT57	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314282.66	3292820.68	4.52	13.72	310.928	4.572
C-TOWER1	CCWT58	Routine	Cooling Tower, Unit 5	POINT	vertical stack	314285.19	3292805.79	5.43	13.72	310.928	4.572
AUX-BLR	CAB5	Routine	Auxiliary Boiler	POINT	vertical stack	314224.00	3292891.00	5.12	60.96	421.483	10.979
GAS-HTR	CHTR_GAS	Routine	Gas Heater	POINT	vertical stack	314149.02	3292824.24	4.94	15.24	394.261	7.152
EMGEN	CCBYEDG5	Readiness	Emergency Diesel Generator	POINT	vertical stack	314207.75	3292755.29	5.98	4.57	673.206	98.915
CBY51-LOV	CCBYLV51	Routine	Unit 1 Lube Oil Vent	POINT	vertical stack	314236.30	3292831.55	3.31	9.14	0.000	0.001
CBYST1-LOV	CCBYLST5	Routine	Steam Turbine 1 Lube Oil Vent	POINT	vertical stack	314192.26	3292798.18	5.93	9.14	0.000	0.001
FUG-MSS	CMSSCEMS	Routine	Planned Maintenance Activities Fugitives, CEMS	POINT	vertical stack	314224.63	3292886.62	5.18	60.96	344.817	13.043
FUG-MSS	CMSSFILT	Routine	Planned Maintenance Activities Fugitives, Filter	POINT	ground level fugitive	314210.60	3292822.70	3.39	1.00	0.000	0.001
FUG-MSS	CMSSCAT	Routine	Planned Maintenance Activities Fugitives, Catalyst	POINT	ground level fugitive	314233.70	3292865.40	5.39	1.00	0.000	0.001
CBY1	CBY1	Routine	Unit 1 Steam Boiler, Natural Gas	POINT	vertical stack	313716.60	3292665.10	5.41	65.53	414.817	21.245
CBY2	CBY2	Routine	Unit 2 Steam Boiler, Natural Gas	POINT	vertical stack	313805.10	3292679.30	5.34	65.53	414.817	21.272
CB1-LOV	CBYLOV01	Routine	Lube Oil Vent, Unit 1	POINT	vertical stack	313698.83	3292650.76	5.39	9.14	310.928	1.524
CB2-LOV	CBYLOV02	Routine	Lube Oil Vent, Unit 2	POINT	vertical stack	313827.00	3292673.60	5.34	9.14	310.928	1.524
CBY1EDG	CBYEDG1	Readiness	Emergency Diesel Generator #1	POINT	vertical stack	313759.60	3292673.00	5.38	4.57	783.150	16.154
CBY2EDG	CBYEDG2	Readiness	Emergency Diesel Generator #2	POINT	vertical stack	313776.80	3292676.10	5.36	4.57	783.150	16.154
ACT1	CWT1	Routine	Cooling Tower, Unit 1	POINT	vertical stack	313666.75	3292732.45	5.42	5.11	0.000	10.363
ACT2	CWT2	Routine	Cooling Tower, Unit 2	POINT	vertical stack	313850.65	3292762.35	5.49	5.11	0.000	10.363
CBY FUG	FUG_NH31	Routine	CBY Ammonia Fugitives	POINT	ground level fugitive	313827.00	3292673.60	5.34	1.00	0.000	0.001
MSSFUG	MSSFUG1	Routine	MSS Activities, Units 1&2	POINT	ground level fugitive	313762.92	3292662.18	5.31	1.00	0.000	0.001
CBY41, CBY4CAP	CBY41	Routine	Combustion Turbine 41	POINT	vertical stack	314034.26	3292869.64	6.23	45.72	394.261	26.213
CBY42, CBY4CAP	CBY42	Routine	Combustion Turbine 42	POINT	vertical stack	313991.78	3292865.13	5.88	45.72	394.261	26.213
CBY41, CBY4CAP	CBYMSS41	MSS	Combustion Turbine 41	POINT	vertical stack	314040.05	3292819.44	5.38	45.72	394.261	26.213
CBY42, CBY4CAP	CBYMSS42	MSS	Combustion Turbine 42	POINT	vertical stack	313996.93	3292811.72	6.14	45.72	394.261	26.213
CBY41-LOV	CBYLOV41	Routine	Lube Oil Vent, Turbine 41	POINT	vertical stack	314040.05	3292819.44	5.38	9.14	310.928	1.524

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Electronic Modeling Evaluation Workbook (EMEW)

Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Source Description	Point Source Type	Point Source Justification	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Height [m]	Exit Temperature [K]	Exit Velocity [m/s]
CBY42-LOV	CBYLOV42	Routine	Lube Oil Vent, Turbine 42	POINT	vertical stack	313996.93	3292811.72	6.14	9.14	310.928	1.524
U4ST-LOV	CBYLVST4	Routine	Lube Oil Vent, Unit 4 Steam Turbine	POINT	vertical stack	314087.03	3292806.57	4.89	9.14	310.928	1.524
BS-GEN	GEN_BS	Routine	Black Start Generator	POINT	vertical stack	314082.20	3292741.10	5.74	4.57	783.150	16.154
C-Tower1	CWT4	Routine	Cooling Tower, Unit 4	POINT	vertical stack	313935.58	3292827.90	5.32	13.72	0.000	8.839
FUG-SCR	FUG_NH34	Routine	Fugitives, SCR Piping	POINT	ground level fugitive	314014.10	3292861.06	6.21	1.00	0.000	0.001

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Electronic Modeling Evaluation Workbook (EMEW)

Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Source Description	Point Source Type	Point Source Justification	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Height [m]	Exit Temperature [K]	Exit Velocity [m/s]
MSSFUG	MSSFUG4	Routine	MSS Activities, Unit 4	POINT	ground level fugitive	313987.00	3292861.10	5.84	1.00	0.000	0.001
AB1	AB1	Routine	Auxiliary Boiler 1	POINT	vertical stack	313717.00	3292676.00	5.43	65.53	633.150	7.285
CBAB2N	AB2N	Routine	Auxiliary Boiler 2	POINT	vertical stack	313717.00	3292676.00	5.43	65.53	633.150	7.285
CBAB3N	AB3N	Routine	Auxiliary Boiler 3	POINT	vertical stack	313717.00	3292676.00	5.43	65.53	633.150	7.285
SCRMSS	MSSSCR4	Routine	MSS Activities - SCR, Unit 4	POINT	ground level fugitive	313827.00	3292673.60	5.34	1.00	0.000	0.001

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Electronic Modeling Evaluation Workbook (EMEW)
Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Diameter [m]
7.010
7.010
7.010
7.010
6.096
6.096
6.096
6.096
6.096
6.096
6.096
6.096
1.219
0.610
0.305
0.001
0.001
7.010
0.001
0.001
7.925
7.925
0.152
0.152
0.229
0.229
4.267
4.267
0.001
0.001
5.486
5.486
5.486
5.486
0.152

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
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Date: _03/18/20_
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Company Name: _NRG Cedar Bayou 5 LLC_

Diameter [m]
0.152
0.152
0.229
4.267
0.001

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Point Source Parameters

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Diameter [m]
0.001
4.237
4.237
4.237
0.001

Texas Commission on Environmental Quality

Date: _03/18/20_
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Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Calculations

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Footprint of Source Length (m)	Footprint of Source Width (m)	Length of Side (making it a square) SQRT(L * W)	Type of Volume Source (sigma y) *Pick from drop-down*	**Sigma Y** (m)	Vertical Span Min Release (m)	Vertical Span Max Release (m)	Vertical Dimension (m)
FUG-SCR	CFUG_NH35	10.67	36.88	19.84	Single Volume Source	4.61	0.00	25.15	25.15
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
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				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
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				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00
				0.00		Incomplete			0.00

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Volume Source Calculations

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Type of Volume Source (sigma z) *Pick from drop-down*	Release Height (middle point of vertical span) (m)	Building Name (if on/adjacent to a building) *Pick from drop-down*	Adjacent Building Height, if applicable (m)	**Sigma Z** (m)
Surface-Based Source	12.57			11.70
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
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	0.00			Incomplete
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	0.00			Incomplete
	0.00			Incomplete
	0.00			Incomplete
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	0.00			Incomplete
	0.00			Incomplete

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Parameters

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeled Release Height [m]	Modeled Length X [m]	Lateral Dimension SigmaY [m]	Vertical Dimension SigmaZ [m]	Modeling Scenario	Easting: X [m]	Northing: Y [m]	Base Elevation [m]	Source Description
FUG-SCR	CFUG_NH35	12.57	19.84	4.61	11.70	Routine	314228.13	3292866.13	5.38	Ammonia Component Fugitives

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Volume Source Parameters

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Volume Source Size Justification
Piping surrounding SCR structure

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
CBY51	CCBY51100	Base	Generic	1-hr			No	1.00
CBY51	CCBY51075	Medium	Generic	1-hr			No	1.00
CBY51	CCBY51050	Low	Generic	1-hr			No	1.00
FUG-SCR	CFUG_NH35	Routine	Generic	1-hr			No	1.00
CBY51	CCBY51100	Base	NOx	1-hr	NAAQS	SIL analysis	No	26.88
CBY51	CCBY51075	Medium	NOx	1-hr	NAAQS	SIL analysis	No	16.20
CBY51	CCBY51050	Low	NOx	1-hr	NAAQS	SIL analysis	No	14.58
CBY51	CCBYMS51	MSS	NOx	1-hr	NAAQS	SIL analysis	No	43.96
AUX-BLR	CAB5	Routine	NOx	1-hr	NAAQS	SIL analysis	No	0.891
GAS-HTR	CHTR_GAS	Routine	NOx	1-hr	NAAQS	SIL analysis	No	0.116
EMGEN	CCBYEDG5	Readiness	NOx	1-hr	NAAQS	SIL analysis	Yes	0.0388
FUG-MSS	CMSSCEMS	Routine	NOx	1-hr	NAAQS	SIL analysis	No	1.19E-04
CBY51	CCBY51100	Base	NOx	Annual	NAAQS	SIL analysis	No	27.66
CBY51	CCBYMS51	MSS	NOx	Annual	NAAQS	SIL analysis	No	0.386
AUX-BLR	CAB5	Routine	NOx	Annual	NAAQS	SIL analysis	No	0.203
GAS-HTR	CHTR_GAS	Routine	NOx	Annual	NAAQS	SIL analysis	No	0.116
EMGEN	CCBYEDG5	Readiness	NOx	Annual	NAAQS	SIL analysis	No	0.485
FUG-MSS	CMSSCEMS	Routine	NOx	Annual	NAAQS	SIL analysis	No	2.73E-07
CBY51	CCBY51100	Base	SO2	1-hr	NAAQS	SIL analysis	No	10.64
CBY51	CCBY51075	Medium	SO2	1-hr	NAAQS	SIL analysis	No	6.42
CBY51	CCBY51050	Low	SO2	1-hr	NAAQS	SIL analysis	No	5.73
AUX-BLR	CAB5	Routine	SO2	1-hr	NAAQS	SIL analysis	No	0.249
GAS-HTR	CHTR_GAS	Routine	SO2	1-hr	NAAQS	SIL analysis	No	0.0270
EMGEN	CCBYEDG5	Readiness	SO2	1-hr	NAAQS	SIL analysis	Yes	2.90E-05
CBY51	CCBY51100	Base	SO2	3-hr	NAAQS	SIL analysis	No	10.64
CBY51	CCBY51075	Medium	SO2	3-hr	NAAQS	SIL analysis	No	6.42
CBY51	CCBY51050	Low	SO2	3-hr	NAAQS	SIL analysis	No	5.73
AUX-BLR	CAB5	Routine	SO2	3-hr	NAAQS	SIL analysis	No	0.249
GAS-HTR	CHTR_GAS	Routine	SO2	3-hr	NAAQS	SIL analysis	No	0.0270
EMGEN	CCBYEDG5	Readiness	SO2	3-hr	NAAQS	SIL analysis	No	0.00529
CBY51	CCBY51100	Base	SO2	1-hr	State Property Line	Site Wide	No	10.64
CBY51	CCBY51075	Medium	SO2	1-hr	State Property Line	Site Wide	No	6.42
CBY51	CCBY51050	Low	SO2	1-hr	State Property Line	Site Wide	No	5.73
AUX-BLR	CAB5	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.249
GAS-HTR	CHTR_GAS	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.0270
EMGEN	CCBYEDG5	Readiness	SO2	1-hr	State Property Line	Site Wide	No	0.0159
CBY1	CBY1	Routine	SO2	1-hr	State Property Line	Site Wide	No	112.00
CBY2	CBY2	Routine	SO2	1-hr	State Property Line	Site Wide	No	112.00
CBY1EDG	CBYEDG1	Readiness	SO2	1-hr	State Property Line	Site Wide	No	0.190
CBY2EDG	CBYEDG2	Readiness	SO2	1-hr	State Property Line	Site Wide	No	0.190
CBY41, CBY4CAP	CBY41	Routine	SO2	1-hr	State Property Line	Site Wide	No	17.70
CBY42, CBY4CAP	CBY42	Routine	SO2	1-hr	State Property Line	Site Wide	No	17.70
BS-GEN	GEN_BS	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.190
MSSFUG	MSSFUG4	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.0100

Texas Commission on Environmental Quality

Date: _03/18/20_
Permit #: ___TBD__

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
AB1	AB1	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.150
CBAB2N	AB2N	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.210

Texas Commission on Environmental Quality

Date: _03/18/20_
Permit #: ___TBD__

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
CBAB3N	AB3N	Routine	SO2	1-hr	State Property Line	Site Wide	No	0.210
CBY51	CCBY51100	Base	H2SO4	1-hr	State Property Line	Site Wide	No	7.00
CBY51	CCBY51075	Medium	H2SO4	1-hr	State Property Line	Site Wide	No	4.23
CBY51	CCBY51050	Low	H2SO4	1-hr	State Property Line	Site Wide	No	3.77
CBY41, CBY4CAP	CBY41	Routine	H2SO4	1-hr	State Property Line	Site Wide	No	2.70
CBY42, CBY4CAP	CBY42	Routine	H2SO4	1-hr	State Property Line	Site Wide	No	2.70
CBY51	CCBY51100	Base	H2SO4	24-hr	State Property Line	Site Wide	No	7.00
CBY51	CCBY51075	Medium	H2SO4	24-hr	State Property Line	Site Wide	No	4.23
CBY51	CCBY51050	Low	H2SO4	24-hr	State Property Line	Site Wide	No	3.77
CBY41, CBY4CAP	CBY41	Routine	H2SO4	24-hr	State Property Line	Site Wide	No	2.70
CBY42, CBY4CAP	CBY42	Routine	H2SO4	24-hr	State Property Line	Site Wide	No	2.70

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
CBY51	CCBY51100	Generic Modeling	No	
CBY51	CCBY51075	Generic Modeling	No	
CBY51	CCBY51050	Generic Modeling	No	
FUG-SCR	CFUG_NH35	Generic Modeling	No	
CBY51	CCBY51100	Project increase	No	
CBY51	CCBY51075	Project increase	No	
CBY51	CCBY51050	Project increase	No	
CBY51	CCBYMS51	Project increase	No	
AUX-BLR	CAB5	Project increase	No	
GAS-HTR	CHTR_GAS	Project increase	No	
EMGEN	CCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
FUG-MSS	CMSSCEMS	Project increase	No	
CBY51	CCBY51100	Project increase	No	
CBY51	CCBYMS51	Project increase	No	
AUX-BLR	CAB5	Project increase	No	
GAS-HTR	CHTR_GAS	Project increase	No	
EMGEN	CCBYEDG5	Project increase	No	
FUG-MSS	CMSSCEMS	Project increase	No	
CBY51	CCBY51100	Project increase	No	
CBY51	CCBY51075	Project increase	No	
CBY51	CCBY51050	Project increase	No	
AUX-BLR	CAB5	Project increase	No	
GAS-HTR	CHTR_GAS	Project increase	No	
EMGEN	CCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
CBY51	CCBY51100	Project increase	No	
CBY51	CCBY51075	Project increase	No	
CBY51	CCBY51050	Project increase	No	
AUX-BLR	CAB5	Project increase	No	
GAS-HTR	CHTR_GAS	Project increase	No	
EMGEN	CCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
CBY51	CCBY51100	Sitewide total	No	
CBY51	CCBY51075	Sitewide total	No	
CBY51	CCBY51050	Sitewide total	No	
AUX-BLR	CAB5	Sitewide total	No	
GAS-HTR	CHTR_GAS	Sitewide total	No	
EMGEN	CCBYEDG5	Emergency engine tested once per month no more than 30 min	No	
CBY1	CBY1	Sitewide total	No	
CBY2	CBY2	Sitewide total	No	
CBY1EDG	CBYEDG1	Emergency engine tested once per month no more than 30 min	No	
CBY2EDG	CBYEDG2	Emergency engine tested once per month no more than 30 min	No	
CBY41, CBY4CAP	CBY41	Sitewide total	No	
CBY42, CBY4CAP	CBY42	Sitewide total	No	
BS-GEN	GEN_BS	Sitewide total	No	
MSSFUG	MSSFUG4	Sitewide total	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
AB1	AB1	Sitewide total	No	
CBAB2N	AB2N	Sitewide total	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Point + Flare Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
CBAB3N	AB3N	Sitewide total	No	
CBY51	CCBY51100	Sitewide total	No	
CBY51	CCBY51075	Sitewide total	No	
CBY51	CCBY51050	Sitewide total	No	
CBY41, CBY4CAP	CBY41	Sitewide total	No	
CBY42, CBY4CAP	CBY42	Sitewide total	No	
CBY51	CCBY51100	Sitewide total	No	
CBY51	CCBY51075	Sitewide total	No	
CBY51	CCBY51050	Sitewide total	No	
CBY41, CBY4CAP	CBY41	Sitewide total	No	
CBY42, CBY4CAP	CBY42	Sitewide total	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Volume Source Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent Source?	Modeled Emission Rate [lb/hr]
FUG-SCR	CFUG_NH35	Routine	Generic	1-hr			No	1.00

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Volume Source Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Basis of Emission Rate	Scalars or Factors Used?	Scalar/Factor in Use
FUG-SCR	CFUG_NH35	Generic Modeling	No	

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Speciated Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Speciated Emissions by Model ID

CAS #	Chemical Species	Other Species	Short-Term ESL (µg/m³)	Long-Term ESL (µg/m³)				
7664-41-7	ammonia		180	92				
7783-20-2	ammonium sulfate		Must Meet NAAQS	Must Meet NAAQS				

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Speciated Emissions

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Speciated Emissions by

CAS #															
7664-41-7															
7783-20-2															

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Combined Emissions

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

EPN	Model ID	Modeling Scenario	Pollutant	Modeled Averaging Time	Standard Type	Review Context	Intermittent
CBY51	CCBY51100	Base	Generic	1-hr			No
CBY51	CCBY51075	Medium	Generic	1-hr			No
CBY51	CCBY51050	Low	Generic	1-hr			No
FUG-SCR	CFUG_NH35	Routine	Generic	1-hr			No
CBY51	CCBY51100	Base	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	CCBY51075	Medium	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	CCBY51050	Low	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	CCBYMS51	MSS	NOx	1-hr	NAAQS	SIL analysis	No
AUX-BLR	CAB5	Routine	NOx	1-hr	NAAQS	SIL analysis	No
GAS-HTR	CHTR_GAS	Routine	NOx	1-hr	NAAQS	SIL analysis	No
EMGEN	CCBYEDG5	Readiness	NOx	1-hr	NAAQS	SIL analysis	Yes
FUG-MSS	CMSSCEMS	Routine	NOx	1-hr	NAAQS	SIL analysis	No
CBY51	CCBY51100	Base	NOx	Annual	NAAQS	SIL analysis	No
CBY51	CCBYMS51	MSS	NOx	Annual	NAAQS	SIL analysis	No
AUX-BLR	CAB5	Routine	NOx	Annual	NAAQS	SIL analysis	No
GAS-HTR	CHTR_GAS	Routine	NOx	Annual	NAAQS	SIL analysis	No
EMGEN	CCBYEDG5	Readiness	NOx	Annual	NAAQS	SIL analysis	No
FUG-MSS	CMSSCEMS	Routine	NOx	Annual	NAAQS	SIL analysis	No
CBY51	CCBY51100	Base	SO2	1-hr	NAAQS	SIL analysis	No
CBY51	CCBY51075	Medium	SO2	1-hr	NAAQS	SIL analysis	No
CBY51	CCBY51050	Low	SO2	1-hr	NAAQS	SIL analysis	No
AUX-BLR	CAB5	Routine	SO2	1-hr	NAAQS	SIL analysis	No
GAS-HTR	CHTR_GAS	Routine	SO2	1-hr	NAAQS	SIL analysis	No
EMGEN	CCBYEDG5	Readiness	SO2	1-hr	NAAQS	SIL analysis	Yes
CBY51	CCBY51100	Base	SO2	3-hr	NAAQS	SIL analysis	No
CBY51	CCBY51075	Medium	SO2	3-hr	NAAQS	SIL analysis	No
CBY51	CCBY51050	Low	SO2	3-hr	NAAQS	SIL analysis	No
AUX-BLR	CAB5	Routine	SO2	3-hr	NAAQS	SIL analysis	No
GAS-HTR	CHTR_GAS	Routine	SO2	3-hr	NAAQS	SIL analysis	No
EMGEN	CCBYEDG5	Readiness	SO2	3-hr	NAAQS	SIL analysis	No
CBY51	CCBY51100	Base	SO2	1-hr	State Property Line	Site Wide	No
CBY51	CCBY51075	Medium	SO2	1-hr	State Property Line	Site Wide	No
CBY51	CCBY51050	Low	SO2	1-hr	State Property Line	Site Wide	No
AUX-BLR	CAB5	Routine	SO2	1-hr	State Property Line	Site Wide	No
GAS-HTR	CHTR_GAS	Routine	SO2	1-hr	State Property Line	Site Wide	No
EMGEN	CCBYEDG5	Readiness	SO2	1-hr	State Property Line	Site Wide	No
CBY1	CBY1	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY2	CBY2	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY1EDG	CBYEDG1	Readiness	SO2	1-hr	State Property Line	Site Wide	No
CBY2EDG	CBYEDG2	Readiness	SO2	1-hr	State Property Line	Site Wide	No
CBY41, CBY4CAP	CBY41	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY42, CBY4CAP	CBY42	Routine	SO2	1-hr	State Property Line	Site Wide	No
BS-GEN	GEN_BS	Routine	SO2	1-hr	State Property Line	Site Wide	No
MSSFUG	MSSFUG4	Routine	SO2	1-hr	State Property Line	Site Wide	No
AB1	AB1	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBAB2N	AB2N	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBAB3N	AB3N	Routine	SO2	1-hr	State Property Line	Site Wide	No
CBY51	CCBY51100	Base	H2SO4	1-hr	State Property Line	Site Wide	No
CBY51	CCBY51075	Medium	H2SO4	1-hr	State Property Line	Site Wide	No
CBY51	CCBY51050	Low	H2SO4	1-hr	State Property Line	Site Wide	No
CBY41, CBY4CAP	CBY41	Routine	H2SO4	1-hr	State Property Line	Site Wide	No
CBY42, CBY4CAP	CBY42	Routine	H2SO4	1-hr	State Property Line	Site Wide	No
CBY51	CCBY51100	Base	H2SO4	24-hr	State Property Line	Site Wide	No
CBY51	CCBY51075	Medium	H2SO4	24-hr	State Property Line	Site Wide	No
CBY51	CCBY51050	Low	H2SO4	24-hr	State Property Line	Site Wide	No
CBY41, CBY4CAP	CBY41	Routine	H2SO4	24-hr	State Property Line	Site Wide	No
CBY42, CBY4CAP	CBY42	Routine	H2SO4	24-hr	State Property Line	Site Wide	No
FUG-SCR	CFUG_NH35	Routine	Generic	1-hr			No

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Combined Emissions

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Source Type	Modeled Emission Rate [lb/hr]
Point	1.00
Point	1.00
Point	1.00
Volume	1.00
Point	26.88
Point	16.20
Point	14.58
Point	43.96
Point	0.89
Point	0.12
Point	0.04
Point	0.00
Point	27.66
Point	0.39
Point	0.20
Point	0.12
Point	0.48
Point	0.00
Point	10.64
Point	6.42
Point	5.73
Point	0.25
Point	0.03
Point	0.00
Point	10.64
Point	6.42
Point	5.73
Point	0.25
Point	0.03
Point	0.01
Point	10.64
Point	6.42
Point	5.73
Point	0.25
Point	0.03
Point	0.02
Point	112.00
Point	112.00
Point	0.19
Point	0.19
Point	17.70
Point	17.70
Point	0.19
Point	0.01
Point	0.15
Point	0.21
Point	0.21
Point	7.00
Point	4.23
Point	3.77
Point	2.70
Point	2.70
Point	7.00
Point	4.23
Point	3.77
Point	2.70
Point	2.70
Volume	1.00

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Intermittent Sources

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Pollutant	Review Context	Modeling Scenario	Modeled Emission Rate (lb/hr)	Emergency Engine?	Maximum Emission Rate (lb/hr)	# Events per year	Hours per Event	Hours per Year
EMGEN	CCBYEDG5	NOx	SIL analysis	Readiness	0.0388	Yes	42.48	12	0.5	6
EMGEN	CCBYEDG5	SO2	SIL analysis	Readiness	2.90E-05	Yes	0.0318	12	0.5	6
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Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
Intermittent Sources

Date: _03/18/20_
Permit #: ___TBD__

Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Calculated emission rate (lb/hr)	List Intermittent Sources operating simultaneously	Describe any other justification for intermittent
EMGEN	CCBYEDG5	0.0388	no other intermittent sources operating	
EMGEN	CCBYEDG5	2.90E-05	no other intermittent sources operating	
		0		
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Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Modeling Scenarios

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Modeling Scenario	Scenario Description:
Base	Noted turbine at full load
Low	Noted turbine at low load
Medium	Noted turbine at medium load
MSS	Noted turbine at startup/shutdown
Readiness	Noted emergency engine at testing
Routine	Project and existing sources at normal operations

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NAAQS-SPL Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Table 1. Project-Related Modeling Results for State Property Line

Pollutant	Averaging Time	GLCmax (µg/m^3)	De Minimis (µg/m^3)
SO_2	1-hr		20.42
H_2SO_4	1-hr		1
H_2SO_4	24-hr		0.3
H_2S	1-hr		2.16 *(If property is residential, recreational, business, or commercial)*
H_2S	1-hr		3.24 *(If property is not residential, recreational, business, or commercial)*

Table 2. Site-wide Modeling Results for State Property Line

Pollutant	Averaging Time	GLCmax (µg/m^3)	Standard (µg/m^3)
SO_2	1-hr	105.36555	1021
H_2SO_4	1-hr	1.40969	50
H_2SO_4	24-hr	0.836	15
H_2S	1-hr		108 *(If property is residential, recreational, business, or commercial)*
H_2S	1-hr		162 *(If property is not residential, recreational, business, or commercial)*

Table 3. Modeling Results for Minor NSR De Minimis

Pollutant	Averaging Time	GLCmax (µg/m^3)	De Minimis (µg/m^3)
SO_2	1-hr	1.31205	7.8*
SO_2	3-hr	1.42355	25
SO_2	24-hr		5
SO_2	Annual		1
PM_{10}	24-hr		5
NO_2	1-hr	7.00104	7.5**
NO_2	Annual	0.237	1
CO	1-hr		2000
CO	8-hr		500

Additional information for the De Minimis values listed above can be found at:
* https://www.epa.gov/sites/production/files/2015-07/documents/appwso2.pdf
** https://www.tceq.texas.gov/assets/public/permitting/air/memos/guidance_1hr_no2naaqs.pdf

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NAAQS-SPL Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Table 4. $PM_{2.5}$ Modeling Results for Minor NSR De Minimis

Pollutant	Averaging Time	GLCmax (µg/m^3)	Secondary $PM_{2.5}$ Contribution (µg/m^3)	Total Conc. = Secondary $PM_{2.5}$ + GLCmax (µg/m^3)
$PM_{2.5}$	24-hr		0	0.00000
$PM_{2.5}$	Annual		0	0.00000

Additional information for the De Minimis values listed above can be found at:
* https://www.tceq.texas.gov/permitting/air/modeling/epa-mod-guidance.html

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NAAQS-SPL Modeling Results

Table 5. Total Concentrations for Minor NSR NAAQS (Concentrations > De Minimis)

Pollutant	Averaging Time	GLCmax ($\mu g/m^3$)	Background ($\mu g/m^3$)	Total Conc. = [Background + GLCmax] ($\mu g/m^3$)
SO_2	1-hr		0	0
SO_2	3-hr		0	0
SO_2	24-hr		0	0
SO_2	Annual		0	0
PM_{10}	24-hr		0	0
Pb	3-mo		0	0
NO_2	1-hr		0	0
NO_2	Annual		0	0
CO	1-hr		0	0
CO	8-hr		0	0

De Minimis ($\mu g/m^3$)
1.2*
0.2*

Standard (µg/m^3)
196
1300
365
80
150
0.15
188
100
40000
10000

Texas Commission on Environmental Quality
Electronic Modeling Evaluation Workbook (EMEW)
NAAQS-SPL Modeling Results

Table 6. Total Concentrations for Minor NSR NAAQS (Concentrations > De Minimis)

Pollutant	Averaging Time	GLCmax (µg/m^3)	Secondary $PM_{2.5}$ Contribution (µg/m^3)	Background (µg/m^3)
$PM_{2.5}$	24-hr		0	0
$PM_{2.5}$	Annual		0	0

Total Conc. = [Background + Secondary + GLCmax] (µg/m^3)	Standard (µg/m^3)
0	35
0	12

Texas Commission on Environmental Quality

Electronic Modeling Evaluation Workbook (EMEW)

Unit Impact Multipliers

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

EPN	Model ID	Modeling Scenario	Averaging Time	GLCmax ($\mu g/m^3$ per lb/hr)	GLCmax ($\mu g/m^3$ per tpy)
CBY51	CCBY51100	Base	1-hr	0.131	2.09E-06
CBY51	CCBY51075	Medium	1-hr	0.139	2.21E-06
CBY51	CCBY51050	Low	1-hr	0.174	2.99E-06
FUG-SCR	CFUG_NH35	Routine	1-hr	253.04	0.00556
FUG-SCR	CFUG_NH35	Routine	1-hr	121.10	0.00210

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Electronic Modeling Evaluation Workbook (EMEW)

Health Effect Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

Modeled Health Effect Results (MERA Guidance):				Step 3	Step 4: Production		Step 4: MSS
Chemical Species	CAS Number	Averaging Time	ESL [µg/m^3]	10% ESL Step 3 Modeled GLCmax [µg/m^3]	25 % ESL Step 4 Production GLCmax since most recent site wide modeling [µg/m^3]	10% ESL Step 4 Production Project Only GLCmax [µg/m^3]	50% ESL Step 4 MSS GLCmax since most recent site wide modeling [µg/m^3]
ammonia	7664-41-7	1-hr	180	9.71			

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Electronic Modeling Evaluation Workbook (EMEW)

Health Effect Modeling Results

Date: _03/18/20_
Permit #: ___TBD__
Company Name: _NRG Cedar Bayou 5 LLC_

Facility:

Modeled Hea		Step 5: MSS Only	Step 5: Hours of Exceedance				Step 6
Chemical Species	25% ESL Step 4 MSS Project Only GLCmax [µg/m^3]	Full ESL Step 5 GLCmax [µg/m^3]	*1X ESL GLCmax* Step 5 MSS Hours of Exceedance	*2X ESL GLCmax* Step 5 MSS Hours of Exceedance	*4X ESL GLCmax* Step 5 MSS Hours of Exceedance	*10X ESL GLCmax* Step 5 MSS Hours of Exceedance	Was Step 6 relied on to fall out of the MERA?
ammonia							Yes (Verify with Permit Reviewer)