

Construction Permit Source Analysis & Technical Review

Company	FPEC, LLC	Permit Numbers	173582, PSDTX1626, and GHGPSDTX233
City	Fairfield	Project Number	361716
County	Freestone	Regulated Entity Number	RN111788618
Project Type	Initial	Customer Reference Number	CN606169704
Project Reviewer	Huy Pham	Received Date	August 10, 2023
Site Name	Freestone Peakers Plant		

Project Overview

Environmental Consulting & Technology, Inc. (ECT) submitted the applications on behalf of Calpine Corporation, who is proposing to install the Freestone Peakers Plant (also called FPEC) to be located adjacent to the existing Freestone Energy Center property line. The FPEC consists of two natural gas-fired simple cycle combustion turbines (SCCT) and ancillary emission sources, such as an emergency generator, storage tanks, and fugitive emissions. The purpose of the FPEC is to respond quickly to reliable, dispatchable power generation to the grid when needed.

Emission Summary

Air Contaminant	Proposed Allowable Emission Rates (tpy)*
PM	27.53
PM ₁₀	27.53
PM _{2.5}	27.53
VOC	82.82
NO _x	291.13
CO	566.02
SO ₂	12.76
H ₂ SO ₄	0.98
HAPs**	4.58
GHG (as CO ₂ e)	1,004,643

*For an initial permit, the baseline actual emissions are zero. Therefore, the values represented here also represent the project changes at major sources (baseline actual emissions to proposed allowable emissions).

**The HAP emission rates are below the thresholds which dictate a site to be a major Title V site based on HAPs alone, so a synthetic limit of less than 25 tpy total HAPs and less than 10 tpy of any single HAPs is added to the MAERT.

Compliance History Evaluation - 30 TAC Chapter 60 Rules

A compliance history report was reviewed on:	August 18, 2023
Site rating & classification:	N/A
Company rating & classification:	N/A
Has the permit changed on the basis of the compliance history or rating?	No
Did the Regional Office have any comments? If so, explain.	No

Public Notice Information

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Requirement	Date
Legislator letters mailed	8/25/2023
Date 1 st notice published	9/7/2023
Publication Name: Fairfield Recorder	
Pollutants: carbon monoxide, hazardous air pollutants, nitrogen oxides, organic compounds, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less, sulfur dioxide, sulfuric acid mist, and greenhouse gases.	
Date 1 st notice Alternate Language published	N/A
Publication Name (Alternate Language): A bilingual program is required by the Texas Education Code in the School District. However, a newspaper or publication could not be found in any of the alternative languages in which notice is required.	
1 st public notice tearsheet(s) received	9/15/2023
1 st public notice affidavit(s) received	9/21/2023
1 st public notice certification of sign posting/application availability received	10/11/2023
SB709 Notification mailed	8/25/2023; re-issued 4/22/2024
Date 2 nd notice published	7/6/2024
Publication Name: Fairfield Recorder	
Pollutants: carbon monoxide, hazardous air pollutants, nitrogen oxides, organic compounds, particulate matter including particulate matter with diameters of 10 microns or less and 2.5 microns or less, sulfur dioxide, sulfuric acid mist, and greenhouse gases.	
Date 2 nd notice published (Alternate Language)	N/A
Publication Name (Alternate Language): A bilingual program is required by the Texas Education Code in the School District. However, a newspaper or publication could not be found in any of the alternative languages in which notice is required.	
2 nd public notice tearsheet(s) received	5/3/2024
2 nd public notice affidavit(s) received	5/3/2024
2 nd public notice certification of sign posting/application availability received	5/31/2024

Public Interest

One public comment was received after the second public notice (NAPD) comment period, which is considered not timely.

Federal Rules Applicability

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Requirement	
Subject to NSPS?	Yes
Subparts	A, IIII, KKKK, & TTTT
Subject to NESHAP?	No
Subparts	N/A
Subject to NESHAP (MACT) for source categories?	Yes
Subparts	A, YYYY, & ZZZZ

Nonattainment review applicability:

The proposed site location will be in the portion of Freestone County that is currently designated as nonattainment for the 2010 SO₂ standard. The project increases however, do not constitute the major source threshold for SO₂, which is 100 tpy. Following the project, the site will also still be a minor Nonattainment source for SO₂. Therefore, Nonattainment review does not apply.

PSD review applicability:

The proposed FPEC peaking units will be located adjacent to the existing Freestone Energy Center property. Since Calpine Corporation is a major stakeholder of the Freestone Energy Center and the sole owner of the FPEC Facility, both properties operate under the same SIC Code (4911) and will share a variety of personnel and services. Therefore, FPEC and Freestone Energy Center will be considered co-located for purposes of PSD applicability. The Freestone Energy Center is an existing unnamed major source with respect to PSD.

The Baseline Actual Emissions (BAE) are zero for an initial permit. PSD review applies to CO, NO_x, PM, PM₁₀, PM_{2.5}, and VOC since they exceed the major stationary source threshold according to 40 CFR §

52.21(b)(1)(i)(a). Lead (Pb) emissions are represented in the application but not included on the MAERT due to being only present in trace amounts in natural gas and diesel. Since the project emission increase of GHG (as CO₂e) exceeds the 75,000 tpy major source threshold, GHG regulation applies according to 40 CFR §

52.21(b)(49)(iv). All other pollutants are below the major modification thresholds.

	CO (tpy)	NO _x (tpy)	SO ₂ (tpy)	PM (tpy)	PM ₁₀ (tpy)	PM _{2.5} (tpy)	H ₂ SO ₄ (tpy)	VOC (tpy)	Pb (tpy)	GHG as CO ₂ e (tpy)
Project increase	566.02	291.13	12.76	27.53	27.53	27.52	0.98	82.82	<0.01	1,004,644
PSD Major Modification Threshold	100	40	40	25	15	10	7	40	0.6	75,000

Title V Applicability - 30 TAC Chapter 122 Rules

Requirement

Title V applicability:

The site will be a major source with respect to the Federal Operating Permits Program (Title V program). Calpine will submit an initial permit application for a Federal Operating Permit prior to start of operation of the power plant.

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Periodic Monitoring (PM) applicability:

The site will be a major source for Title V and subject to the 30 TAC 122 periodic monitoring requirements. The following provisions for monitoring related to this initial project are included in the special conditions:

- Stack testing from the gas turbines;
- Records of natural gas fired monthly;
- Records of opacity observations from the gas turbines;
- Records of hours of operation for the emergency engine;
- Records of tank throughput updated monthly;
- NO_x, CO, and O₂ CEMS for the gas turbines;
- Recordkeeping of maintenance, startup, and shutdown activities;
- Recordkeeping of the offline turbine washings with surfactant use;
- Recordkeeping of AVO checks, maintenance, repair for natural gas fugitive leaks; and
- Recordkeeping of checks, maintenance, repair for SF₆ circuit breaker leaks.

Compliance Assurance Monitoring (CAM) applicability:

Although each turbine has a pre-control potential-to-emit above the major source thresholds for NO_x and CO, a control device is not used to achieve compliance with an emission limitation. Therefore, CAM is not applicable.

Process Description / Project Scope

Environmental Consulting & Technology, Inc. (ECT) submitted the application on behalf of Calpine, who is proposing to install the Freestone Peakers Plant (also called FPEC) to be located adjacent to the existing Freestone Energy Center property line. The Freestone Energy Center property consists of four existing combined-cycle CTs operated by Freestone Energy and authorized under PSDTX940 and Permit No. 41249. FPEC will be constructed on property leased from Calpine Corporation, who will be the sole owner of the FPEC Facility.

The proposed FPEC includes two natural gas-fired simple cycle combustion turbines (SCCT), one emergency generator, ancillary storage tanks, and fugitive emissions. The purpose of the FPEC is to respond quickly to reliable, dispatchable power generation to the grid when needed, which includes high demand periods, seasonal peaks, and extreme temperature events, as well as when intermittent generation resources (such as solar and wind) are unavailable or insufficient to meet customer needs.

Combustion Turbines

The two F-class combustion turbines (CTs) will be operated in simple-cycle mode and fire only natural gas. These CTs will be General Electric (GE) 7FA.05 CTs, with an average heat input of 2,257 MMBtu/hr each, and a nominal power output per combustion turbine of 221 MW (442 MW total). The two turbines will be limited to a total of 7,600 hours of operation per year, which includes a maximum of 450 startup operations and 450 associated shutdown operations (equivalent to 375 hours per year, with each startup expected to last 30 minutes and each shutdown for 20 minutes) per turbine.

CTs convert latent fuel energy into work using compressed hot gas. Mechanical output is delivered via a rotating shaft used to drive an electrical generator, thereby converting a portion of the turbine's mechanical output to electrical energy. Ambient air is filtered and compressed by the CT compressor. During warm days (typically 60F or greater), the CT inlet ambient air can be cooled by evaporative cooling to improve power output. The compressed combustion air is combined with natural gas fuel and burned in the high-pressure combustor to produce hot exhaust gases. Post-combustion, these high pressure, hot gases expand through the turbine section and turn the CT to produce rotary shaft power, which is used to drive an electric generator as well as the CT air compressor. The CT exhaust gases are discharged to the atmosphere through a stack after passing through the CT.

Ancillary emission sources

Additional emissions may occur from the natural gas feed system piping fugitive leaks (EPN NGPipeLeak) and the dedicated lubrication oil feed system for each unit. Lube oil will circulate through the turbine machinery from the oil sump, and heated in the gas turbine and generator housings to create oil vapor and oil condensate droplets in the oil reservoir compartments (EPNs Stack5LOV and Stack6LOV). Lube oil storage tanks (EPN Stack5LOVT and Stack6LOVT) supply the lube oil necessary for the turbines. The project also includes a new 1.5 MW diesel-fired emergency generator and associated diesel storage tank (EPN EGTank). No auxiliary boilers or cooling towers are proposed.

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Maintenance, Startup, and Shutdown (MSS)

A maximum of 450 startup events and 450 shutdown events per year per CT are proposed. A planned startup of CTG 5 and CTG 6 (EPN Nos. STACK5 and STACK6) is defined as the period that begins when measurable fuel flow is recorded and ends 9 minutes after the combustion unit reaches Mode 6Q operation or 30 minutes maximum. A planned shutdown of CTG 5 and CTG 6 is defined as the period that begins when the unit drops out of Mode 6Q and ends when measurable fuel flow is no longer recorded. A planned shutdown for CTG 5 and CTG 6 is limited to 20 minutes.

MSS emissions also occur during offline and online turbine washing. During offline turbine washing activities (EPN Stack5TWOF and Stack6TWOF), a surfactant (Conntect 6000, which contains <10% VOC by weight) is used to capture dust and other particles on the turbine fan blades. Therefore, offline turbine washing is a non-inherently low emitting (non-ILE) activity. The VOCs that are emitted result from the spraying of the surfactant, while the un-volatilized portion of the surfactant, as well as the captured dust and particles, are washed down a drain. Approximately 3-6 gallons of the surfactant will be used per wash. At most, a turbine would be washed offline twice a year, resulting in a total of 12-24 gallons total for both turbines. During online turbine washing activities (EPN Stack5TWON and Stack6TWON), the surfactant is not used. Only water is used to spray the fan blades and loosen up/release any built up dust or particles; therefore, online turbine washing is considered an ILE activity.

Additional ILE activities (EPN FUGMSS) represented are filter replacements, necessary maintenance for CEMS analyzers, meter proving, cleaning of sight glasses, and small equipment and fugitive component repair and replacement. Additional non-ILE activities include combustion unit tuning, diagnostic load reduction activities, tank maintenance activities, and any necessary gaseous fuel venting. Emissions from these combustion unit tuning is not expected to be higher than the maximum hourly emission rates occurring during startup and shutdown of the CTs. Greenhouse Gas (GHG) emissions occur from circuit breakers using sulfur hexafluoride (EPNs CirBreak1-6), as well as the gas turbines, natural gas fugitive leaks, and the emergency engine.

Best Available Control Technology

Source Name	EPN	Best Available Control Technology Description
Gas turbines	Stack5 and Stack6	Each turbine is limited to 3,800 hours of operation, which includes startup and shutdown activities. Hourly emission rates for each pollutant are derived from the unit load and ambient temperature resulting in the highest hourly emissions for each CT. The gas turbines are fired exclusively with pipeline-quality natural gas. Good combustion practices are used. Turbines meet the following emission limits: NOx: Excluding periods of startup and shutdown, the CT exhaust NOx concentration will not exceed 9 parts per million by dry volume (ppmvd) corrected to 15 percent oxygen on a 3-hour average, through use of dry low-NOx (DLN) CT combustors. CO: Excluding periods of startup and shutdown, the CT exhaust CO concentration will not exceed 9 ppmvd corrected to 15 percent oxygen on a 3-hour average. VOC: Excluding periods of startup and shutdown, the CT exhaust VOC concentration will not exceed 2 ppmvd, corrected to 15 percent oxygen at normal loads. SO₂: The CTs will fire exclusively pipeline-quality natural gas containing no more than 0.5 grains of total sulfur per 100 standard cubic feet (gr S/100 scf). PM/PM₁₀/PM_{2.5}: CTs are exclusively fired with pipeline quality natural gas and limited to 5 percent opacity during routine operation. GHG as CO₂e: The CTs are exclusively fired with pipeline quality natural gas. The total gross thermal efficiency for both CTs initially proposed was 1,418 lb CO₂/MWh, which has been adjusted to account for performance variability and degradation. This standard is on a 12-month rolling

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		average. During the application review, the NSPS TTTTa had been finalized and published in the Federal Register, and the thermal efficiency was revised accordingly. FPEC has stated that these CTs could, in any rolling 12-month period, be operated in either the Base Load, Intermediate Load, or Low Load subcategory, according to the requirements and definitions in 40 CFR 60 NSPS Subpart TTTTa. Since the rule currently requires different emission standards for various load subcategories, the site will comply with the appropriate standard during the operation of each turbine as follows: • During base load operation, the thermal efficiency is limited to 800 lb CO₂/MWh-gross prior to January 1, 2032. Effective January 1, 2032, the thermal efficiency is limited to 100 lb CO₂/MWh-gross. • During intermediate load operation, the thermal efficiency is limited to 1,170 lb CO₂/MWh-gross. • During low load operation, the thermal efficiency is limited to less than 160 lb CO₂/MMBtu. These thermal efficiencies are based on a rolling 12-month average and apply during normal operation and startup and shutdown of the turbine. The TCEQ interprets these operations as meeting the emission standards set forth in 40 CFR 60 Subpart TTTTa. These requirements are more stringent than what BACT was most recently for GHG emissions prior to the rule being promulgated. MSS: During startup or shutdown periods, higher NO_x emissions may be produced during the transition of the combustors from the diffusion flame mode to full low-NO_x (lean premix) operation. Higher VOC and CO emissions are expected during startup/shutdown due to incomplete combustion as the unit transitions to the lean premix operating mode. During startup, higher-than-normal opacity may be experienced. Planned startups and shutdowns are limited to a maximum of 450 hours of startup and 300 hours of shutdown total for both turbines on a rolling 12-month period. FPEC based these hours are based on limiting an individual startup to 30 minutes and an individual shutdown to 20 minutes, with 450 startup and 450 shutdown events expected per year. Opacity will not exceed 15 percent during startup or shutdown periods.
Emergency generator	EMGEN	The 1,500-kWe emergency generator is powered by a 2,206 bhp diesel engine. The emergency generator meets EPA Tier 2 emission levels required by NSPS Subpart IIII. The emergency generator fires only ultra-low sulfur diesel fuel with a maximum sulfur content of 15 ppm. The emergency generator will operate up to 100 hours per year for non-emergency operation, including maintenance checks and readiness testing. It is equipped with a non-resettable runtime meter. The emergency generator meets an emission limit of 115.68 tpy CO₂e.
Combustion Turbine 5 Stack – Lube Oil Vent and Combustion Turbine 6 Stack – Lube Oil Vent	Stack5LOV and Stack6LOV	Emissions are generated from the lubrication oil feed system, and emissions of condensed droplets will be controlled by a mist eliminator serving the lube oil reservoir. Emissions are estimated based on an assume daily volumetric emission rate per mist eliminator and the lube oil replacement rates for similar units equipped with mist eliminators. Lube oil vent emissions are counted both as VOC and particulate matter. It is assumed that lube oil mist eliminator vents will emit equal to or less than 0.2 gallons per day of lube oil per vent, based on oil consumption for similar units.

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Diesel storage tank	EGTank	The fixed roof storage tank is equipped with submerged fill. Uninsulated exterior surfaces exposed to the sun are white or aluminum. The capacity is 3,600 gallons. MSS: Tank maintenance activities that require opening the vessel to atmosphere are accomplished by transferring the stored liquid to a covered vessel using submerged fill lines. Since the vapor pressure of diesel is less than 0.02 psia at operating temperature, the tank can open to the atmosphere without prior VOC vapor control.
Combustion Turbine 5 – Lube oil storage tank	Stack5LOVT	The fixed roof tank is equipped with submerged fill. Uninsulated exterior surfaces exposed to the sun are white or aluminum. The capacity is 6,150 gallons. MSS: Tank maintenance activities that require opening the vessel to atmosphere are accomplished by transferring the stored liquid to a covered vessel using submerged fill lines. Since the vapor pressure of lube oil is less than 0.02 psia at operating temperature, the tank can open to the atmosphere without prior VOC vapor control.
Combustion Turbine 6 – Lube oil storage tank	Stack6LOVT	The fixed roof tank is equipped with submerged fill. Uninsulated exterior surfaces exposed to the sun shall be white or aluminum. The capacity is 6,150 gallons. MSS: Tank maintenance activities that require opening the vessel to atmosphere are accomplished by transferring the stored liquid to a covered vessel using submerged fill lines. Since the vapor pressure of lube oil is less than 0.02 psia at operating temperature, the tank can open to the atmosphere without prior VOC vapor control.
Natural Gas Piping Component Fugitive Leaks	NGPipeLeak	The potential uncontrolled VOC emissions from total fugitive piping component leaks are less than 10 tpy. Therefore, monitoring is not required per Tier I BACT. However, daily AVO inspections are performed. No reduction credit is claimed for performing these daily AVO inspections. SOCM1 without ethylene emission factors are used.
Circuit Breakers	CirBreak1, CirBreak2, CirBreak3, CirBreak4, CirBreak5, CirBreak6	Fugitive emissions from the circuit breakers are due to SF ₆ leakage. SF ₆ is used in high voltage electrical equipment as an insulator and/or arc quenching medium. Up to 6 circuit breakers will be used. State-of-the-art enclosed pressure SF ₆ circuit breakers with leak detection are used to minimize leaks of SF ₆ . Use of good operations and preventative maintenance practices are employed. The circuit breakers meet a total emission limit of 68.97 tpy CO ₂ e.
Miscellaneous Maintenance Fugitive Emissions	FUGMSS	These emissions occur from the following MSS ILE activities: • miscellaneous PM filter maintenance activities where baghouses and air intake filters or turbines need to be replaced; • CEMS analyzer and other process instrument calibrations, inspections, repair, replacement, and testing, including other sight glasses, gauges, meters, etc; • Small equipment and fugitive component repair/replacement in VOC service, including pumps, compressors, valves, pipes, flanges, transport lines, filters/screens in natural gas service, diesel oil service, lube oil service; and • Gaseous fuel venting Good engineering design and operating practices are used to minimize impacts associated with ILE activities. ILE activities are revalidated annually.
Combustion Turbine 5	Stack5TWON	Online turbine washing uses only water to spray the fan blades to release any

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Stack – Turbine Washing Online and Combustion Turbine 6 Stack – Turbine Washing Online	and Stack6TWON	built-up dust or particles and is therefore considered an ILE activity. Good engineering design and operating practices to minimize impacts associated with this ILE activity.
Combustion Turbine 5 Stack – Turbine Washing Offline and Combustion Turbine 6 Stack – Turbine Washing Offline	Stack5TWOF and Stack6TWOF	Offline turbine washing is a non-ILE activity due to its use of a surfactant during washing activities. Offline turbine washing will be limited to a maximum of six total washing events per year of surfactant used per CTG. Good engineering design and operating practices to minimize impacts associated with this activity.

Impacts Evaluation

Was modeling conducted?	Yes	Type of Modeling:	AERMOD
Is the site within 3,000 feet of any school?	No		
Additional site/land use information: The surrounding area is predominantly rural. Medium roughness and elevated terrain were used in the modeling analysis.			

ECT, on behalf of FPEC, conducted air dispersion modeling via AERMOD, including PSD modeling and a minor NAAQS analysis, which was all audited by the Air Dispersion Modeling Team. Based on the results of the dispersion model, no short-term or long-term adverse health effects are expected to occur among the public health, welfare, or the environment as a result of exposure to the emissions from the facilities authorized under this permit. The results are summarized below and were deemed acceptable for all review types and pollutants.

PM₁₀, PM_{2.5}, annual NO_x (as NO₂), and CO impacts did not exceed the PSD De Minimis analysis, while the NO_x and ozone (O₃) impacts passed the full PSD NAAQS. Minor NAAQS analysis for SO₂ emission rate increases did not exceed the associated Minor NSR De Minimis levels, while the Pb emission increases did not exceed the Minor NSR NAAQS. Additionally, impacts associated with SO₂ and H₂SO₄ emission increases did not exceed any applicable State Property Line Standard.

All health effects pollutants were evaluated under the TCEQ Modeling and Effects Review Applicability (MERA) guidance document (APDG 5874) and determined acceptable. The surfactants used, ethylene glycol monobutyl ether and ethoxylated alcohols C-C11, pass Step 2 of the MERA since the emissions increases associated with planned MSS are below 0.1 lb/hr. Diesel fuel No. 2 and lubricating oil emission increases are modeled via SCREEN3 and pass Step 3 of the MERA. The GLCmax for diesel and lubricating oil are 16.78 ug/m³ and 38.69 ug/m³, respectively. Both values are below 100 ug/m³, which is 10 percent of the associated Emissions Screening Level (ESL) for both pollutants.

More detailed information regarding the air quality analysis can be found in the ADMT modeling memo dated March 15, 2024, Central File Room Content ID 6968114.

	6/7/2024		6/9/2024
Project Reviewer Huy Pham, PE	Date	Team Leader Joel Stanford	Date