

US EPA ARCHIVE DOCUMENT

**PREVENTION OF SIGNIFICANT DETERIORATION PERMIT
FOR GREENHOUSE GAS EMISSIONS
ISSUED PURSUANT TO THE REQUIREMENTS AT 40 CFR § 52.21**

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 6

PSD PERMIT NUMBER: PSD-TX-104511-GHG

PERMITTEE: Apex Bethel Energy Center, LLC


FACILITY NAME: Apex Bethel Energy Center, LLC

FACILITY LOCATION: Intersection of County Rd. 2504 and FM 2706
Tennessee Colony, Texas 75861

Pursuant to the provisions of the Clean Air Act (CAA), Subchapter I, Part C (42 U.S.C. Section 7470, *et. Seq.*), and the Code of Federal Regulations (CFR) Title 40, Section 52.21, and the Federal Implementation Plan at 40 CFR § 52.2305 (effective May 1, 2011 and published at 76 FR 25178), the U.S. Environmental Protection Agency, Region 6 is issuing a *Prevention of Significant Deterioration* (PSD) permit to Apex Bethel Energy Center, LLC (Apex) for Greenhouse Gas (GHG) emissions. The Permit applies to the construction of a new compressed air energy storage (CAES) facility to be located near Tennessee Colony, Anderson County, Texas.

Apex is authorized to construct a new CAES bulk energy storage system using CAES technology as described herein, in accordance with the permit application (and plans submitted with the permit application), the federal PSD regulations at 40 CFR § 52.21, and other terms and conditions set forth in this PSD permit in conjunction with the corresponding Texas Commission on Environmental Quality (TCEQ) standard permit No.104511. Failure to comply with any condition or term set forth in this PSD Permit may result in enforcement action pursuant to Section 113 of the Clean Air Act (CAA). This PSD Permit does not relieve Apex of the responsibility to comply with any other applicable provisions of the CAA (including applicable implementing regulations in 40 CFR Parts 51, 52, 60, 61, 72 through 75, and 98) or other federal and state requirements (including the state PSD program that remains under approval at 40 CFR § 52.2303).

In accordance with 40 CFR §124.15(b), this PSD Permit becomes effective immediately upon issuance of this final decision.


Wren Stenger, Director
Multimedia Planning and Permitting Division

3/13/14
Date

**Apex Bethel Energy Center CAES (PSD-TX-104511-GHG)
Prevention of Significant Deterioration Permit
For Greenhouse Gas Emissions
Draft Permit Conditions**

PROJECT DESCRIPTION

Apex will construct the Bethel Energy Center consisting of a new compressed air energy storage (CAES) power plant in Anderson County, Texas to produce up to 317 MW of electrical power. The Bethel facility will employ two Dresser-Rand CAES compression trains, each consisting of a multi-stage compressor section driven by a dedicated 150 MW (nominal rating) electric motor. Each compression train will be capable of producing up to 1.4 million pounds per hour of air at a compressor outlet pressure of up to 2,830 psia, and will be operated during non-peak hours. The air will be stored in underground caverns. The cavern well casing shoe for Apex will be set at a depth of approximately 3750 feet and will have a maximum pressure of 3188 psia. The energy from the stored compressed high pressure air will be supplemented with the natural gas fired combustion turbines to produce electricity. The expansion/generation component of the plant will consist of two expansion turbine/generator trains, each rated at 158.34 MW to supply peak energy for the Electric Reliability Council of Texas (ERCOT) system. At maximum compression load, the facility will consume up to 300 MW of energy, while at maximum generator output the facility will produce approximately 317 MW of electricity. If full, the cavern will support approximately 100 hours of generation at full rated output without recharge.

EQUIPMENT LIST

The following devices are subject to this GHG PSD permit:

EPN	Description
TURBASTK	One Natural Gas-Fired Gas Expansion/Generation Turbine Train capable of generating 158.34 MW electricity.
TURBBSTK	One Natural Gas-Fired Gas Expansion/Generation Turbine Train capable of generating 158.34 MW electricity.
FUGI	Fugitive emissions from Apex Bethel Energy Center.
GENENGI	One 740-kW Natural Gas Fired Emergency Generator limited to fifty hours of operation per year.
MAINT1	Facility maintenance activities.

I. GENERAL PERMIT CONDITIONS

A. PERMIT EXPIRATION

As provided in 40 CFR §52.21(r), this PSD Permit shall become invalid if construction:

- a. is not commenced (as defined in 40 CFR §52.21(b)(9)) within 18 months after the approval takes effect; or
- b. is discontinued for a period of 18 months or more; or
- c. is not completed within a reasonable time.

Pursuant to 40 CFR §52.21(r), EPA may extend the 18-month period upon a written satisfactory showing that an extension is justified.

B. PERMIT NOTIFICATION REQUIREMENTS

Permittee shall notify EPA Region 6 in writing or by electronic mail of the:

1. date construction is commenced, postmarked within 30 days of such date;
2. actual date of initial startup, as defined in 40 CFR §60.2, postmarked within 15 days of such date; and
3. date upon which initial performance tests will commence, in accordance with the provisions of Section VI, postmarked not less than 30 days prior to such date. Notification may be provided with the submittal of the performance test protocol required pursuant to Condition VI.C.

C. FACILITY OPERATION

At all times, including periods of startup, shutdown, and maintenance, Permittee shall, to the extent practicable, maintain and operate the facility including associated air pollution control equipment in a manner consistent with good air pollution control practice for minimizing emissions. Determination of whether acceptable operating and maintenance procedures are being used will be based on information available to the EPA, which may include, but is not limited to, monitoring results, review of operating maintenance procedures and inspection of the facility.

D. MALFUNCTION REPORTING

1. Permittee shall notify EPA by mail within 48 hours following the discovery of any failure of air pollution control equipment, process equipment, or of a process to operate in a normal manner, which results in an increase in GHG emissions above the allowable emission limits stated in Sections II and III of this permit.
2. Within 10 days of the restoration of normal operations after any failure described in I.D.1., Permittee shall provide a written supplement to the initial notification that includes

a description of the malfunctioning equipment or abnormal operation, the date of the initial malfunction, the period of time over which emissions were increased due to the failure, the cause of the failure, the estimated resultant emissions in excess of those allowed in Section II and III, and the methods utilized to mitigate emissions and restore normal operations.

3. Compliance with this malfunction notification provision shall not excuse or otherwise constitute a defense to any violation of this permit or any law or regulation such malfunction may cause.

E. RIGHT OF ENTRY

EPA authorized representatives, upon the presentation of credentials, shall be permitted:

1. to enter the premises where the facility is located or where any records are required to be kept under the terms and conditions of this PSD Permit;
2. during normal business hours, to have access to and to copy any records required to be kept under the terms and conditions of this PSD Permit;
3. to inspect any equipment, operation, or method subject to requirements in this PSD Permit; and
4. to sample materials and emissions from the source(s).

F. TRANSFER OF OWNERSHIP

In the event of any changes in control or ownership of the facilities to be constructed, this PSD Permit shall be binding on all subsequent owners and operators. Permittee shall notify the succeeding owner and operator of the existence of the PSD Permit and its conditions by letter; a copy of the letter shall be forwarded to EPA Region 6 within thirty days of the letter signature.

G. SEVERABILITY

The provisions of this PSD Permit are severable, and, if any provision of the PSD Permit is held invalid, the remainder of this PSD Permit shall not be affected.

H. ADHERENCE TO APPLICATION AND COMPLIANCE WITH OTHER ENVIRONMENTAL LAWS

Permittee shall construct this project in compliance with this PSD Permit, the application on which this permit is based, the TCEQ Permit 104511 and all other applicable federal, state, and local air quality regulations. This PSD permit does not release the Permittee from any liability for compliance with other applicable federal, state and local environmental laws and regulations, including the Clean Air Act.

I. ACRONYMS AND ABBREVIATIONS

API	American Petroleum Institute
BACT	Best Available Control Technology
BSCFD	Billion Standard Cubic Feet per Day
CAA	Clean Air Act
CC	Carbon Content
CCS	Carbon Capture and Sequestration
CEMS	Continuous Emissions Monitoring System
CFR	Code of Federal Regulations
CH ₄	Methane
CO ₂	Carbon Dioxide
CO ₂ e	Carbon Dioxide Equivalent
dscf	Dry Standard Cubic Foot
EF	Emission Factor
EPN	Emission Point Number
FIN	Facility Identification Number
FR	Federal Register
GHG	Greenhouse Gas
gr	Grains
GWP	Global Warming Potential
HHV	High Heating Value
KWH	Kilowatt - hour
hr	Hour
LAER	Lowest Achievable Emission Rate
lb	Pound
LDAR	Leak Detection and Repair
MMBtu	Million British Thermal Units
MWH	Megawatt hour
SS	Start-up and Shutdown
NNSR	Nonattainment New Source Review
N ₂ O	Nitrous Oxides
NO _x	Nitrogen Oxides
NSPS	New Source Performance Standards
PSD	Prevention of Significant Deterioration
QA/QC	Quality Assurance and/or Quality Control
SCFH	Standard Cubic Feet per Hour
SCR	Selective Catalytic Reduction
SF ₆	Sulfur Hexafluoride
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TPY	Tons per Year
USC	United States Code
VOC	Volatile Organic Compound

II. ANNUAL EMISSION LIMITS

Annual emissions, in tons per year (TPY) on a 12-month total rolling monthly average, shall not exceed the following:

Table 1. Facility Emission Limits¹

EPN	Description	GHG Mass Basis		TPY CO ₂ e ^{2,3}	BACT Requirements
			TPY ²		
TURBASTK TURBBSTK	Combined Gas Expansion Turbine Train A and Train B	CO ₂	456,296	458,769	i. BACT of 558 lb CO ₂ /MWH ⁵ on a 12 month rolling average ii. See Special Condition III.A. iii. Maximum heat input to one train is 695.1MMBtu/hr. iv. Work practice standards in Section III.A.
		CH ₄	12.66		
		N ₂ O	7.12		
FUG1	Fugitives	CO ₂	No Numerical Limit Established ⁴	No Numerical Limit Established ⁴	Implementation of AVO program. See Special Condition III.B.
		CH ₄	No Numerical Limit Established ⁴		
		SF ₆	No Numerical Limit Established ⁴		
GENENG1	Natural Gas-Fired Emergency Generator	CO ₂	23	23	Good Combustion and Operating Practices. Limit to 50 hours of operation per year. See Special Condition III.C.
MAINT1	Maintenance	CO ₂	0.010	0.26	See Special Condition III.D.
		CH ₄	0.014		

Compliance with the annual emission limits (tons per year) is based on a 12-month total rolling monthly average.

1. The TPY emission limits specified in this table are not to be exceeded for this facility and include emissions from the facility during all operations to include startup and shutdown activities.
2. On January 1, 2014, the GWP for CH₄, N₂O and SF₆ changed from 21 to 25 for CH₄, 310 to 298 for N₂O, and 23,900 to 22,800 for SF₆ respectively. The change has been reflected in the emission limits.
3. Fugitive emissions (EPN FUG1) are estimated to be 0.27 tpy CO₂, 5.56 tpy CH₄ and 0.0065 tpy SF₆ for a total of 288 tpy CO₂e. The emission limit will be a design/work practice standard as specified in this permit.
4. Electrical output shall be measured at the generator terminals.

III. SPECIAL PERMIT CONDITIONS

A. Gas Expansion Turbine Trains (EPNs: TURBASTK and TURBBSTK)

1. Emission Limits and Conditions

- a. Only pipeline quality natural gas is to be used in the combustion turbines with a fuel sulfur content of up to 5 grains of sulfur per 100 dry standard cubic feet (gr S/100 dscf).
- b. The gas expansion turbines shall meet a BACT limit of 558 lbs CO₂/MWH on a 12 month rolling average. Upon demonstration that the gas expansion turbines are in compliance with the design emissions limit as in Section V of this permit, the Permittee shall not discharge or cause the discharge of emissions from TURBASTK and TURBBSTK into the atmosphere in excess of the limits in 558lb CO₂/MWH with electric output at the generator terminals on a 12 month rolling average. To determine the BACT emission limit, the Permittee shall calculate the limit based on the measured hourly energy output (MWH) at the generator terminals and the tons of CO₂ emissions from the CEMS. The calculated hourly rate is averaged daily.
- c. The MWH is measured directly at the generator terminals. Permittee shall determine the hourly CO₂ emission rate by installing and operating aCO₂ CEMS and a volumetric stack gas flow monitor and associated data acquisition and handling system in accordance with the CO₂ CEMS system provided in 40 CFR § 75.10(a)(3) through(5).
- d. The maximum annual fuel input as limited by the TCEQ Standard Permit for NO_x emissions is 7,807,409 MMBtu/year. This will be measured by totaling the 12 month fuel use amount and multiplying it by the HHV of the fuel. The fuel gross calorific value (GCV) [high heat value (HHV)] of the fuel shall be determined, at a minimum semi-annually by the procedures contained in 40 CFR Part 98.34(a)(6).
- e. The energy efficiency factor of the turbines is 4773 MMBTU/KWH (electrical output at the generator terminal) on a 12-month rolling average. To determine this limit, Permittee shall calculate the average heat rate on a hourly basis consistent with equation F-20 and procedure provided in 40 CFR Part 75.10(b)-(f) and, Appendix F, § 5.5.2 and the measured hourly energy output (KWH). Sum the hourly heat input for the operating month and sum the hourly electrical energy for the operating month. Divide the total heat input for the month by the total electric output for the month. Add the quotient to the sum of the quotients of the previous 11 operating months and divide by 12 to determine the 12-operating month rolling average.
- f. Each turbine train shall be installed with a recuperator to preheat the air entering the expander train.

2. Work Practice Standards and Operational Requirements

- a. The air-fuel ratio shall be adjusted by a feedback control on the exit temperature of

the combustor and by monitoring various variables such as fuel rate, inlet mass air rate and turbine inlet temperature, as recommended by the manufacturer.

- b. The burner maintenance and inspection schedule shall be performed to manufacturer's recommendations and is included as Appendix A to the permit.
- c. The fuel flow rate shall be measured using an operational non-resettable elapsed flow meter or by recording the flow rate data in an electronic format with individual flow measurements being taken no less frequently than once every 15 minutes. Electronic data may be reduced to hourly averages for recordkeeping purposes.
- d. Permittee shall install a CO₂ CEMS and volumetric stack gas flow monitoring system with an automated data acquisition and handling system for measuring and recording CO₂ emissions discharged to the atmosphere.

3. Gas Expansion Turbine Startup and Shutdown

- a. Permittee shall minimize emissions during startup and shutdown activities by maintaining the facility according to the manufacturer's recommendations using safe operating practices and instrumentation monitors and alarms.
- b. Emissions during startup and shutdown activities shall be minimized by planning the shutdown and limiting the duration of operation in startup and shutdown mode.
 - i. A planned startup for each turbine is limited to 30 minutes per event.
 - ii. Planned startups shall not exceed 365 events per year per turbine train.
 - iii. A planned shutdown of the turbine is limited to 3.3 minutes per event.
 - iv. Shutdowns shall not exceed 365 events per year per turbine train.
- c. Permittee must record the time, date, fuel heat input (HHV) in MMBtu/hr and duration of each startup and shutdown event in order to calculate CO₂e emissions for these activities.

B. Requirements for Fugitive Emission Sources (EPN FUG1)

1. Natural Gas piping fugitive equipment

- a. The Permittee shall implement the comprehensive maintenance plan that consists of:
 - i. Daily auditory, visual, and olfactory (AVO) monitoring for detecting leaks in natural gas piping components.
 - ii. Tag the leaker for first attempt repairs to be done within 5 days, and/or second attempt replacement within 15 days when possible.
 - iii. Record the results of the monitoring program, to include the number of leakers and when the repairs were completed.
- b. Requirements for Circuit Breakers in SF₆ Service

- i. SF₆ emissions shall be calculated annually (calendar year) in accordance with the mass balance approach provided in equation DD-1 of the Mandatory Greenhouse Gas Reporting rules for Electrical Transmission and Distribution Equipment Use, 40 CFR Part 98, Subpart DD. The total SF₆ inventory of the circuit breakers shall not exceed 2190lb.
- ii. Permittee shall equip the circuit breakers with a low pressure alarm and a low pressure lockout.
- iii. Permittee shall maintain a file of all records, data measurements, reports and documents related to the fugitive emission sources including, but not limited to, the following: all records or reports pertaining to maintenance performed, all records relating to compliance with the Monitoring and Quality Assurance and Quality Control (QA/QC) procedures outlined in 40 CFR 98.304.

C. Emergency Generator (EPN: GENENG1)

1. The Emergency Generator (GENENG1) shall only combust pipeline quality natural gas.
2. The Emergency Generator is limited to fifty (50) hours of non-emergency operation per year. This includes reliability testing for the generator.
3. The Emergency Generator shall meet the applicable monitoring and recordkeeping requirements as required in 40 CFR Part 60 Subpart JJJJ, Standards of Performance for Stationary Spark Ignition Internal Combustion Engines.
4. Permittee shall install and maintain an operational non-resettable elapsed time meter for the Emergency Generator.
5. Permittee shall maintain a file of all records, data measurements, reports and documents related to the operation of the Emergency Generator, including, but not limited to, the following: all records or reports pertaining to maintenance performed, all records relating to performance tests and monitoring of the emergency generator equipment; fuel heat input values; and hours of operation required in Special Condition III.C.; and all other information as required by 40 CFR 60 Subpart JJJJ recorded in a permanent form suitable for inspection.

D. Facility Maintenance Activities (EPN: MAINT1)

1. The Permittee shall limit the number of planned maintenance activities to one event per quarter.
2. The Permittee shall keep records of each maintenance purge performed to include the date, time, duration, and estimated volume of natural gas released to the atmosphere.

IV. MONITORING AND RECORDKEEPING FOR ALL GHG EMISSION POINTS

1. Monitor and record the CO₂ emissions from the CEMS to include the raw data from the recorder, the computation of the hourly emissions to determine compliance with the limit and conditions of the turbine trains as specified in Section III. A.

2. Monitor the turbine stack temperatures to indicate recuperator performance and maintenance requirements.
3. Monitor the fuel used and the maintenance and quality assurance of the fuel meter for the turbines and also for the emergency generator as stated in Section III.
4. Records and data for the appropriate quality assurance requirements specified in 40 CFR Part 75, Appendix D and F and 40 CFR Part 60 for the fuel flow meter and/or CO₂ emission monitoring system should be maintained for 5 years following the date of such measurements, maintenance, reports, and/or records
5. Records of all maintenance to the turbines (work practice standards), reliability tests for the emergency generators, fugitive emission equipment, and facility maintenance purging of the natural gas lines should be kept on site.
6. Monitor and keep records of the comprehensive fugitive emission program to include the components that are leaking, repaired and have not been repaired within the 15 days.
7. Keep records of the duration and number of events of pipeline purging for maintenance.
8. For SF₆, the emissions shall be calculated annually in accordance with the mass balance approach provided in 40 CFR § 98.303(a), Equation DD-1. All reports of maintenance performed and compliance with the Monitoring and Quality Assurance and Quality Control (QA/QC) procedures in 40 CFR § 98.304.
9. Keep records of the low pressure alarms and lockout occurrences and of possible releases to the atmosphere of SF₆ using the equation on 40 CFR §98.303(a), Equation DD-1, and the action taken to fix the problem
10. Compliance with the emission limits and conditions stated in Section III should be summarized as a monthly report for:
 - a. Operating hours for CAES Turbine Trains A and B and Emergency Generator;
 - b. The natural gas fuel usage for all combustion sources, using continuous fuel flow monitors (a group of equipment can utilize a common fuel flow meter, as long as actual fuel usage is allocated to the individual equipment based upon actual operating hours and maximum firing rate);
 - c. The HHV of the fuel and the KWH produced by the turbines;
 - d. CO₂ CEMS data.
 - e. Energy efficiency of the turbines in MMBTU/KWH
 - f. Fugitive emissions program compliance.
 - g. Calculations of SF₆ emissions using Equation DD-1 of 40 CFR § 98.303
 - h. Number of startup/shutdown events.
 - i. Number and duration of maintenance purging events of natural gas lines.
 - j. Total CO₂e emissions from the facility on a monthly basis.

11. All records required by this PSD Permit shall be retained and remain accessible for not less than 5 years following the date of such measurements, maintenance, and reporting.

V. REPORTING REQUIREMENTS

1. Permittee shall maintain records and submit a written report of all GHG excess emissions to EPA semi-annually, except when more frequent reporting is specifically required by an applicable subpart; or the Administrator or authorized representative, on a case-by-case basis, determines that more frequent reporting is necessary to accurately assess the compliance status of the source. The report is due on the 30th day following the end of each semi-annual period and shall include the following:
 - a. Time intervals, data and magnitude of the excess emissions, the nature and cause (if known), corrective actions taken and preventive measures adopted;
 - b. Applicable time and date of each period during which the monitoring equipment was inoperative (monitoring down-time);
 - c. Fugitive emission leaks that were not repaired/replaced within 15 days after discovery.
 - d. A statement in the report of a negative declaration; that is a statement when no excess emissions occurred or when the monitoring equipment has not been inoperative, repaired or adjusted and
 - e. Any failure to conduct any required source testing, monitoring, or other compliance activities.
2. Excess emissions shall be defined as any period in which the facility emissions exceed a maximum emission limit set forth in this permit.
3. Excess emissions indicated by GHG emission source certification testing or compliance monitoring shall be considered violations of the applicable emission limit for the purpose of this permit.

VI. PERFORMANCE TESTING

Within 60 days after achieving the maximum production rate at which the affected facility will be operated, but not later than 180 days after initial startup of the facility, performance tests(s) of the turbine trains must be conducted and a written report of the performance testing results furnished to the EPA. Additional sampling may be required by TCEQ or EPA.

1. Permittee shall submit a performance test protocol to EPA no later than 30 days prior to the test to allow review of the test plan and to arrange for an EPA observer to be present at the test. The performance test shall be conducted in accordance with the submitted protocol, and any changes required by EPA.
2. The owner or operator shall provide, or cause to be provided, performance testing facilities as follows:
 - a. Sampling ports adequate for test methods applicable to this facility,
 - b. Safe sampling platform(s),

- c. Safe access to sampling platform(s), and
 - d. Utilities for sampling and testing equipment
3. Unless otherwise specified, each performance test shall consist of three separate one-hour runs using the applicable test method. Each run shall be conducted for the time and under the conditions specified in the applicable standard. For purposes of determining compliance with an applicable standard, the arithmetic mean of the results of the three runs shall apply
 4. Performance tests must be conducted under such conditions to ensure representative performance of the affected facility. The owner or operator must make available to the EPA such records as may be necessary to determine the conditions of the performance tests.
 5. The analyzer and fuel meter quality assurance certifications should be performed before or at the same time of the initial tests, and the results reported to EPA with this test.
 6. The turbine shall be tested at or above ninety percent 90%, 50% and 10% of maximum load operations for the atmospheric conditions which exist during testing. The tested turbine load shall be identified in the sampling report. The permit holder shall present in the performance test protocol the manner in which stack sampling will be executed in order to demonstrate compliance with the emissions limits contained in Section III.
 7. Since both turbine generator trains are identical, test results of one turbine train would suffice to determine compliance with the BACT and emission limits in the permit.
 8. The Permittee shall perform stack sampling and other testing to establish the actual pattern and quantities of air contaminants being emitted into the atmosphere from the stacks of the Gas Expansion Turbines to determine the initial compliance with the CO₂ emission limits established in this permit. Sampling shall be conducted in accordance with 40 CFR § 60.8 and EPA Method 3a or 3b for the concentration of CO₂.
 9. Multiply the CO₂ hourly average emission rate determined under maximum operating test conditions by 8,760 hours for the gas expansion turbines and determine using the emission factors in Table 1 of 40 CFR 98, for CH₄ and N₂O the annual CO₂e emissions.
 10. Determine the BACT emission limit using the CO₂ analyzer and the MWh at the generator terminals output.
 - a. If the above calculated CO₂ emission total or the BACT limit does not exceed the limits specified in Table 1, no compliance strategy needs to be developed.
 - b. If the above calculated CO₂ emission total or BACT limit is exceeded as specified in Table 1, the facility shall document the potential to exceed in the test report; and explain within the report how the facility will assure compliance with the CO₂ emission limits listed in Table 1.
 11. Emissions testing, as outlined above, shall be performed every five years, plus or minus 6 months, from when the previous performance test was performed, or within 180 days

after the issuance of a permit renewal, whichever comes later, to verify continued performance at permitted emission limits.

VII. Agency Notifications

Permittee shall submit GHG permit applications, permit amendments, and other applicable permit information to:

Multi Media Planning and Permitting Division
EPA Region 6
1445 Ross Avenue (6 PD-R)
Dallas, TX 75202
Email: Group R6AirPermits@EPA.gov

Permittee shall submit a copy of all compliance and enforcement correspondence as required by this Approval to Construct to:

Compliance Assurance and Enforcement Division
EPA Region 6
1445 Ross Avenue (6EN)
Dallas, TX 75202

Table 1. Dresser-Rand LP Turbo-Expander Maintenance Schedule

Component	Recommended Maintenance Activity	
	Hot Gas Path Inspect-Repair Interval ⁽²⁾	
	Starts	EOH ⁽³⁾ (hours)
Combustion Liners	1000	24,000
Transition Pieces	1000	24,000
Fuel Nozzles	1000	24,000
Stage 1 Nozzles	1000	24,000
Stage 2 Nozzles	1000	24,000
Stage 3 Nozzles	1000	24,000
Stage 4 Nozzles	1000	24,000
Stage 1 Buckets	1000	24,000 ⁽³⁾
Stage 2 Buckets	1000	24,000 ⁽³⁾
Stage 3 Buckets	1000	24,000
Stage 4 Buckets	1000	24,000

Notes:

(1) Whichever comes first.

(2) Equivalent Operating Hours (EOH) Calculation:

Emergency Start (<10 Min)	50 EOH
Fast Start (=10 < 15 Min)	25 EOH
Normal Start(>15 Min)	15 EOH
1600°F TIT	EOH = 1 X actual fired hours
≤ 1550°F TIT	EOH = .75 X actual fired hours
≤ 1500°F TIT	EOH = .5 X actual fired hours

(3) Stage 1 & 2 buckets must be removed from rotor to inspect bucket and disk fir trees at 1st HGPI. All stages at subsequent HGPI's.

Table 2. Dresser-Rand CAES HP & VHP Turbo-Expander Maintenance Schedule

Component	Recommended Maintenance Activity	
	Gas Path Inspect-Repair Interval ⁽¹⁾	
	Starts	EOH ⁽²⁾ (hours)
Combustion Liners	1000	24,000
Fuel Nozzles	1000	24,000
Stage 1 Nozzles	1000	48,000
Stage 2 - 6 Nozzles	1000	48,000
Stage 1 Buckets	1000	48,000
Stage 2 - 6 Buckets	1000	48,000
Rotor	1000	48,000

Notes:

(1) Whichever comes first.

(2) Equivalent Operating Hours (EOH) Calculation:

Starts: 15 hours/start
(power-generation or compressor starts using expanders)

Operating Hours: 1000°F TIT EOH = 1.0 X actual fired hours
 <950°F TIT EOH = 0.75 X actual fired hours

