

Bay Area Air Quality Management District

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**Permit Evaluation
and
Statement of Basis
for
MAJOR FACILITY REVIEW PERMIT**

**for
Goose Haven Energy Center
Facility #B4416**

Facility Address:

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Title V Permit Evaluation/Statement of Basis

A. Background

This facility is subject to the Operating Permit requirements of Title V of the federal Clean Air Act, Part 70 of Volume 40 of the Code of Federal Regulations (CFR), and BAAQMD Regulation 2, Rule 6, Major Facility Review because it is a Phase II Acid Rain facility as defined by BAAQMD Regulation 2-6-217. It is an Acid Rain facility because it burns fossil fuel, serves a generator that is over 25 MW that is used to generate electricity for sale, and will be built after November 15, 1990. It is not a “major facility” as defined by BAAQMD Regulation 2-6-212.

Major Facility Operating permits (Title V permits) must meet specifications contained in 40 CFR Part 70 as contained in BAAQMD Regulation 2, Rule 6. The permits must contain all applicable requirements (as defined in BAAQMD Regulation 2-6-202), monitoring requirements, recordkeeping requirements, and reporting requirements. The permit holders must submit reports of all monitoring at least every six months and compliance certifications at least every year.

In addition, Phase II Acid Rain facilities must meet the requirements of Title IV of the federal Clean Air Act, Acid Rain, and the Acid Rain regulations in Parts 72 through 78 of Volume 40 of the Code of Federal Regulations. These regulations were adopted and incorporated by reference by BAAQMD Regulation 2, Rule 7, Acid Rain. The main provisions of the regulations for natural gas fired acid rain sources, such as the ones at this facility, are the requirement to obtain one SO₂ allowance for each ton of SO₂ that is emitted, stringent monitoring requirements for NO_x, CO, CO₂ or O₂, and SO₂, and stringent recordkeeping and reporting.

In the Bay Area, state and District requirements are also applicable requirements and are included in the permit. These requirements can be federally enforceable or non-federally enforceable. All applicable requirements are contained in Sections I through VI of the permit.

Each facility in the Bay Area is assigned a facility identifier that consists of a letter and a 4-digit number. This identifier is also considered to be the identifier for the permit. The identifier for this facility is B4416.

This facility is a new facility that received an Authority to Construct on August 14, 2002 pursuant to Application #4925, submitted on April 22, 2002. A revised Authority to Construct was issued October 24, 2002 pursuant to Application #6511, submitted on October 11, 2002. An extensive evaluation of the requirements, including much background information, was prepared before issuance of the Authority to Construct. The evaluation is contained in Appendix A and is considered part of this Major Facility Review permit evaluation/statement of basis.

B. Facility Description

An extensive facility description is contained in Appendix A in the permit evaluation for Application #6511.

C. Permit Content

The legal and factual basis for the permit follows. The permit sections are described in the order presented in the permit.

I. Standard Conditions

This section contains administrative requirements and conditions that apply to all facilities. If the Title IV (Acid Rain) requirements for fossil-fuel fired electrical generating facilities or the accidental release (40 CFR § 68) programs apply, the section will contain a standard condition pertaining to these programs. Many of these conditions derive from 40 CFR § 70.6, Permit Content, which dictates certain standard conditions that must be placed in the permit. The language that the District has developed for many of these requirements has been adopted into the BAAQMD Manual of Procedures, Volume II, Part 3, Section 4, and therefore must appear in the permit.

The standard conditions also contain references to BAAQMD Regulation 1 and Regulation 2. These are the District's General Provisions and Permitting rules.

Condition I.J.1 has been added to clarify that the capacity limits shown in Table II-A are enforceable limits.

II. Equipment

This section of the permit lists all permitted or significant sources. Each source is identified by an S and a number (e.g., S-24).

Permitted sources are those sources that require a BAAQMD operating permit pursuant to BAAQMD Rule 2-1-302.

Significant sources are those sources that have a potential to emit of more than 2 tons of a "regulated air pollutant," as defined in BAAQMD Rule 2-6-222, per year or 400 pounds of a "hazardous air pollutant," as defined in BAAQMD Rule 2-6-210, per year.

All abatement (control) devices that control permitted or significant sources are listed. Each abatement device whose primary function is to reduce emissions is identified by an A and a number (e.g., A-24). If a source is also an abatement device, such as when an engine controls VOC emissions, it will be listed in this table but will have an "S" number. An abatement device may also be a source of secondary emissions (such as selective catalytic reduction, which has secondary ammonia emissions). If the primary function of a device is to control emissions, it is considered an abatement (or "A")

device. If the primary function of a device is a non-control function, the device is considered to be a source (or “S”).

The equipment section is considered to be part of the facility description. It contains information that is necessary for applicability determinations, such as fuel types, contents or sizes of tanks, etc. This information is part of the factual basis of the permit.

Each of the permitted sources has previously been issued an authority to construct or a permit to operate pursuant to the requirements of BAAQMD Regulation 2, Permits. These permits are issued in accordance with state law and the District’s regulations. The capacities in this table are the maximum allowable capacities for each source, pursuant to Standard Condition I.J and BAAQMD Regulation 2-1-403.

III. Generally Applicable Requirements

This section of the permit lists requirements that generally apply to all sources at a facility including insignificant sources and portable equipment that may not require a District permit. If a generally applicable requirement applies specifically to a source that is permitted or significant, the standard will also appear in Section IV and the monitoring for that requirement will appear in Sections IV and VII of the permit. Parts of this section apply to all facilities (e.g., particulate, architectural coating, odorous substance, and sandblasting standards). In addition, standards that apply to insignificant or unpermitted sources at a facility (e.g., refrigeration units that use more than 50 pounds of an ozone-depleting compound) are placed in this section.

Unpermitted sources are exempt from normal District permits pursuant to an exemption in BAAQMD Regulation 2, Rule 1. They may, however, be specifically described in a Title V permit if they are considered significant sources pursuant to the definition in BAAQMD Rule 2-6-239.

IV. Source-Specific Applicable Requirements

This section of the permit lists the applicable requirements that apply to permitted or significant sources. These applicable requirements are contained in tables that pertain to one or more sources that have the same requirements. The order of the requirements is:

- District Rules
- SIP Rules (if any) are listed following the corresponding District rules. SIP rules are District rules that have been approved by EPA for inclusion in the California State Implementation Plan. SIP rules are “federally enforceable” and a “Y” (yes) indication will appear in the “Federally Enforceable” column. If the SIP rule is the current District rule, separate citation of the SIP rule is not necessary and the “Federally Enforceable” column will have a “Y” for “yes”. If the SIP rule is not the current District rule, the SIP rule or the necessary portion of the SIP rule is cited separately after the District rule. The SIP portion will be federally enforceable; the

non-SIP version will not be federally enforceable, unless EPA has approved it through another program.

- Other District requirements, such as the Manual of Procedures, as appropriate.
- Federal requirements (other than SIP provisions)
- BAAQMD permit conditions. The text of BAAQMD permit conditions is found in Section VI of the permit.
- Federal permit conditions. The text of Federal permit conditions, if any, is found in Section VI of the permit.

Section IV of the permit contains citations to all of the applicable requirements for particular sources. The text of the requirements is found in the regulations, which are readily available on the District’s or EPA’s websites, or in the permit conditions, which are found in Section VI of the permit. All monitoring requirements are cited in Section IV. Section VII is a cross-reference between the limits and monitoring requirements. A discussion of monitoring is included in Section C.VII of this permit evaluation/statement of basis.

Complex Applicability Determinations

An analysis of the effect of the following complex requirements is contained in the original permit evaluation in Appendix A.

- Best Available Control Technology
- PSD
- CEQA
- Toxic Risk Management Policy

Several items in the permit evaluation or conditions merit explanation and/or clarification.

- **Toxic Risk Screen**

The Hazardous Air Pollutants used in the toxic risk screen are as follows:

Pollutant	Emission Factor(1), lbs/MMscf	Emissions, tons/yr
Acetaldehyde	1.37E-01	2.97E-01
Acrolein	1.89E-02	4.09E-02
Ammonia	(2)	2.71E+01
Benzene	1.33E-02	2.88E-02
1,3-Butadiene	1.27E-04	2.75E-04
Ethyl benzene	1.79E-02	3.88E-02
Formaldehyde	9.17E-01	1.99E+00
Hexane	1.75E+00	3.79E+00
Naphthalene	1.66E-03	3.60E-03
Total PAH	1.06E-04	2.30E-04
Propylene	1.05E+00	2.27E+00
Propylene Oxide	4.78E-02	1.04E-01
Toluene	7.26E-02	1.57E-01

Xylene	2.89E-02	6.26E-02
Diesel PM	(3)	3.40E-05

- Notes:
- 1) Except for hexane, propylene, toluene and xylene, which are higher, emission factors are the mean values from the CARB CATEF II database.
 - 2) Ammonia emissions based on 10 ppm ammonia slip from SCR system.
 - 3) Diesel PM emissions based on 0.04 g/bhp-hr and 100 hr/yr

- **Offsets.**

NOx. NOx emission offsets for this project are the subject of BAAQMD Regulation 2-2-302, which requires offsets when emissions exceed 15 tons/yr. Panda Energy International, Inc. located in Dallas, Texas developed the original projects, known as Panda West 1, 2 and 3. However, BAAQMD Regulation 2-2-215.3 requires all three projects, which are less than three miles apart, to be considered as a single facility when determining the emissions subject to offset requirements. Consequently, even though the individual project NOx emissions did not exceed the 15 ton/yr threshold of BAAQMD Regulation 2-2-302, the combined NOx emissions from the ‘single facility’ did exceed 15 ton/yr. An Authority to Construct was issued to all three Panda West projects in June, 2001. As part of the application process, the District provided NOx emission offsets from the Small Facility Banking Account as allowed in Regulation 2-4-414. The Small Facility Banking Account provided 14.8 tons/yr of NOx offsets for each facility, or a total of 44.4 ton/yr. When Calpine Corporation acquired the Panda West projects, these emission offsets had to be returned to the Small Facility Banking Account because BAAQMD Regulation 2-4-414 requires that any applicant that holds banked emission reduction credits must use them prior to obtaining credits from the Small Facility Banking Account. Furthermore, Calpine submitted a modification to the Authority to Construct issued to Panda West which included, among other things, an increase in NOx emissions from 14.4 tons/yr to 16.6 tons/yr, for a new total of 49.8 tons/yr for the ‘single facility’ evaluation required in BAAQMD Regulation 2-2-215.3. Therefore, offsets were surrendered in two steps: 1) 44.4 tons/yr that were returned to the Small Facility Banking Account, and 2) 5.4 tons/yr to satisfy the total offset requirement of 49.8 tons/yr.

POC. POC emission offsets for this project are the subject of BAAQMD Regulation 2-2-302. Offsets for POC are not required because the ‘single facility’ threshold of 15 tons/yr is not exceeded.

PM₁₀. PM₁₀ emission offsets are the subject of BAAQMD Regulation 2-2-303 if the facility is a Major Facility. BAAQMD Regulation 2-1-204 defines a Major Facility as one that emits over 100 tons/yr of a pollutant. The ‘single facility’ emissions do not exceed the threshold limit of 100 tons/yr of this regulation. Therefore, offsets are not required.

SO₂. SO₂ emission offsets are the subject of BAAQMD Regulation 2-2-303 if the facility is a Major Facility. BAAQMD Regulation 2-1-204 defines a Major Facility as one that emits over 100 tons/yr of a pollutant. The ‘single facility’ emissions do not exceed the threshold limit of 100 tons/yr of this regulation. Therefore, offsets are not required.

- **S-1, Combustion Gas Turbine**

40 CFR Part 60 Subpart GG. Part 26 of the Authority to Construct conditions states that operation needs to be in compliance with 40 CFR Part 60 Subpart GG. The exceptions are defined in Section IX, Permit Shield, which details the Subpart GG requirements that are subsumed by BAAQMD conditions.

Regulation 6. In the Authority to Construct Evaluation, the Compliance Determination refers to BAAQMD Regulation 6-302, Opacity Limitation. This regulation does not apply because it has not been invoked by the APCO.

V. Schedule of Compliance

A schedule of compliance is required in all Title V permits pursuant to BAAQMD Regulation 2-6-409.10 which provides that a major facility review permit shall contain the following information and provisions:

“409.10 A schedule of compliance containing the following elements:

- 10.1 A statement that the facility shall continue to comply with all applicable requirements with which it is currently in compliance;
- 10.2 A statement that the facility shall meet all applicable requirements on a timely basis as requirements become effective during the permit term; and
- 10.3 If the facility is out of compliance with an applicable requirement at the time of issuance, revision, or reopening, the schedule of compliance shall contain a plan by which the facility will achieve compliance. The plan shall contain deadlines for each item in the plan. The schedule of compliance shall also contain a requirement for submission of progress reports by the facility at least every six months. The progress reports shall contain the dates by which each item in the plan was achieved and an explanation of why any dates in the schedule of compliance were not or will not be met, and any preventive or corrective measures adopted.”

The facility is not yet operating. Therefore, a survey of past compliance is not appropriate. The schedule of compliance for this permit contains only sections 2-6-409.10.1 and 2-6-409.10.2, since section 2-6-409.10.3 applies to facilities that are out of compliance.

VI. Permit Conditions

The permit conditions that were developed during the permit evaluation for Application #6511 have been transferred to Section VI of the Title V permit. The permit condition is identified with a unique numerical identifier, up to five digits. Each part of the condition is also identified by a part number and each subpart is identified by a letter (for example, Condition 789, part 1a).

When necessary to meet Title V requirements, additional monitoring, recordkeeping, or reporting has been added to the permit.

Any changes to existing permit conditions are clearly shown in “strike-out/underline” format in the proposed permit. When the permit is issued, all ‘strike-out’ language will

be deleted; all “underline” language will be retained, subject to consideration of comments received.

Permit conditions may also be imposed or revised as part of the annual review of the facility by the District pursuant to California Health and Safety Code (H&SC) § 42301(e), through a variance pursuant to H&SC § 42350 et seq., an order of abatement pursuant to H&SC § 42450 et seq., or as an administrative revision initiated by District staff. After issuance of the Title V permit, permit conditions will be revised using the procedures in BAAQMD Regulation 2, Rule 6, Major Facility Review.

The regulatory basis is listed following each condition. The regulatory basis may be a rule or regulation. The District is also using the following terms for regulatory basis:

- BACT: This term is used for a condition imposed by the Air Pollution Control Officer (APCO) to ensure compliance with the Best Available Control Technology in BAAQMD Regulation 2-2-301.
- Cumulative Increase: This term is used for a condition imposed by the APCO that limits a source’s operation to the operation described in the permit application pursuant to BAAQMD Regulation 2-1-403.
- Offsets: This term is used for a condition imposed by the APCO to ensure compliance with the use of offsets for the permitting of a source or with the banking of emissions from a source pursuant to BAAQMD Regulation 2, Rules 2 and 4.
- PSD: This term is used for a condition imposed by the APCO to ensure compliance with a Prevention of Significant Deterioration permit issued pursuant to BAAQMD Regulation 2, Rule 2.
- TRMP: This term is used for a condition imposed by the APCO to ensure compliance with limits that arise from the District’s Toxic Risk Management Policy.

Additional monitoring or recordkeeping has been added, where appropriate, to assure compliance with the applicable requirements.

Several changes to the Authority to Construct conditions should be noted.

- S-1, Combustion Gas Turbine.
Emission rate limits and averaging. In Part 18, the emission limits are stated based on average rates over a period of time. Rolling averages are a standard of reporting continuously monitored emissions. Since only NO_x and CO are monitored continuously, reference to a rolling average time period only makes sense with these pollutants. Reference to rolling averages for POC and ammonia have been deleted (note that ammonia emissions are calculated based on the NO_x rolling average emission, but are not themselves a rolling average based on continuous monitoring). Furthermore, to be consistent with NO_x and other permits, the rolling average period for CO has been changed from 1 hour to 3 hours.
Continuous monitoring requirements. In Part 23c of the Conditions, a change is made to show the flexibility in the monitoring regulation allowing either O₂ or CO₂ to be monitored.

Fuel Gas Sulfur and Nitrogen Monitoring. Condition 20057, Part 26, has been amended to allow the use of custom fuel schedule monitoring for fuel sulfur and nitrogen pursuant to 40 CFR 60.334(b)(1) and the August 14, 1987 memorandum from John Rasnic at USEPA.

VII. Applicable Limits and Compliance Monitoring Requirements

This section of the permit is a summary of numerical limits and related monitoring requirements for each source. The summary includes a citation for each monitoring requirement, frequency of monitoring, and type of monitoring. The applicable requirements for monitoring are completely contained in Sections IV, Source-Specific Applicable Requirements, and VI, Permit Conditions, of the permit.

The tables below contain only the limits for which there is no monitoring or inadequate monitoring in the applicable requirements. The District has examined the monitoring for other limits and has determined that monitoring is adequate to provide a reasonable assurance of compliance. Calculations for potential to emit will be provided in the discussion when no monitoring is proposed due to the size of a source.

Monitoring decisions are typically the result of a balancing of several different factors including: 1) the likelihood of a violation given the characteristics of normal operation, 2) degree of variability in the operation and in the control device, if there is one, 3) the potential severity of impact of an undetected violation, 4) the technical feasibility and probative value of indicator monitoring, 5) the economic feasibility of indicator monitoring, and 6) whether there is some other factor, such as a different regulatory restriction applicable to the same operation, that also provides some assurance of compliance with the limit in question.

SO₂ Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
S-1 Combustion Gas Turbine and S-2 Diesel Firewater Pump	BAAQMD 9-1-301	Ground level concentrations of SO ₂ shall not exceed: 0.5 ppm for 3 consecutive minutes AND 0.25 ppm averaged over 60 consecutive minutes AND 0.05 ppm averaged over 24 hours	None
S-1 Combustion Gas Turbine and S-2 Diesel Firewater Pump	BAAQMD 9-1-302	SO ₂ concentration at stack shall not exceed 300 ppm (dry)	None

SO₂ Sources

# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
S-2 Diesel Firewater Pump	BAAQMD 9-1-304	Sulfur content of liquid fuel limited to 0.5% by weight	Low-Sulfur Fuel Certification by supplier for each lot
S-2 Diesel Firewater Pump	BAAQMD Condition #20058 Part 2	Sulfur content of liquid fuel limited to 0.05% by weight	Low-Sulfur Fuel Certification by supplier for each lot

SO₂ Discussion:

BAAQMD Regulation 9-1-301

Area monitoring to demonstrate compliance with the ground level SO₂ concentration requirements of BAAQMD Regulation 9-1-301 is at the discretion of the APCO (per BAAQMD Regulation 9-1-501). This facility does not have equipment that emits large amounts of SO₂ and therefore is not required to have ground level monitoring by the APCO.

All facility combustion sources are subject to the SO₂ emission limitations in District Regulation 9, Rule 1 (ground-level concentration and emission point concentration). In EPA's June 24, 1999 agreement with CAPCOA and ARB, "Periodic Monitoring Recommendations for Generally Applicable Requirements in SIP", EPA has agreed that natural-gas-fired combustion sources do not need additional monitoring to verify compliance with BAAQMD Regulation 9, Rule 1, since violations of the regulation are unlikely. Therefore, no monitoring is necessary for this requirement.

Per the CAPCOA/ARB/EPA Agreement of 6/24/99 entitled "Periodic Monitoring Recommendations For Generally Applicable Requirements in SIP", compliance with Diesel fuel sulfur limits in BAAQMD Regulation 9-1-304 and BAAQMD Condition 20058 Part 2 will be assured by certification of the sulfur content by the fuel supplier for each fuel delivery.

PM Sources

S# & Description	Emission Limit Citation	Federally Enforceable Emission Limit	Monitoring
S-1 Combustion Gas Turbine	BAAQMD Regulation 6-301	Ringelmann 1.0	None
S-1 Combustion Gas Turbine	BAAQMD Regulation 6-310	0.15 gr/dscf	None
S-3 Cooling Tower	BAAQMD Regulation 6-301	Ringelmann 1.0	None
S-3 Cooling Tower	BAAQMD Regulation 6-310	0.15 gr/dscf	None

PM Discussion:

BAAQMD Regulation 6 “Particulate Matter and Visible Emissions”

Visible Emissions

BAAQMD Regulation 6-301 limits visible emissions to no darker than 1.0 on the Ringelmann Chart (except for periods or aggregate periods less than 3 minutes in any hour). Visible emissions are normally not associated with combustion of gaseous fuels, such as natural gas. Source S-1, Combustion Gas Turbine, burns natural gas exclusively; therefore, per the EPA's June 24, 1999 agreement with CAPCOA and ARB titled "Summary of Periodic Monitoring Recommendations for Generally Applicable Requirements in SIP", no monitoring is required to assure compliance with this limit for these sources.

Particulate Weight Limitation

BAAQMD Regulation 6-310 limits filterable particulate (FP) emissions from any source to 0.15 grains per dry standard cubic foot (gr/dscf) of exhaust volume. This is a “grain loading” standard.

Exceedances of the grain loading standards are normally not associated with combustion of gaseous fuels, such as natural gas. Source S-1, Combustion Gas Turbine, burns natural gas exclusively, therefore, per the EPA's July 2001 agreement with CAPCOA and ARB entitled "CAPCOA/CARB/EPA Region IX Recommended Periodic Monitoring for Generally Applicable Grain Loading Standards in the SIP: Combustion Sources: Summary of Periodic Monitoring Recommendations for Generally Applicable Requirements in SIP", no monitoring is required to assure compliance with this limit for these sources.

VIII. Test Methods

This section of the permit lists test methods that are associated with standards in District or other rules. It is included only for reference. In most cases, the test methods in the rules are source test methods that can be used to determine compliance but are not required on an ongoing basis. They are not applicable requirements.

If a rule or permit condition requires ongoing testing, the requirement will also appear in Section IV of the permit.

IX. Permit Shield:

The District rules allow two types of permit shields. The permit shield types are defined as follows: (1) A provision in a major facility review permit that identifies and justifies specific federally enforceable regulations and standards are not applicable to a source or group of sources, or (2) A provision in a major facility review permit that identifies and justifies specific federally enforceable applicable requirements for monitoring, recordkeeping and/or reporting which are subsumed because other applicable requirements for monitoring, recordkeeping, and reporting in the permit will assure compliance with all emission limits.

The second type of permit shield is allowed by EPA’s White Paper 2 for Improved Implementation of the Part 70 Operating Permits Program. The District uses the second type of permit shield for all streamlining of monitoring, recordkeeping, and reporting requirements in Title V permits. The District’s program does not allow other types of streamlining in Title V permits.

This facility has the first and second types of permit shield.

Following is the detail of the permit shields that were requested by the applicant.

1. The following requested permit shields are disallowed:

S-1, Combustion Gas Turbine

Citation	Title or Description (Reason not applicable)
None	

S-2, Diesel Firewater Pump

Citation	Title or Description (Reason not applicable)
None	

2. The following permit shields are allowed:

**Table IX A - 1
Permit Shield for Non-applicable Requirements
S-1 – COMBUSTION GAS TURBINE**

Citation	Title or Description (Reason not applicable)
BAAQMD Regulation 4	Air Pollution Episode Plan (3/20/91)
SIP Regulation 4	Air Pollution Episode Plan (8/06/90)

BAAQMD Regulation 4 requires facilities emitting more than 100 tons/yr of any pollutant to submit an air pollution episode plan. Because the facility’s potential to emit is limited by permit conditions to less than 100 tons/yr for all pollutants, Regulation 4 is not applicable to the facility.

**Table IX B - 1
Permit Shield for Subsumed Requirements
S-1 COMBUSTION GAS TURBINE**

Subsumed Requirement Citation	Title or Description	Streamlined Requirements	Title or Description
40 CFR 60.334 (a)	Fuel-to-water monitoring	BAAQMD Condition 20057, Part 25	Continuous emission monitoring for 2.5 ppmv limit @ 15% oxygen
40 CFR 60.334(c)(1)	Periods of excess emissions, NOx	BAAQMD Condition 20057, Part 25	Requirement for continuous emission monitor for NOx

Monitoring to 2.5 ppmv of NOx is much more stringent than the fuel-to-water monitoring.

D. Alternate Operating Scenarios:

No alternate operating scenario has been requested for this facility.

E. Compliance Status:

For existing plants, a compliance report from the Director of Compliance and Enforcement presents a review of the compliance record of each facility. Since this facility has not yet been built, a compliance report is not appropriate.

F. Differences between the Application and the Proposed Permit:

The Title V permit application was originally submitted on October 23, 2002. This version is the basis for constructing the proposed Title V permit. The only significant difference between the application and the proposed permit concerns the regulations that are federally enforceable. The proposed permit lists many of the regulations (shown as not federally enforceable in the application) as federally enforceable.

There are minor differences between the Title V permit application and the engineering evaluation included in Appendix A:

- I. Cooling tower emissions. The application shows the PM10 emissions from the cooling tower to be 2.9 tons/year. Since this source is exempt from District Permitting requirements, the engineering evaluation does not include any emissions from the cooling tower.
- II. Toxic compound emissions. The emission factors and total annual emissions are different for Formaldehyde, Hexane, Propylene and PAH compounds. The District uses more conservative (higher) emission factors for these compounds except for PAH compounds, where the application shows a higher emission rate.
- III. Annual NOx emissions. Calpine has surrendered 16.6 tons/year of NOx offsets for the entire facility. The original 2002 application included a 300 HP Diesel Firewater Pump that emitted 0.2 tons/year of NOx, leaving 16.4 tons/year for the main combustion turbine. Subsequently, Calpine submitted an administrative modification for a smaller 94 HP Diesel Firewater Pump, which emitted 0.1 ton/year NOx. Technically, this means the main gas turbine could emit 16.5 ton/year of NOx (the number shown in the Title V application), however, if this 16.5 t/yr gas turbine emission was included in the smaller Diesel pump modification, it would not qualify as an administrative modification since the main combustion gas turbine emissions would be going up (albeit a small increase). It was agreed that it was not prudent for a standard modification (with its associated fees) to be made for 0.1 ton/year of NOx emissions, so therefore the engineering application contains this discrepancy.

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APPENDIX A
PERMIT EVALUATION FOR
AUTHORITY TO CONSTRUCT
for
APPLICATION 6511

ENGINEERING EVALUATION
Application no. 6511
GOOSE HAVEN ENERGY CENTER
PLANT #14416

Background

Calpine Corporation has acquired controlling interest in the former Panda West 3 LLC peaking power plant in Solano County. This site, formerly Plant 13031, was originally evaluated in Application 2542. An Authority to Construct was issued for a 49.9 megawatt “peaking” power plant to provide power and T&D (transmission and distribution) support to the electric grid during periods of high electricity demand. The facility will consist of one simple-cycle, gas-fired combustion turbine and will be located at an undeveloped site in Solano County, California. Then, Application 4925 for a modification to the Authority to Construct re-rates the turbine from 470 MMBtu/hr to 500MMBtu/hr and adds a Diesel driven Firewater Pump. Application 4925 also included a modification to the NOx emissions, from 2.5 ppmv to 5.0 ppmv, but Calpine withdrew this request May 24, 2002. However, there was an increase in total facility NOx emissions (for both sources) from 14.8 tons/yr to 16.6 tons/yr and Calpine surrendered the required offsets.

This application 6511 revised the make and model of S-2, the Diesel Firewater Pump. The pump in Application was a 300 HP engine; this application is for a 94 HP engine.

Project Description:

The Goose Haven Energy Center will consist of the following equipment proposed for installation/operation:

- S-1 Combustion Gas Turbine with Water Injection, General Electric LM6000 PC Sprint, natural gas fired, 49 MW net simple-cycle, 500 MMBtu/hr maximum heat input rating; abated by A-1 Oxidation Catalyst, and A-2 Selective Catalytic Reduction System.**
- S-2 Diesel Firewater Pump, Clarke Model JU4H-UF40, 94 HP**
- S-3 Cooling Tower, 4160 GPM (Exempt)**
- S-4 Fire Pump Diesel Storage Tank (Exempt)**

The following projected operating scenario for S-1 was utilized in the initial application to estimate maximum annual air pollutant emissions from the new gas turbines and HRSGs.

- 6000 hours of baseload (100% load) operation per year @ 60°F
- 312 gas turbine total start-ups per year
- 312 gas turbine total shutdowns per year

This modification application includes no more than 4 starts per day, and 365 starts per year. The total hours of operation will be managed to prevent exceeding the total NO_x emission limit of 16.6 tons/yr. Total hours of operation can reach the maximum 8760 hours/year is no annual emission limits are exceeded.

The Diesel driven Firewater Pump is projected to be operated 100 hours per year, or approximately one hour per day, two days per week, 52 weeks per year.

Emissions Control Strategy:

The proposed project triggers the Best Available Control Technology (BACT) requirement of New Source Review (District Regulation 2, Rule 2, NSR) for emissions of nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POCs), sulfur dioxide (SO₂), and particulate matter of less than 10 microns in diameter (PM₁₀). The applicant has proposed the following controls:

Selective Catalytic Reduction with Ammonia Injection for the Control of NO_x

The S-1 gas turbine will be equipped with water injection to minimize NO_x emissions which will be further reduced through the use of a selective catalytic reduction (SCR) system with ammonia injection. The gas turbine will achieve a BACT-level NO_x emission limit of 2.5 ppmvd @ 15 % O₂ (three hour average).

Oxidation Catalyst to Minimize CO and POC Emissions

The S-1 gas turbines trigger BACT for CO and POC emissions. A CO catalyst designed to catalytically oxidize the CO and POC to achieve a BACT-level CO emission limit of 6.0 ppmvd @ 15 % O₂ and a POC level of 2.0 ppmvd @ 15 % O₂.

Exclusive Use of Clean-burning Natural gas to Minimize SO₂ and PM₁₀ Emissions

The S-1 gas turbine will utilize exclusively natural gas as a fuel to minimize SO₂ and PM₁₀ emissions. Because the emission rate of SO₂ depends on the sulfur content of the fuel burned and is not dependent upon the burner type or other combustion characteristics; the use of natural gas will result in the lowest possible emission of SO₂. PM₁₀ emissions are minimized through the use of best combustion practices and "clean burning" natural gas.

Emissions Calculations

The emission calculations for S-1 have changed since the original application. The maximum hourly emission estimates are higher than in the original application due to the higher turbine rating (500 MMBtu/hr, up from 470 MMBtu/hr). The highest daily emissions have changed not only due to the higher turbine rating, but also due to a proposed operation that includes a maximum of 4 starts per day. The annual emission limits have changed due to the new total NOx limit of 16.6 tons/yr (up from 14.8 tons/yr), the proposed operation that included a maximum of 365 starts/yr, and the addition of the Diesel Fire Pump. Since the Diesel Fire Pump emissions need to be subtracted from the total 16.6 tons/yr NOx limit, these calculations will be shown first.

S-2 Diesel Firewater Pump, Clarke Model JU4H-UF40, 94 HP

Emission factors for the Diesel engine are provided by the applicant and are summarized in the following table:

Pollutant	g/BHP-hr	<u>Lb/hr</u>	Lb/day	Lb/yr	Ton/yr
NOx	6.1	1.26	1.26	131	0.066
CO	0.20	0.0414	0.0414	4.31	0.0022
PM10	0.04	0.0083	0.0083	0.86	0.00043
POC	0.29	0.0601	0.0601	6.25	0.0031
SO₂	0.10	0.0207	0.0207	2.14	0.0011

Emissions are based on the proposed operation of 1 hr/day, 2 days/wk, 52 weeks/yr or 100 hr/yr.

S-1 Combustion Gas Turbine with Water Injection, General Electric LM6000 PC Sprint, natural gas fired, 49 MW net simple-cycle, 500 MMBtu/hr maximum heat input rating; abated by A-1 Oxidation Catalyst, and A-2 Selective Catalytic Reduction System.

A. S-1 Maximum Hourly Emission Estimates:

NOx, CO, POC, and ammonia are all limited by BACT and enforceable permit conditions to not exceed certain exhaust concentrations. BACT for SO₂ and PM₁₀ is the exclusive use of clean-burning natural gas. The exhaust concentration, in ppmv, is not specifically limited for SO₂ and PM₁₀, so the hourly emission rate will be taken to be those values provided by natural gas composition and General Electric, respectively.

The S-1 emissions calculations are in two parts: Baseload and emissions due to Start/Stops.

1. Baseload Operation Emissions

The emissions are summarized below (detailed calculations follow the table):

S-1 Turbine Baseload Hourly Emissions Estimates, lb/hour

NO _x	CO	POC	PM ₁₀	SO ₂
4.52	6.60	1.26	3	1.38

a. NO_x emissions. The applicant has agreed to a NO_x emission limit of 2.5 ppmv (averaged over three hours), which complies BACT requirements for this gas turbine. The NO_x emissions from the turbine will be limited by permit condition to 2.5 ppmv, dry @ 15% O₂. This concentration is converted to a mass emission factor as follows:

$$(2.5 \text{ ppmvd})(20.95-0)/(20.95 - 15) = 8.8 \text{ ppmv NO}_x, \text{ dry @ 0\% O}_2$$

$$(8.8/1,000,000)(1 \text{ lbmol}/385.3 \text{ dscf})(46.01 \text{ lb NO}_x \text{ (as NO}_2\text{)/lbmol})(8600 \text{ dscf/MMBtu}) \\ = 0.0090 \text{ lb NO}_2\text{/MMBtu}$$

The NO_x mass emission rate based on the maximum firing rate of the turbine is calculated as follows:

$$(0.0090 \text{ lb NO}_x\text{/MMBtu})(500 \text{ MMBtu/hr}) = \mathbf{4.52 \text{ lb NO}_x\text{/hr}}$$

b. CO emissions. The CO emissions from each turbine will be limited by permit condition to 6.0 ppmv, dry @ 15% O₂. The CO mass emission rate based on the maximum firing rate of the turbine is calculated as follows based on 6.0 ppmvd @ 15% O₂:

$$(6.0 \text{ ppmvd})(20.95-0)/(20.95 - 15) = 21 \text{ ppmv CO, dry @ 0\% O}_2 \\ (21/10^6)(1 \text{ lbmol}/385.3 \text{ dscf})(28.01 \text{ lb CO/lbmol})(8600 \text{ dscf/MMBtu}) = 0.0132 \text{ lb/MM} \\ (0.0132 \text{ lb CO/MMBtu})(500 \text{ MMBtu/hr}) = \mathbf{6.60 \text{ lb CO/hr}}$$

c. POC emissions. The POC emission from the turbine will be limited by permit condition to 2.0 ppmv, dry @ 15% O₂. The POC mass emission rate based on the maximum firing rate of the turbine is calculated as follows based on 2.0 ppmvd @ 15% O₂:

$$(2.0 \text{ ppmvd})(20.95-0)/(20.95 - 15) = 7.04 \text{ ppmv POC, dry @ 0\% O}_2 \\ (7.04/10^6)(1 \text{ lbmol}/385.3 \text{ dscf})(16.0 \text{ lb POC(as C}_1\text{)/lbmol})(8600 \text{ dscf/MMBtu}) = .00251 \text{ lb/MM} \\ (0.00251 \text{ lb POC/MMBtu})(500 \text{ MMBtu/hr}) = \mathbf{1.26 \text{ lb POC/hr}}$$

d. Ammonia emissions. The ammonia (NH₃) mass emission rate from the turbine will be limited by permit condition to 10.0 ppmv, dry @ 15% O₂. The NH₃ mass emission rate based on the maximum firing rate of the turbine is calculated as follows based on 10.0 ppmv @ 15% O₂:

$$(10 \text{ ppmvd})(20.95-0)/(20.95 - 15) = 35.2 \text{ ppmv NH}_3, \text{ dry @ 0\% O}_2 \\ (35.2/10^6)(1 \text{ lbmol}/385.3 \text{ dscf})(17.0 \text{ lb NH}_3 \text{ /lbmol})(8600 \text{ dscf/MMBtu}) = .0134 \text{ lb/MM}$$

$$(0.0134 \text{ lb NH}_3/\text{MMBtu})(500 \text{ MMBtu/hr}) = \mathbf{6.68 \text{ lb NH}_3/\text{hr}}$$

e. SO₂ emissions. The SO₂ emission factor is based upon an expected average natural gas sulfur content that will not exceed 1.0 grains per 100 scf and a higher heating value of 1030 Btu/scf. Although the maximum sulfur content can be as high as 1.0 grain per 100 scf, the actual sulfur content is likely to be much less.

The sulfur emission factor is calculated as follows:

$$(1.0 \text{ gr}/100\text{scf})(10^6 \text{ Btu/MM Btu})(2 \text{ lb SO}_2/\text{lb S})/[(7000 \text{ gr}/\text{lb})(1030 \text{ Btu}/\text{scf})] \\ = 0.00277 \text{ SO}_2\text{lb /MM Btu}$$

The corresponding mass SO₂ emission rate is:

$$(0.00277 \text{ lb SO}_2/\text{MM Btu})(500 \text{ MM Btu/hr}) = \mathbf{1.38 \text{ lb/hr SO}_2}$$

f. PM₁₀ emissions. The PM₁₀ emission factor is based upon the General Electric vendor prediction of 3 lb/hr. This is consistent with the use of natural gas as a fuel, which is BACT for a simple cycle turbine.

2. Start/Stop Emissions

The start-up/shutdown (non-baseload) emissions are the same as the original application. Data were provided by the turbine manufacturer, General Electric, for the United Golden Gate Project. Both the United Golden Gate Project and the Gilroy Energy Center, which use the same make and model gas turbine, used the factors below to estimate start-up and shutdown emissions. A start-up is anticipated to take an average of ten minutes for a simple cycle turbine whereas shutdowns are practically instantaneous. The SCR catalyst will require approximately 30 minutes to reach optimal operating temperature and the oxidation catalyst, about 10 minutes. Total time for a start/stop event is approximated as an hour.

S-1 General Electric Turbine Start-up/Stop Emissions, lb/hour per start/stop cycle

NO_x	POC	PM₁₀	CO	SO₂
7.7	0.68	2.5	7.7	0.33

3. S-1 Maximum Daily Emissions, lb/day:

Maximum daily emissions are estimated based on 24 hours of worst-case emission rates. The worst-case daily emission rate is either: a day, which includes a maximum of four startup/shutdown cycles, with the balance of the daily operations based on 100% load (33.8 F ambient temperature) or 100% load for 24 hours. The baseload hourly emission estimates, as shown in Part 1 above, are based on allowable BACT concentration emission limits at 100% load. The start/stop hourly emission estimates are based on the emission estimates provided by the turbine vendor as summarized in Part 2 above.

$$\text{NO}_x = (7.7 \text{ lb/hr-start/stop})(4 \text{ starts}) + (4.52 \text{ lb/hr-baseload})(20 \text{ hr}) = 121 \text{ lb/day NO}_x$$

$$\text{CO} = (7.7 \text{ lb/hr-start/stop})(4 \text{ starts}) + (6.60 \text{ lb/hr-baseload})(20 \text{ hr}) = 163 \text{ lb/day CO}$$

$$\text{POC} = (1.26 \text{ lb/hr-baseload})(24 \text{ hr}) = 30.2 \text{ lb/day POC}$$

$$\text{PM}_{10} = (3.0 \text{ lb/hr-baseload})(24 \text{ hr}) = 72.0 \text{ lb/day POC}$$

$$\text{SO}_2 = (1.38 \text{ lb/hr-baseload})(24 \text{ hr}) = 33.1 \text{ lb/day POC}$$

A summary of the maximum daily emissions follows:

S-1 Maximum Turbine Daily Emissions, lb/day

NO _x	CO	POC	PM ₁₀	SO ₂
121	163	30.2	72.0	33.1

B. S-1 Maximum Annual Emissions Estimates

The applicant is requesting emission limits based on nominal operation limited to 24 hours/day, a maximum of 365 starts per year, and a maximum NO_x emissions of 16.6 tons/yr. Since the total NO_x emissions of S-2 are about 0.2 tons/yr, the net NO_x available for S-1 is 16.4 ton/yr. It is noted that Application 6511 reduces the size of S-2 which would reduce the S-2 NO_x figure above. However, the new number is insignificant and consequently the remaining calculations remain unchanged from those in the evaluation of Application 4925.

If the turbine were allowed to run without NO_x limits, the emissions would depend on the number of starts. The minimum number of starts is 1, and the maximum requested by the applicant is 365. These two scenarios results in the following emissions:

$$\begin{aligned} \text{Single start NO}_x &= [7.7 \text{ lb/start X } 1 \text{ start} + 4.52 \text{ lb/hr X } 8759 \text{ hrs}] / 2000 \text{ lb/ton} \\ &= 19.8 \text{ tons/yr NO}_x \end{aligned}$$

$$\text{Max. start NO}_x = [7.7 \text{ X } 365 + 4.52 \text{ X } (8760 - 365)] / 2000 = 20.4 \text{ tons/yr NO}_x$$

$$\begin{aligned} \text{Single start CO} &= [7.7 \text{ lb/start X } 1 \text{ start} + 6.60 \text{ lb/hr X } 8759 \text{ hrs}] / 2000 \text{ lb/ton} \\ &= 28.9 \text{ tons/yr CO} \end{aligned}$$

$$\text{Max. start CO} = [7.7 \text{ X } 365 + 6.60 \text{ X } (8760 - 365)] / 2000 = 29.1 \text{ tons/yr CO}$$

$$\begin{aligned} \text{Single start POC} &= [0.68 \text{ lb/start X } 1 \text{ start} + 1.26 \text{ lb/hr X } 8759 \text{ hrs}] / 2000 \text{ lb/ton} \\ &= 5.52 \text{ tons/yr POC} \end{aligned}$$

$$\text{Max. start POC} = [0.68 \text{ X } 365 + 1.26 \text{ X } (8760 - 365)] / 2000 = 5.41 \text{ tons/yr POC}$$

$$\text{Single start PM}_{10} = [2.5 \text{ lb/start X } 1 \text{ start} + 3.0 \text{ lb/hr X } 8759 \text{ hrs}] / 2000 \text{ lb/ton}$$

$$= 13.1 \text{ tons/yr NO}_x$$

$$\text{Max. start PM}_{10} = [2.5 \times 365 + 3.0 \times (8760 - 365)] / 2000 = 13.0 \text{ tons/yr NO}_x$$

$$\begin{aligned} \text{Single start SO}_2 &= [0.33 \text{ lb/start} \times 1 \text{ start} + 1.38 \text{ lb/hr} \times 8759 \text{ hrs}] / 2000 \text{ lb/ton} \\ &= 6.04 \text{ tons/yr SO}_2 \end{aligned}$$

$$\text{Max. start SO}_2 = [0.33 \times 365 + 1.38 \times (8760 - 365)] / 2000 = 5.85 \text{ tons/yr SO}_2$$

In summary, here are the unrestricted annual emissions for S-1 Turbine:

Pollutant	Single Start Case – Tons/Yr (One start, 8759 hrs Baseload)	Maximum Start Case – Tons/Yr (365 Starts, 8395 hrs Baseload)
NO_x	19.8	20.4
CO	28.9	29.1
POC	5.52	5.41
PM₁₀	13.1	13.0
SO₂	6.04	5.85

To calculate the maximum possible annual emissions, the unrestricted rates above will be prorated by the maximum S-1 NO_x rate of 16.4 ton/yr.

$$\text{NO}_x = 16.4 \text{ ton/yr (16.6 t/y offsets surrendered less 0.2 t/y used by S-2)}$$

$$\text{POC} = 5.52 \text{ tons/yr} \times 16.4/19.8 = 4.57 \text{ ton/yr POC (single start case)}$$

$$\text{or } 5.41 \text{ tons/yr} \times 16.4/20.4 = 4.34 \text{ ton/yr POC (maximum 365 start case)}$$

$$\text{PM}_{10} = 13.1 \text{ tons/yr} \times 16.4/19.8 = 10.9 \text{ ton/yr PM}_{10}$$

$$\text{or } 13.0 \text{ tons/yr} \times 16.4/20.4 = 10.5 \text{ ton/yr PM}_{10}$$

$$\text{CO} = 28.9 \text{ tons/yr} \times 16.4/19.8 = 23.9 \text{ ton/yr CO}$$

$$\text{or } 29.1 \text{ tons/yr} \times 16.4/20.4 = 23.4 \text{ ton/yr CO}$$

$$\text{SO}_2 = 6.04 \text{ tons/yr} \times 16.4/19.8 = 5.00 \text{ ton/yr SO}_2$$

$$\text{or } 5.85 \text{ tons/yr} \times 16.4/20.4 = 4.70 \text{ ton/yr SO}_2$$

The applicant has requested that if a pollutant is not otherwise capped, the permitted annual emissions should be based on 8760 operating hours per year. The following summarize the permitted annual rates:

Pollutant	Unrestricted Tons/Yr One start, 8759 hrs Baseload	Unrestricted Tons/Yr 365 starts, 8295 hrs Baseload	Permitted Annual Tons/Yr	Limitation
NO_x	19.8	20.4	16.4	Surrendered Offsets
CO	28.9	29.1	29.1	8760 hrs operation
POC	5.5	5.4	4.9	Offset Threshold
PM₁₀	13.1	13.0	13.1	8760 hrs operation
SO₂	6.0	5.9	6.0	8760 hrs operation

C. Annual Fuel Usage

Fuel usage can be calculated using operating hours, which will be dependent on the number of annual turbine starts. The highest potential operating hours would be if the turbine was operated continuously. The maximum operating hours are calculated as follows:

Baseload operation = total emissions – startup emissions

16.4 ton/yr NO_x X 2000 lb/ton – 7.7 lbs/start = 32,792 lb NO_x baseload emissions

Operating hours = baseload emissions / baseload emission rate

32,792 lb/yr NO_x / 4.52 lb/hr = **7255 Maximum Annual Operating Hours**

It is unlikely that this turbine would be operated continuously for 7255 hours. However, this number can be used to estimate maximum fuel usage. (The minimum operating hours would likely be determined by the need for peaking plant energy. However, a similar computation of baseload operation for the 365 start case results in:

[16.4 X 2000 – 7.7 X 365] / 4.52 = 6,635 operating hours)

Maximum theoretical fuel use can be projected as follows:

7255 hrs/yr X 500 MMBtu/hr = 3,627,000 MMBtu/yr

3,627,000 MMBtu/yr X 1 therm/100,000Btu X 1,000,000 Btu/MMBtu

= 36,275,000 therms/yr Turbine Maximum Fuel Usage

The applicant has requested that the maximum annual fuel usage be permitted as if the turbine would operate 8760 hours per year:

8760 hrs/yr X 500 MMBtu/hr = **4,380,000 MMBtu/yr Maximum Fuel Usage**
= **43,800,000 Therms/yr**

The actual fuel usage would be less, and in any case limited by the maximum permitted emissions. The accumulated emission totals will be monitored by the Continuous Emission Monitor (CEM) system.

Total Facility Cumulative Emissions

The total emissions for the Goose Haven facility are as follows:

Pollutant	S-1 ton/yr	S-2 ton/yr	Total ton/yr
NOx	16.4	0.179	16.6
POC	4.9	0.005	4.5
PM10	13.1	0.003	10.9
CO	29.1	0.009	23.8
SOx	6.0	0.000014	5.0

Note that if the smaller engine emissions were incorporated into the table above, this would be the result:

Pollutant	S-1 ton/yr	S-2 ton/yr	Total ton/yr
NOx	16.4	0.066	16.5
POC	4.9	0.0031	4.9
PM10	13.1	0.00043	13.1
CO	29.1	0.0022	29.1
SOx	6.0	0.0011	6.0

Only the NOx shows a total ton/yr difference and as stated above, the change is insignificant. Note that Calpine has surrendered 16.6 ton/yr of NOx offsets. Revising the S-1 emissions would entail a modification to the permit conditions for S-1. The applicant has agreed not to require this and the S-1 permit conditions will remain unchanged.

Compliance Determination

This Section summarizes the applicable District Rules and Regulations and describes how the proposed project will comply with those requirements.

I. Source S-1, Main Gas Turbine

A. Regulation 2, Rule 2; New Source Review

The primary requirements of New Source Review that apply to the proposed Goose Haven Energy Center are Section 2-2-301; “Best Available Control Technology Requirement”, Section 2-2-302; “Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides, NSR”, and Section 2-2-303; “Offset Requirement, PM₁₀ and Sulfur Dioxide, NSR” and Section 2-2-304, “PSD Requirements”.

1. Best Available Control Technology (BACT) Determinations

The following section includes BACT determinations by pollutant for the permitted sources of the proposed project.

a. Air Pollution Control Strategies and Equipment

The proposed facility includes sources that trigger the Best Available Control Technology (BACT) requirement of New Source Review (District Regulation 2, Rule 2, NSR) for emissions of nitrogen oxides (NO_x), carbon monoxide (CO), precursor organic compounds (POC), sulfur dioxide (SO₂), and particulate matter of less than 10 microns in diameter (PM₁₀).

The NO_x, CO and oxygen concentrations will be monitored continuously using a continuous emissions monitor (CEM). Therefore, emission concentrations of NO_x and CO will be limited to parts per million (ppm) emissions concentrations in the permit conditions. POC emissions will also be limited to parts per million (ppm) emissions concentrations in the permit conditions and will be verified with source tests.

b. Nitrogen Oxides (NO_x)

District BACT Guideline 89.1.2, dated 8/28/00, specifies BACT2 (achieved in practice) for NO_x for a simple-cycle gas turbine with a power rating ≤ 50 MW as NO_x emissions < 5.0 ppmvd @ 15% O₂, achieved through high temperature Selective Catalytic Reduction (SCR) with combustion modifications.

Water will be injected into the turbine combustor to reduce NO_x emissions in the combustor exhaust. Aqueous ammonia is injected into the SCR catalyst to control exiting stack emissions to

less than 2.5 ppmvd NO_x @ 15% O₂. The ammonia slip will be limited by permit condition to 10.0 ppmv. The applicant has agreed to reduce NO_x emissions below those levels required by current District BACT. Thus, some allowance for ammonia slip is appropriate.

The BAAQMD issued permits to the Gilroy Energy Center for simple-cycle gas turbines (GE LM6000) limit of 5 ppmvd NO_x at 15 % O₂ averaged over 3 hours with ammonia slip limit of 6 ppmvd. Moreover, the Gilroy Energy Center gas turbines have been in operation below 2.5 ppmvd NO_x since September 2001.

Since SCR, controlling NO_x emissions to 2.5 ppmv corrected to 15% oxygen, represents a control technology that is technologically feasible, cost-effective, and achieved in practice, it represents BACT for the project.

c. Carbon Monoxide (CO)

District BACT Guideline 89.1.2, dated 8/28/00, specifies BACT2 (achieved in practice) for CO for a gas turbine with a power rating ≤ 50 MW as CO emissions ≤ 10.0 ppmvd @ 15% O₂, achieved through the use of Catalytic Combustor.

The CO emissions from the combustion turbine will be reduced through the use of an oxidation catalyst to less than 6.0 ppmvd CO @ 15% O₂. CO emissions are also minimized through the use of best combustion practices and "clean burning" natural gas. This will comply with BACT.

d. Precursor Organic Compounds (POCs)

District BACT Guideline 89.1.2, dated 8/28/00, specifies BACT2 (achieved in practice) for POC for a gas turbine with a power rating ≤ 50 MW as POC emissions ≤ 2.0 ppmvd @ 15% O₂, achieved through the use of Catalytic Combustor.

The POC emissions from the combustion turbine will be reduced to less than 2.0 ppmvd through the use of an oxidation catalyst. POC emissions are also minimized through the use of best combustion practices and "clean burning" natural gas.

e. Sulfur Dioxide (SO₂)

District BACT Guideline 89.1.2, dated 8/28/00, specifies BACT2 (achieved in practice) for SO₂ for a gas turbine with a rated heat input ≥ 2.0 MW and < 50 MW as the exclusive use of clean-burning natural gas. The gas turbines will utilize natural gas exclusively to minimize SO₂ emissions. Because the emission rate of SO₂ depends on the sulfur content of the fuel burned and is not dependent upon the burner type or other combustion characteristics, the use of natural gas will result in the lowest possible emission of SO₂.

f. Particulate Matter (PM₁₀)

District BACT Guideline 89.1.2, dated 8/28/00, specifies BACT (achieved in practice) for PM₁₀ for a gas turbine with a rated heat input ≥ 2.0 MW and < 50 MW as the exclusive use of clean-burning natural gas. PM₁₀ emissions are minimized through the use of best combustion practices and "clean burning" natural gas. The gas turbines will utilize natural gas exclusively to minimize PM₁₀ emissions.

2. Emission Offsets

This project is being evaluated with two similar projects under common ownership, each within three miles of the other two. These projects are evaluated by the District as three separate projects for the purposes of permitting. However, pursuant to District Regulation 2-2-215, the cumulative emissions of all three projects must be totaled to determine the offset requirements of Regulation 2-2-302. Since the emission rates for all three projects are similar, and identical for NO_x (where offsets are needed), the total emissions are three times that of a single project.

Calpine Solano County Energy Center Emission Offset Summary

Pollutant	NO_x	SO₂	CO	POC	PM₁₀
Each Facility (tpy)	16.6	6.0	29.1	4.9	13.1
All Three Facilities (tpy)	49.8	18.0	87.3	14.7	39.3
Facility Threshold (tpy)	15	100	n/a	15	100
Total Offsets Required (tpy)	49.8	0	n/a	0	0
Offsets Provided to date (tpy)	49.8				
Net Offsets Required (tpy)	0.0				

Total facility emissions will be more than 15 tons per year but less than 50 tons per year of NO_x. Calpine has provided 49.8 tons/yr of NO_x offsets credits.

3. Prevention of Significant Deterioration, PSD

Pursuant to Regulation 2-2-221, a PSD air quality analysis is not required because this facility emits less than the trigger levels listed below for NO_x, POC, PM₁₀, CO and SO₂. As such, the project is not a major modification of a stationary source and will not be subject to PSD review for those pollutants.

Goose Haven Energy Center PSD Trigger Comparison

Pollutant	Trigger Level (tpy)	Project Emissions (tpy)
NO _x :	40	16.6
CO:	100	29.1
POC:	40	4.9
PM ₁₀ :	15	13.1
SO ₂ :	40	6.0

B. CEQA Analysis

Per District Regulation 2-1-310, except for permit applications which will be reviewed as ministerial projects under Section 2-1-311 or which are exempt from California Environmental Quality Act (CEQA) pursuant to Section 2-1-312, all proposed new and modified sources for which an authority to construct must be obtained from the District shall be reviewed in accordance with the requirements of CEQA. For this project, the Lead Agency under CEQA is the County of Solano, California.

An Initial Study of the project was performed by the Lead Agency to assess potential impacts and identify mitigation measures to avoid, reduce, or minimize significant impacts to less than significant levels. Since the Initial Study concludes that all project impacts would be reduced to less than significant with the implementation of mitigation measures, the County of Solano has issued a Negative Declaration for the project.

The modification of the Diesel Firewater Pump engine does not materially change the project reviewed by the county of Solano. Therefore, this project therefore complies with the requirements of Regulation 2-1-426.2.

C. Toxic Risk Screen

Pursuant to the BAAQMD Risk Management Policy, a health risk screening must be executed to determine the potential impact on public health resulting from the worst-case emissions of toxic air contaminants (TACs) from the project. In accordance with the requirements of the BAAQMD Risk Management Policy and California Air Pollution Control Officers Association (CAPCOA) guidelines, the impact on public health due to the emission of these compounds was assessed utilizing air pollutant dispersion models.

A review of the health risk assessment submitted by the applicant for operation of a gas turbine generator peaking unit and Diesel Firewater Pump was performed by the District’s Toxics Evaluation Section. The emission rates are calculated based on 8760 hours/yr operation or an annual fuel use of 4,380,000 MMBtu (3978 MMscf/yr.). The ammonia emissions shown are based upon a worst-case ammonia emission concentration of 10 ppmvd @ 15% O₂ due to ammonia slip from the SCR systems. The rest of the pollutant emissions are calculated using the maximum emission factors from the California Air Toxics Emission Factor (CATEF) database available from the California Air Resources Board (CARB 1996) for gas turbines with COC/SCR controls.

The results of the District’s risk screen are as follows:

Cancer Risk	Chronic Hazard Index	Acute Hazard Index
0.6 in a million	0.1	0.2

These levels of risk are not considered significant. Thus, in accordance with the BAAQMD Risk Management Policy, the screen passes. Therefore, the facility is deemed to be in compliance with the BAAQMD Risk Management Policy.

D. Other Applicable District Rules and Regulations1. Regulation 1, Section 301: Public Nuisance

None of the project's proposed sources of air contaminants are expected to cause injury, detriment, nuisance, or annoyance to any considerable number of persons or the public with respect to any impacts resulting from the emission of air contaminants regulated by the District. In part, the air quality impact analysis is designed to insure that the proposed facility will comply with this Regulation.

2. Regulation 2, Rule 1, Sections 301 and 302:
Authority to Construct and Permit to Operate

Pursuant to Regulation 2-1-301 and 2-1-302, the applicant has submitted an application to the District to obtain an Authority to Construct and Permit to Operate for the proposed S-1 Gas Turbine.

3. Regulation 2, Rule 6: Major Facility Review

Title V of the 1990 Clean Air Act Amendments (CAAA) required states to implement and administer a source-wide operating permit program consistent with the provisions of Title 40, Code of Federal Regulations (CFR), Part 70. The BAAQMD has been delegated authority to administer the Title V program through Rule 2-6.

Pursuant to 40 CFR 72, the new units may not be operated before either the acid rain permit is issued, or 24 months after the acid rain permit application is submitted whichever is first.

4. Regulation 2, Rule 7: Acid Rain

Per the definition of Phase II Acid Rain Facility in Regulation 2-6-217.1, this facility is a Phase II Acid Rain Facility. This project will be subject to the requirements of Title IV of the federal Clean Air Act. The requirements of the Acid Rain Program are outlined in 40 CFR Part 72, 73, and 75. The specifications for the type and operation of continuous emission monitors (CEMs) for pollutants that contribute to the formation of acid rain are given in 40 CFR Part 75.

District Regulation 2, Rule 7 incorporates by reference the provisions of 40 CFR Part 72 and administers the program in concert with the Title V Operating Permits Program (Rule 2-6).

The facility must obtain an Acid Rain Permit from the BAAQMD prior to the date on which the unit commences operation. The District has been delegated authority to issue Acid Rain permits. The applicant has submitted Application 5013 for the Acid Rain Permit for the Goose Haven Energy Center.

The project will be subject to the following general requirements under the acid rain program:

- Duty to apply for a modification to the Acid Rain Permit.

- Compliance with SO₂ and NO_x emission limits.
- Duty to obtain required SO₂ allowances.
- Duty to install, operate and certify Continuous Emission Monitoring Systems (CEMs) to demonstrate compliance with the acid rain requirements.

The applicant will secure the required SO₂ allowances and will perform the required emission monitoring. Monitoring plans will be submitted as required by EPA rules.

5. Regulation 6: Particulate Matter and Visible Emissions

The combustion of natural gas at the proposed gas turbine is not expected to result in visible emissions. Specifically, the facility's combustion sources are expected to comply with Regulation 6, including sections 301 (Ringelmann No. 1 Limitation), 302 (Opacity Limitation) with visible emissions not to exceed 20% opacity, and 310 (Particulate Weight Limitation) with particulate matter emissions of less than 0.15 grains per dry standard cubic foot of exhaust gas volume.

6. Regulation 7: Odorous Substances

Regulation 7-302 prohibits the discharge of odorous substances, which remain odorous beyond the facility property line after dilution with four parts odor-free air. Regulation 7-302 limits ammonia emissions to 5000 ppm. Because the ammonia emissions from the proposed SCR system will each be limited by permit condition to 10 ppmvd @ 15% O₂, the facility is expected to comply with the requirements of Regulation 7.

7. Regulation 8: Organic Compounds

This Source S-1 is exempt from Regulation 8, Rule 2, "Miscellaneous Operations" per 8-2-110 since natural gas will be fired exclusively at the project.

8. Regulation 9: Inorganic Gaseous Pollutants

a. Regulation 9, Rule 1, Sulfur Dioxide

This regulation establishes emission limits for sulfur dioxide from all sources and applies to the combustion sources at this facility. Section 301 (Limitations on Ground Level Concentrations) prohibits emissions which would result in ground level SO₂ concentrations in excess of 0.5 ppm continuously for 3 consecutive minutes, 0.25 ppm averaged over 60 consecutive minutes, or 0.05 ppm averaged over 24 hours. Section 302 (General Emission Limitation) prohibits SO₂ emissions in excess of 300 ppm (dry). The gas turbine is not expected to contribute to noncompliance with ground level SO₂ concentrations and should easily comply with section 302.

b. Regulation 9, Rule 3, Nitrogen Oxides from Heat Transfer Operations

The proposed combustion gas turbine shall comply with the Regulation 9-3-303 NO_x limit of 125 ppm with nitrogen oxide emissions of 5.0 ppmvd @ 15% O₂.

c. Regulation 9, Rule 9, Nitrogen Oxides from Stationary Gas Turbines

Because the proposed combustion gas turbine will be limited by permit condition to NO_x emissions of 2.5 ppmvd @ 15% O₂, it is expected to comply with the Regulation 9-9-301.3 NO_x limitation of 9 ppmvd @ 15% O₂.

d. Regulation 9, Rule 11, Nitrogen Oxides and Carbon Monoxide from Electric Power Generating Steam Boilers

This rule does not apply because this project does not utilize a boiler.

9. Regulation 10: New Source Performance Standards (NSPS)

This regulation incorporates the federal NSPS.

Subpart A General Provisions provides the general framework for NSPS. Subpart Db Standards of Performance for Industrial-Commercial-Institutional Steam Generating Units does not apply because this project does not utilize duct burners.

Subpart GG Standards of Performance for Stationary Gas Turbines – contains NO_x and SO_x emission limits, as well as monitoring and testing requirements for combustion turbines. The project emissions will be well below the applicable NO_x and SO₂ emissions limits. The Applicant will comply with emission and fuel monitoring requirements, and monitoring plans will be submitted, as required. The applicable requirements will be incorporated into the Title V permit.

10. Section 112 of the Clean Air Act, National Emission Standards for Hazardous Air Pollutants (NESHAP)

These standards are contained in 40 CFR Parts 61 and 63 and are not applicable to the proposed project.

11. Regulation 2-1-412: Public Notice

The facility is over 1000 feet from the nearest school and therefore not subject to the public notification requirements of Regulation 2-1-412.

II. Source S-2, Diesel Firewater Pump

A. Regulation 6 –Visible Emissions.

S-2 is subject to and will comply with the Visible Emission requirements of Regulations 6-301(Ringelmann No. 1 Limitation), 6-305 (Visible Particles), and 6-310 (Particulate Weight Limitation). Regulation 6-302 does not apply because the APOC has not invoked it.

B. Regulation 9-1 – Sulfur Dioxide

S-2 are subject to and in compliance with the Sulfur Dioxide requirements of Regulations 9-1-301 (Limitations on Ground Level Concentrations), and 9-1-304 (Fuel Burning – Liquid and Solid Fuels). Regulation 9-1-302 does not apply for liquid fuels because Regulation 9-1-304 is the applicable regulation.

C. Regulation 2-2-301 -- BACT

A Best Available Control Technology (BACT) review is required for any new or modified source that results in a cumulative emissions increase for POC, NPOC, NO_x, SO₂, PM₁₀, or CO of greater than 10 pounds per highest day. S-2 will not exceed the 10 pounds limit for any pollutant, due to the fact that normal operation will be only one hour per day for a maintenance/reliability test. However, if the engine were to operate for a 24 hour period in an emergency situation, emissions of NO_x could exceed 10 lb/day. Therefore BACT does apply. The NO_x BACT requirements for new engines, as stated in the District Permit Advisory dated November 20, 2001, is 6.9gm/hp-hr. Since the emissions for this source are 6.1 gm/hp-hr, this engine complies with BACT.

D. Other Applicable District Rules and Regulations

Toxics, Offsets, Public Notice, CEQA, PSD, NSR, NSPS and NESHAPS are all addresses facility wide or in conjunction with the Main Gas Turbine and the results are included in the S-1 evaluation above.

Permit Conditions

Permit Conditions

Calpine Corporation

Goose Haven Energy Center

Solano County, CA

Source S-1: Combustion Gas Turbine with Water Injection, General Electric LM6000 PC Sprint, natural gas fired, 49 MW net simple-cycle, 500 MMBtu/hr

Definitions:

Hour:	Any continuous 60-minute period.
Calendar Day:	Any continuous 24-hour period beginning at 12:00 AM or 0000 hours.
Year:	Any consecutive twelve-month period of time
Heat Input:	All heat inputs refer to the heat input at the higher heating value (HHV) of the fuel, in Btu/scf.
Firing Hours:	Period of time, during which fuel is flowing to a unit, measured in fifteen-minute increments.
MM Btu:	million British thermal units
Gas Turbine Start-up Mode:	The time beginning with the introduction of continuous fuel flow to the Gas Turbine until the requirements listed in Part 18 are met, but not to exceed 60 minutes.
Gas Turbine Shutdown Mode:	The time from non-compliance with any requirement listed in Part 18 until termination of fuel flow to the Gas Turbine, but not to exceed 30 minutes.
Corrected Concentration:	The concentration of any pollutant (generally NO _x , CO or NH ₃) corrected to a standard stack gas oxygen concentration. For an emission point (exhaust of a Gas Turbine) the standard stack gas oxygen concentration is 15% O ₂ by volume on a dry basis
Commissioning Activities:	All testing, adjustment, tuning, and calibration activities recommended by the equipment manufacturers and the construction contractor to insure safe and reliable steady state operation of the gas turbines, heat recovery steam generators, steam turbine, and associated electrical delivery systems.

Commissioning Period: The Period shall commence when all mechanical, electrical, and control systems are installed and individual system start-up has been completed, or when a gas turbine is first fired, whichever occurs first. The period shall terminate when the plant has completed performance testing, is available for commercial operation, and has initiated sales to the power exchange or 180 days after commencement, whichever occurs first.

Precursor Organic Compounds (POCs): Any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate

Equipment Description

This Authority To Construct Is Issued And Is Valid For This Equipment Only While It Is In The Configuration Set Forth In The Following Description:

Installation of One Simple-Cycle Gas Turbine Generator Consisting Of:

Simple Cycle Gas Turbine, General Electric LM6000 PC, Maximum Heat Input 500 MMBtu/hr, Nominal Electrical Output 49 MW, Natural Gas-Fired.

Selective Catalytic Reduction NOx Control System.

Ammonia Injection System.
(including the ammonia storage tank and control system)

Oxidation Catalyst System.

Continuous emission monitoring system (CEMS) designed to continuously record the measured gaseous concentrations, and calculate and continuously monitor and record the NOx and CO concentrations in ppmvd corrected to 15% oxygen on a dry basis.

Permit Conditions for the Commissioning Period

Parts 1 through 10 shall only apply during the commissioning period as defined above. Unless noted, Parts 11 through 33 shall only apply after the commissioning period has ended.

1. The owner/operator of the Goose Haven Energy Center shall minimize emissions of carbon monoxide and nitrogen oxides from S-1 Gas Turbine to the maximum extent possible during the commissioning period. (Basis: Cumulative Increase)
2. At the earliest feasible opportunity, in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator of S-1 Gas

Turbine combustor shall ensure that the S-1 Gas Turbine be tuned to minimize the emissions of carbon monoxide and nitrogen oxides. (Basis: Cumulative Increase)

3. At the earliest feasible opportunity, in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator of S-1 Gas Turbine will ensure A-1 SCR System and A-2 OC Systems shall be installed, adjusted, and operated to minimize the emissions of nitrogen oxides and carbon monoxide from S-1 Gas Turbine. (Basis: Cumulative Increase)
4. Coincident with the steady-state operation of A-1 SCR System and A-2 OC System pursuant to Part 3 the owner/operator of Gas Turbine (S-1) shall not operate S-1 Gas Turbine unless the NO_x and CO emissions are in compliance with the limitations specified in Parts 18.1 and 18.3. (Basis: Cumulative Increase)
5. The owner/operator of the Goose Haven Energy Center shall submit a plan to the District Permit Services Division at least two week prior to first firing of S-1 Gas Turbine describing the procedures to be followed during the commissioning of the turbines. The plan shall include a description of each commissioning activity, the anticipated duration of each activity in hours, and the purpose of the activity. The activities described shall include, but not be limited to, the tuning of the water injection, the installation and operation of the required emission control systems, the installation, calibration, and testing of the CO and NO_x continuous emission monitors, and any activities requiring the firing of the S-1 Gas Turbine without abatement by their respective SCR Systems. The owner/operator of S-1 Gas Turbine shall not fire S-1 Gas Turbine sooner than fourteen days after the District receives the commissioning plan. The owner/operator of S-1 Gas Turbine shall not exceed 180 days for the commissioning activities under any circumstances. (Basis: BAAQMD Regulation 2-1-403)
6. During the commissioning period, the owner/operator of the Goose Haven Energy Center shall demonstrate compliance with Parts 8 and 9 through the use of properly operated and maintained continuous emission monitors and data recorders for the following parameters:
 - firing hours
 - fuel flow rates
 - stack gas nitrogen oxide emission concentrations,
 - stack gas carbon monoxide emission concentrations
 - stack gas oxygen concentrations.

The monitored parameters shall be recorded at least once every 15 minutes (excluding normal calibration periods or when the monitored source is not in operation) for the S-1 Gas Turbine. The owner/operator shall use District-approved methods to calculate heat input rates, nitrogen dioxide mass emission rates, carbon monoxide mass emission rates, and NO_x and CO emission concentrations, summarized for each hour and each calendar day. All records shall be retained on site for at least 5 years from the date of entry and made available to District personnel upon request. (Basis: Cumulative Increase)

7. The owner/operator of S-1 Gas Turbine shall not fire S-1 Gas Turbine until such time that the District-approved continuous monitors specified in Part 6 shall be installed, calibrated,

and operational. After first firing of the turbine, the detection range of these continuous emission monitors shall be adjusted as necessary to accurately measure the resulting range of CO and NO_x emission concentrations. The type, specifications, and location of these monitors shall be subject to District review and approval. (Basis: BAAQMD Regulation 2-1-403)

8. The owner/operator of S-1 Gas Turbine shall not operate S-1 Gas Turbine without abatement by SCR or CO Systems for more than 200 hours during the commissioning period. Such operation of the S-1 Gas Turbine without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR or CO system in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Permit Services and Enforcement Divisions and the unused balance of the 200 firing hours without abatement shall expire. The owner/operator shall maintain records of all gas turbine firing hours without the SCR and/or OC systems in place and operational. (Basis: Cumulative Increase)
9. The owner/operator of S-1 Gas Turbine shall not perform commissioning activity on S-1 Gas Turbine unless it is fully understood that the total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM₁₀, and sulfur dioxide that are emitted by the S-1 Gas Turbine during the commissioning period shall accrue towards the consecutive twelve-month emission limitations specified in Part 21. (Basis: Cumulative Increase)
10. Within sixty (60) days of startup, the Owner/Operator shall conduct the first RATA test and first source test required by Part 24. The source test shall determine NO_x, CO, and POC emissions during start-up and shutdown of the gas turbines. The POC emissions shall be analyzed for methane and ethane to account for the presence of unburned natural gas. The source test shall include a minimum of three start-up and three shutdown periods. Thirty (30) days before the execution of the source tests, the Owner/Operator shall submit to the District a detailed source test plan designed to satisfy the requirements of this paragraph. The Owner/Operator shall be notified of any necessary modifications to the plan within 20 working days of receipt of the plan; otherwise, the plan shall be deemed approved. The Owner/Operator shall incorporate the District comments into the test plan. The Owner/Operator shall notify the District within ten (10) days prior to the planned source testing date. Source test results shall be submitted to the District within 60 days of the source testing date. (Basis: BAAQMD Regulation 2-1-403)

The Equipment For Which This Authority To Construct Is Issued May Be Operated Only When In Compliance With The Following Conditions:

11. Consistency with Analyses: Owner/Operator of S-1 Gas Turbine shall operate S-1 Gas Turbine only in accordance with all information submitted with the application (and supplements thereof) and the analyses under which this permit is issued unless otherwise noted below. (Basis: BAAQMD Regulation 2-1-403)
12. Conflicts Between Paragraphs: In the event that any paragraph herein is determined to be in conflict with any other paragraph contained herein, then, if principles of law do not

provide to the contrary, the owner/operator must comply with the paragraph most protective of air quality and public health and safety. (Basis: BAAQMD Regulation 1-102)

13. Reimbursement of Costs: The owner/operator of S-1 Gas Turbine shall reimburse all reasonable expenses, as set forth in the District's rules or regulations, incurred by the District for all activities that follow the issuance of this permit, including but not limited to permit condition implementation, compliance verification and emergency response, directly and necessarily related to enforcement of the permit. (Basis: BAAQMD Regulation 2-1-303)
14. Access to Records and Facilities: As to any condition that requires for its effective enforcement the inspection of records or facilities by representatives of the District, the Air Resources Board (ARB), the U.S. Environmental Protection Agency (U.S. EPA), or the California Energy Commission (CEC), the owner/operator shall make such records available or provide access to such facilities upon notice from representatives of the District, ARB, U.S. EPA, or CEC. Access shall mean access consistent with California Health and Safety Code Section §41510 and Clean Air Act Section §114A. (Basis: BAAQMD Regulation 1-440, 1-441)
15. Notification of Commencement of Operation: The owner/operator shall notify the District of the date of anticipated commencement of turbine operation not less than 10 days prior to such date. Temporary operations under this permit is granted consistent with the District's rules and regulations. (Basis: BAAQMD Regulation 2-1-302)
16. Operations: The owner/operator of S-1 Gas Turbine shall only operate S-1 Gas Turbine if the gas turbine, emissions controls, CEMS and associated equipment are properly maintained and kept in good operating condition. (Basis: BAAQMD Regulation 2-1-403)
17. Visible Emissions: The owner/operator shall not operate S-1 Gas Turbine if air contaminant shall be discharged into the atmosphere for a period or periods aggregating more than three minutes in any one hour which is as dark or darker than Ringelmann 1 or equivalent 20% opacity. . (Basis: BAAQMD Regulation 6-301)
18. Emissions Limits: The owner/operator of S-1 Gas Turbine shall only operate S-1 Gas Turbine if all of the following emission limits are met:
 - 18.1 Oxides of nitrogen (NO_x) emissions from the gas turbine shall not exceed 2.5 ppmvd @ 15% O₂ (3-hour rolling average), except during periods of startup and shutdown as defined in this permit. The NO_x emission concentration shall be verified by a District-approved continuous emission monitoring system (CEMS) and during any required source test. (basis: BACT)
 - 18.2 Ammonia emissions from the gas turbine shall not exceed 10 ppmvd @ 15% O₂ (1-hour rolling average), except during periods of startup and shutdown as defined in this permit. The ammonia emission concentration shall be verified by the continuous recording of the ratio of the ammonia injection rate to the NO_x inlet rate to the SCR control system (molar ratio). The maximum allowable NH₃/NO_x molar ratio shall be

determined during any required District approved source test, and shall not be exceeded until reestablished through another valid District approved source test. (basis: BACT)

18.3 Carbon monoxide (CO) emissions from the gas turbine shall not exceed 6 ppmvd @ 15 % O2 (1-hour rolling average), except during periods of startup and shutdown as defined in this permit. The CO emission concentration shall be verified by a District-approved CEMS and during any required source test. (basis: BACT)

18.4 Precursor organic compound (POC) emissions from the gas turbine shall not exceed 2 ppmvd @ 15% O2 (1-hour rolling average), except during periods of startup and shutdown as defined in this permit. The POC emission concentration shall be verified during any required source test. (basis: BACT)

18.5 Particulate matter emissions less than ten microns in diameter (PM10) from the gas turbine shall not exceed 3.0 pounds per hour, except during periods of startup and shutdown as defined in this permit. The PM10 mass emission rate shall be verified during any required source test. (basis: BACT & cumulative increase)

18.6 Oxides of sulfur emissions (SOx) from the gas turbine shall not exceed 1.39 pounds per hour, except during periods of startup and shutdown as defined in this permit. The SOx emission rate shall be verified during any required source test. (basis: BACT & cumulative increase)

19. Turbine Startup: Startup of the gas turbine shall not exceed a time period of 60 minutes each per occurrence, or another time period based on good engineering practice and approved in advance by the District. The startup clock begins with the turbine’s initial firing and continues until the unit meets the emission concentration limits. (Basis: Cumulative increase)

20. Turbine Shutdown: Shutdown of the gas turbine shall not exceed a time period of 30 minutes each per occurrence, or another time period based on good engineering practice and approved in advance by the District. Shutdown begins with initiation of the turbine shutdown sequence and ends with the cessation of turbine firing. (Basis: Cumulative increase)

21. Mass Emission Limits: Owner/operator can only operate S-1 Gas Turbine if the total mass emissions from the S-1 Gas Turbine do not exceed the daily, and annual mass emission limits listed in Table 1 below.

Table 1 – Mass Emission Limits (Including Startups and Shutdowns)

Pollutant	Daily (lb.)	Annual (tons)
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NO _x (as NO ₂)	121	16.4
POC	30	4.9
CO	163	29.1
SO _x (as SO ₂)	33	6.0
PM ₁₀	72	13.1

The daily and annual mass limits are on a calendar basis. Compliance shall be based on calendar average one-hour readings through the use of process monitors (e.g., fuel use meters), CEMS, and source test results; and the monitoring, recordkeeping and reporting conditions of this permit. (Basis: Cumulative increase)

22. Operational Limits: In order to comply with the emission limits of this rule, the owner/operator of S-1 Gas Turbine shall operate S-1 Gas Turbine only if the following operational limits are met:
- (a) The heat input to the gas turbine shall not exceed:
 - Hourly: 500 MMBtu/hr
 - Daily: 12,000 MMBtu/day
 - Annual: 4,380,000 MMBtu/year
 - (b) Only PUC Quality natural gas (General Order 58-a) shall be used to fire the gas turbine. The natural gas shall not contain total sulfur in concentrations exceeding 1 gr./100 scf.
 - (c) The owner/operator of the gas turbine shall comply with the daily and annual emission limits listed in Table 1 by keeping running totals based on CEM data. (Basis: Cumulative increase)
23. Monitoring Requirements: The owner/operator of S-1 Gas Turbine shall not operate S-1 Gas Turbine unless the following monitoring systems are installed, maintained and available for service:
- (a) The gas turbine exhaust stack shall be equipped with permanent provisions to allow collection of stack gas samples consistent with EPA test methods. (Basis: BAAQMD Regulation 2-1-403)
 - (b) The ammonia injection system shall be equipped with an operational ammonia flowmeter and injection pressure indicator accurate to plus or minus five percent at full scale and calibrated once every twelve months. (Basis: BACT)
 - (c) The gas turbine exhaust shall be equipped with continuously recording emissions monitor(s) for NO_x, CO and O₂. Continuous emissions monitors shall comply with the requirements of 40 CFR Part 60, Appendices B and F, and 40 CFR Part 75, and shall be capable of monitoring concentrations and mass emissions during normal operating

conditions and during startups and shutdowns. (Basis: 40CFR Part 60, Appendices B and F, and 40CFR Part 75)

(d) The fuel gas supply system shall be continuously recorded using District-approved fuel flow meters along with quarterly fuel compositional analyses for the fuel's higher heating value (wet basis). (Basis: Cumulative Increase)

(e) The fuel gas system shall have sample points and the total sulfur and hydrogen sulfide content of the fuel gas shall be analyzed on a quarterly basis. (Basis: BAAQMD Regulation 9-1-302))

24. Source Testing/RATA: Within sixty days after startup of the gas turbines, and at a minimum on an annual basis thereafter, the owner/operator shall perform a relative accuracy test audit (RATA) on the CEMS in accordance with 40 CFR Part 60 Appendix B Performance Specifications and a source test shall be performed. Additional source testing may be required at the discretion of the District to address or ascertain compliance with the requirements of this permit. The written test results of the source tests shall be provided to the District within 60 days after testing. A complete test protocol shall be submitted to the District no later than 30 days prior to testing, and notification to the District at least ten days prior to the actual date of testing shall be provided so that a District observer may be present. The source test protocol shall comply with the following: measurements of NO_x, CO, POC, and stack gas oxygen content shall be conducted in accordance with ARB Test Method 100; measurements of PM₁₀ shall be conducted in accordance with ARB Test Method 5; and measurements of ammonia shall be conducted in accordance with Bay Area Air Quality Management District test method ST-1B. Alternative test methods, and source testing scope, may also be used to address the source testing requirements of the permit if approved in advance by the District. The initial and annual source tests shall include those parameters specified in the approved test protocol, and shall at a minimum include the following:

- a. NO_x (as NO₂) – ppmvd at 15% O₂ and lb/MMBtu;
- b. Ammonia – ppmvd at 15% O₂ (Exhaust);
- c. CO – ppmvd at 15% O₂ and lb/MMBtu (Exhaust);
- d. POC – ppmvd at 15% O₂ and lb/MMBtu (Exhaust);
- e. PM₁₀ – lb/hr (Exhaust);
- f. SO_x – lb/hr (Exhaust);
- g. Natural gas consumption, fuel High Heating Value (HHV), and total fuel sulfur content;
- h. Turbine load in megawatts;
- i. Stack gas flow rate (SDCFM) calculated according to procedures in U.S. EPA Method 19.
- j. Exhaust gas temperature (°F)
- k. Ammonia injection rate (lb/hr or moles/hr)

(Basis: Cumulative Increase)

25. The owner/operator of S-1 Gas Turbine shall not operate S-1 Gas Turbine until after a written quality assurance program is established in accordance with 40 CFR Part 75, Appendix B and 40 CFR Part 60 Appendix F. (Basis: 40 CFR Part 75, Appendix B and 40 CFR Part 60 Appendix F)
26. The owner/operator of S-1 Gas Turbine shall not operate S-1 Gas turbine unless S-1 is in compliance with the applicable requirements of 40 CFR Part 60 Subpart GG, excluding 60.334(b)(2) and 60.334(c)(1). (Basis: NSPS)
27. The owner/operator shall notify the District of any breakdown condition consistent with the District's breakdown regulations. (Basis: BAAQMD Regulation 1-208)
28. The District shall be notified by the owner/operator of S-1 Gas Turbine in writing in a timeframe consistent with the District's breakdown regulations following the correction of any breakdown condition. The breakdown condition shall include a description of the equipment malfunction or failure, the date and cause of the initial failure, the estimated emissions in excess of those allowed, and the actions taken to restore normal operations. (Basis: BAAQMD Regulation 1-208)
29. Record keeping: The owner/operator of S-1 Gas Turbine shall not operate S-1 Gas turbine unless the following records are maintained:
 - (a) hourly, daily, quarterly and annual quantity of fuel used and corresponding heat input rates (Basis: Cumulative Increase);
 - (b) the date and time of each occurrence, duration, and type of any startup, shutdown, or malfunction along with the resulting mass emissions during such time period (Basis: BACT, Cumulative Increase);
 - (c) emission measurements from all source testing, RATAs and fuel analyses (Basis: BACT, Cumulative Increase, 40CFR60, 40CFR75);
 - (d) daily, quarterly and annual hours of operation (Basis: Cumulative Increase);
 - (e) hourly records of NOx and CO, emission concentrations and hourly ammonia injection rates and ammonia/NOx ratio (Basis: BACT).
 - (f) for the continuous emissions monitoring system; performance testing, evaluations, calibrations, checks, maintenance, adjustments, and any period of non-operation of any continuous emissions monitor. (Basis: BAAQMD Regulation 1-522)
30. All records required to be maintained by this permit shall be retained by the owner/operator for a period of five years and shall be made readily available for District inspection upon request. (Basis: BAAQMD Regulation 2-6-501)
31. Reporting: The owner/operator shall submit to the District a written report for each calendar quarter, within 30 days of the end of the quarter, which shall include:
 - (a) Daily and quarterly fuel use and corresponding heat input rates (Basis: Cumulative Increase);

- (b) Daily and quarterly mass emission rates for all criteria pollutants during normal operations and during other periods (startup/shutdown, breakdowns) (Basis: BACT, Cumulative Increase);
 - (c) Time intervals, date, and magnitude of excess emissions (Basis: BACT, Cumulative Increase);
 - (d) Nature and cause of the excess emission, and corrective actions taken (Basis: BACT, Cumulative Increase);
 - (e) Time and date of each period during which the CEM was inoperative, except for zero and span checks, and the nature of system repairs and adjustments (Basis: BAAQMD Regulation 1-522);
 - (f) A negative declaration when no excess emissions occurred (Basis: BACT, Cumulative Increase);
 - (g) Results of quarterly fuel analyses for HHV and total sulfur/hydrogen sulfide content; (Basis: BACT, 40CFR75)
32. District Operating Permit: The owner/operator shall apply for and obtain all required operating permits from the District according to the requirements of the District's rules and regulations. (Basis: BAAQMD Regulations 2, Rule 2 & BAAQMD Regulation 2, Rule 6)
33. Title IV and Title V Permits: The acid rain monitors (Title IV) must be certified within the earlier of 90 operational days or 180 calendar days of first-fire. (Basis: BAAQMD Regulation 2, Rule 6)

Permit Conditions

Calpine Corporation

Goose Haven Energy Center

Solano County, CA

Source S-2: Diesel Firewater Pump, Clarke Model JU4H-UF40, 94 HP

1. The owner/operator of S-2 Diesel Firewater Pump shall not operate engine unless the requirements of the following regulations are met: Regulation 9, Rule 1 ("Sulfur Dioxide"), Regulation 6 ("Particulate and Visible Emissions"), and Regulation 9, Rule 8 ("NOx and CO from Stationary Internal Combustion Engines"). [basis: BAAQMD Regulation 9, Rule 1; BAAQMD Regulation 9, Rule 8, BAAQMD Regulation 6]
2. The owner/operator of S-2 Diesel Firewater Pump shall not operate engine unless the liquid fuel contains less than 0.05 % Sulfur by weight. [Basis: Cumulative Increase]
3. The owner/operator of S-2 Diesel Firewater Pump shall not operate engine for more than 100 hours each in any consecutive 12 month period, excluding periods when operation is required due to emergency response. [basis: Cumulative Increase]
4. In order to determine compliance with Part 2 above, the owner/operator of S-2 Diesel Firewater Pump shall obtain a supplier certification for each fuel delivery stating the sulfur content. [basis: Cumulative Increase]
5. The owner/operator of S-2 Diesel Firewater Pump shall not operate S-2 unless S-2 is equipped with a non-resettable totalizing counter that records hours of operation. [basis: Cumulative Increase]
6. The owner/operator of S-2 Diesel Firewater Pump shall not operate S-2 Diesel Firewater Pump unless the following monthly records are maintained in a District-approved log:
 - total hours of operation for S-2
 - hours of operation when responding to an emergency
 - fuel usage at S-2
 - for each emergency operation, the nature of the emergency condition.
 Owner/operator must retain these records at least 5 years and they shall be made available to the District upon request. [basis: Cumulative Increase]

Exemptions

S-3 Cooling Tower, 4160 GPM

Exempt from Permitting per Regulation 2-1-128.4.

S-4 Fire Pump Diesel Storage Tank

Exempt from Permitting per Regulation 2-1-123.3.2. The initial boiling point of the stored liquid is 372°F.

Conclusion

The proposed Goose Haven Energy Center, which is composed of the permitted source listed below, complies with all applicable District rules and regulations. It is therefore recommended that a modified Authority to Construct be issued to:

S-1 Combustion Gas Turbine with Water Injection, General Electric LM6000 PC Sprint, natural gas fired, 49 MW net simple-cycle, 500 MMBtu/hr maximum heat input rating; abated by A-1 Oxidation Catalyst, and A-2 Selective Catalytic Reduction System.

S-2 Diesel Firewater Pump, Clarke Model JU4H-UF40, 94 HP

By: _____
Air Quality Engineer

_____ Date

APPENDIX B
GLOSSARY

ACT

Federal Clean Air Act

APCO

Air Pollution Control Officer

ARB

Air Resources Board

BAAQMD

Bay Area Air Quality Management District

BACT

Best Available Control Technology

Basis

The underlying authority that allows the District to impose requirements.

CAA

The federal Clean Air Act

CAAQS

California Ambient Air Quality Standards

CAPCOA

California Air Pollution Control Officers Association

CEQA

California Environmental Quality Act

CFR

The Code of Federal Regulations. 40 CFR contains the implementing regulations for federal environmental statutes such as the Clean Air Act. Parts 50-99 of 40 CFR contain the requirements for air pollution programs.

CO

Carbon Monoxide

Cumulative Increase

The sum of permitted emissions from each new or modified source since a specified date pursuant to BAAQMD Rule 2-1-403, Permit Conditions (as amended by the District Board on 7/17/91) and SIP Rule 2-1-403, Permit Conditions (as approved by EPA on 6/23/95). Cumulative increase is used to determine whether threshold-based requirements are triggered.

District

The Bay Area Air Quality Management District

dscf

Dry Standard Cubic Feet

EPA

The federal Environmental Protection Agency.

Excluded

Not subject to any District regulations.

Federally Enforceable, FE

All limitations and conditions which are enforceable by the Administrator of the EPA including those requirements developed pursuant to 40 CFR Part 51, subpart I (NSR), Part 52.21 (PSD), Part 60 (NSPS), Part 61 (NESHAPs), Part 63 (MACT), and Part 72 (Permits Regulation, Acid Rain), including limitations and conditions contained in operating permits issued under an EPA-approved program that has been incorporated into the SIP.

FP

Filterable Particulate as measured by BAAQMD Method ST-15, Particulate.

HAP

Hazardous Air Pollutant. Any pollutant listed pursuant to Section 112(b) of the Act. Also refers to the program mandated by Title I, Section 112, of the Act and implemented by 40 CFR Part 63.

Major Facility

A facility with potential emissions of: (1) at least 100 tons per year of regulated air pollutants, (2) at least 10 tons per year of any single hazardous air pollutant, and/or (3) at least 25 tons per year of any combination of hazardous air pollutants, or such lesser quantity of hazardous air pollutants as determined by the EPA administrator.

MFR

Major Facility Review. The District's term for the federal operating permit program mandated by Title V of the Federal Clean Air Act and implemented by District Regulation 2, Rule 6.

MOP

The District's Manual of Procedures.

NAAQS

National Ambient Air Quality Standards

NESHAPS

National Emission Standards for Hazardous Air Pollutants. See in 40 CFR Parts 61 and 63.

NMHC

Non-methane Hydrocarbons (Same as NMOC)

NMOC

Non-methane Organic Compounds (Same as NMHC)

NO_x

Oxides of nitrogen.

NSPS

Standards of Performance for New Stationary Sources. Federal standards for emissions from new stationary sources. Mandated by Title I, Section 111 of the Federal Clean Air Act, and implemented by 40 CFR Part 60 and District Regulation 10.

NSR

New Source Review. A federal program for pre-construction review and permitting of new and modified sources of pollutants for which criteria have been established in accordance with Section 108 of the Federal Clean Air Act. Mandated by Title I of the Federal Clean Air Act and implemented by 40 CFR Parts 51 and 52 and District Regulation 2, Rule 2. (Note: There are additional NSR requirements mandated by the California Clean Air Act.)

Offset Requirement

A New Source Review requirement to provide federally enforceable emission offsets for the emissions from a new or modified source. Applies to emissions of POC, NOx, PM10, and SO2.

Phase II Acid Rain Facility

A facility that generates electricity for sale through fossil-fuel combustion and is not exempted by 40 CFR 72 from Titles IV and V of the Clean Air Act.

POC

Precursor Organic Compounds

PM

Particulate Matter

PM10

Particulate matter with aerodynamic equivalent diameter of less than or equal to 10 microns

PSD

Prevention of Significant Deterioration. A federal program for permitting new and modified sources of those air pollutants for which the District is classified "attainment" of the National Air Ambient Quality Standards. Mandated by Title I of the Act and implemented by both 40 CFR Part 52 and District Regulation 2, Rule 2.

SIP

State Implementation Plan. State and District programs and regulations approved by EPA and developed in order to attain the National Air Ambient Quality Standards. Mandated by Title I of the Act.

SO2

Sulfur dioxide

THC

Total Hydrocarbons (NMHC + Methane)

Title V

Title V of the federal Clean Air Act. Requires a federally enforceable operating permit program for major and certain other facilities.

TOC

Total Organic Compounds (NMOC + Methane, Same as THC)

TPH

Total Petroleum Hydrocarbons

TRMP

Toxic Risk Management Plan

TSP

Total Suspended Particulate

VOC

Volatile Organic Compounds

Units of Measure:

bhp	=	brake-horsepower
btu	=	British Thermal Unit
cfm	=	cubic feet per minute
g	=	grams
gal	=	gallon
gpm	=	gallons per minute
hp	=	horsepower
hr	=	hour
lb	=	pound
in	=	inches
max	=	maximum
m ²	=	square meter
min	=	minute
mm	=	million
MMbtu	=	million btu
MMcf	=	million cubic feet
ppmv	=	parts per million, by volume
ppmw	=	parts per million, by weight
psia	=	pounds per square inch, absolute
psig	=	pounds per square inch, gauge
scfm	=	standard cubic feet per minute
yr	=	year