BAY AREA
AIR QUALITY
MANAGEMENT
DISTRICT

Final Determination of Compliance

Mariposa Energy Project

Unincorporated Alameda County between Livermore and Byron
Address: 4887 Bruns Road, Livermore, California 94550

Bay Area Air Quality Management District
Application 20737

November 2010

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Table of Contents

Tables

1 Introduction

The Bay Area Air Quality Management District (District) is issuing a Final Determination of Compliance (FDOC) Permit for the Mariposa Energy Project (MEP), a proposed 200-megawatt (nominal) natural gas fired electric power generation facility.

The Final Determination of Compliance sets forth the District's analysis as to how the facility would comply with applicable air quality regulatory requirements, as well as proposed permit conditions to ensure compliance. The District has previously published a Preliminary Determination of Compliance for public review and comment on August 18, 2010, and reviewed and considered all comments received from the public before deciding whether to issue a Final Determination of Compliance (FDOC) for the proposed project.

The proposed Mariposa Energy Project would be a simple-cycle power plant that would be used to meet demand for electrical power during short-term peaks in demand. The proposed power plant would operate as a load-following power plant, providing a power output from a low of 25 MW to a high of a 200 nominal (194 MW net at 59 F) MW. [1] The proposed MEP consists of four GE LM 6000 PC-Sprint simple-cycle gas turbines and associated support equipment. These simple-cycle turbines have a high degree of unit turndown, which means a low minimum generation rate relative to the maximum generation rate. Their minimum generation rate is 25 MW and the maximum rate is 48.5 MW. Simple-cycle turbines are well suited for a peaking power plant that may not run for an extended period of time, since this type of unit does not have a steam turbine that would need to be kept warm to avoid equipment damage.

The proposed project would be located in Alameda County, California, approximately 7 miles northwest of Tracy, 7 miles east of Livermore, 6 miles south of Byron, and approximately 2.5 miles west of the community of Mountain House. The facility would be located southeast of the intersection of Bruns Road and Kelso Road on a 10-acre portion of a 158-acre parcel immediately south of the Pacific Gas and Electric Company, Bethany Compressor Station, and the 230-kilovolt Kelso Substation on the southern portion of the Lee Property, between two small hills. The Mariposa Energy Project will be constructed, owned, and operated by Mariposa Energy LLC, which is owned by Diamond Generating Corporation, a wholly owned subsidiary of Mitsubishi Corporation.
This FDOC describes how the proposed Mariposa Energy Project would comply with applicable federal, state, and District regulations. These regulations include the Best Available Control Technology and emission offset requirements of the District New Source Review (NSR) requirements contained in District Regulation 2, Rule 2. This document also includes proposed permit conditions necessary to ensure compliance with applicable rules and regulations, air pollutant emission calculations, and a health risk assessment that estimates the impact of emissions of toxic air contaminants from the project on public health.

The FDOC has been prepared in accordance with District Regulations 2-2-404 through 2-2-406, which set forth the procedural requirements for the issuance of NSR permits, and District Regulation 2-3-403 and 2-3-404, which apply the requirements specifically to power plant permits. The purpose of the

[1] Application for Certification, Volume 1, Page 2-2, June 28, 2009

FDOC is to set forth the reasons and analysis that lead to the District's preliminary determination that the project would comply with all applicable regulatory requirements relating to air quality.

The remainder of this document is organized in the following manner. Section 2 provides an overview of the legal framework for power plant permitting in California and describes how members of the public can learn about the project and provide input to the District and the California Energy Commission. Section 3 describes the proposed Mariposa Energy Project, its location, and the turbine selection process. Section 4 describes the project's emissions. Section 5 describes the "Best Available Control Technology" to minimize air pollution and explains how the BACT requirements will apply to the facility. Section 6 describes the emissions offset requirements for the project and how the proposed facility would comply with them. Section 7 presents the results of the Health Risk Screening Analysis for the project. Section 8 addresses other applicable legal requirements. Section 9 sets forth the proposed permit conditions for the project. Section 10 concludes with the preliminary determination of compliance for Mariposa Energy Project.

2 Power Plant Permitting Process and Opportunities for Public Participation

The California Energy Commission (CEC) is the primary permitting authority for new power plants in California. The California Legislature has granted the Energy Commission exclusive licensing authority for all thermal power plants in California of 50 megawatts or more. (*See* Warren-Alquist State Energy Resources Conservation and Development Act, Cal. Public Resources Code §§ 25000 *et seq*.) This licensing authority supersedes all other local and state permitting authority. The intent behind this system is to streamline the licensing process for new power plants while at the same time provide a comprehensive review of potential environmental and other impacts.

As the lead permitting agency, the California Energy Commission (CEC) conducts an in-depth review of environmental and other issues posed by the proposed power plant. This comprehensive environmental review is the equivalent of the review required for major projects under the California Environmental Quality Act (CEQA), and the Energy Commission's license satisfies the requirements of CEQA for these projects. This CEQA-equivalent review encompasses air quality issues within the purview of the District, and also includes all other types of environmental and other issues, including water quality issues, endangered species issues, and land use issues, among others.

The District collaborates with the Energy Commission regarding the air quality portion of its environmental analysis and prepares a "Determination of Compliance" that outlines whether and how the proposed project will comply with applicable air quality regulatory requirements. The Determination of Compliance is used by the Energy Commission to assess air quality issues of the proposed power plant. This document presents the District's Final Determination of Compliance (FDOC). The District solicited and considered public input on the Preliminary Determination of Compliance in order to issue the Final Determination of Compliance for use by the Energy Commission in its CEQA-equivalent environmental review. The CEC will then conduct its environmental review, and at the end of that process, it will decide whether to issue a license for the project and under what conditions.

Both the Energy Commission's licensing process and District's Determination of Compliance process relating to air quality issues provide opportunities for public participation. For the District's Determination of Compliance, the District publishes its preliminary determination – the PDOC – and invites interested members of the public to review and comment on it. This public process allows members of the public to review the District's analysis of whether and how the facility will comply with applicable regulatory requirements and to bring to the District's attention any area in which members of the public believe the District may have erred in its analysis. This process helps improve the District's final determination by bringing to the District's attention any areas where interested members of the public disagree with the District's proposal at an early enough stage that the District can correct any deficiencies before making the final determination. The Energy Commission provides similar opportunities for public participation, and publishes its proposed actions for public review and comment before taking any final actions.

The District published the PDOC on August 18, 2010. The public comment period for the PDOC was noticed in the Tracy Press, Tri-Valley Herald, Stockton Record, and West County Times on August 25, 2010. The comment period ended on September 27, 2010. Numerous comments were received. The comments are attached in Appendix C of this document.

At this time, the Air District is publishing its Final Determination of Compliance (FDOC) for the project. The District has considered comments received on the PDOC from the public in determining whether to issue a Final Determination of Compliance (FDOC) and on what basis. All comments received during the comment period were considered by the District and addressed as necessary in the Final Determination of Compliance.

A formal Response to Comments document has been prepared and is attached in Appendix D of this document. The District has made some changes in response to comments. In particular, the permit conditions have been amended to:

- limit the commissioning of the turbines to one turbine at a time
- replace the hourly particulate limit for each turbine with an annual particulate limit for the facility, while lowering the annual emission limit by 2.53 tons/yr
- delete references to ongoing tuning
- allow any turbine to be operated up to 5,200 hours/yr while limiting the annual hours of operation for all four turbines to the original number of hours used in the calculations

Corrections to the permit conditions include:

- lowering the daily commissioning emissions
- lowering the maximum hourly emissions of CO and POC during startup and shutdown periods
- lowering the maximum daily emissions of NOx, CO, POC, and SO2
- lowering the annual emissions of CO and POC

The power plant approval process also provides opportunities for members of the public to participate in person in public hearings regarding this project. Members of the public will be afforded an opportunity to participate in public hearings regarding the project at the Energy Commission as part of the Commission's environmental review process. The public hearings before the Energy Commission will encompass all aspects of the project, including air quality issues and all other environmental issues.

Interested members of the public are invited to learn more about the project as part of the public review and comment process. Detailed information about the project and how it will comply with applicable regulatory requirements are set forth in the subsequent sections of this document. All supporting documentation, including the permit application and data submitted by the applicant and all other information the District has relied on in its analysis, are available for public inspection at the Communication and Outreach Division Office located on the 5th Floor of District Headquarters, 939 Ellis Street, San Francisco, CA, 94109. This FDOC and the supporting documentation are also available on the District's website at http://www.baaqmd.gov/. The public may also contact Ms. Cabral for further information at (415) 749-4686, bcabral@baaqmd.gov. **Para obtener información en español, comuníquese con Brenda Cabral en la sede del Distrito, (415) 749-4686,** bcabral@baaqmd.gov.

In addition to the District's permitting process involving air quality issues, interested members of the public are also invited to participate in the Energy Commission's licensing proceeding, which addresses other environmental concerns including those that are not related to air quality. For more information, go to the following CEC website: http://www.energy.ca.gov/sitingcases/mariposa/index.html. The public may also contact the Energy Commission's Public Adviser's office at:

Public Adviser
California Energy Commission
1516 Ninth Street, MS-12
Sacramento, CA 95814
Phone: (916) 654-4489
Toll-Free in California: 1-800-822-6228
E-mail: PublicAdviser@energy.state.ca.us

3 Project Description

The Mariposa Energy Project (MEP) is a proposed 200-megawatt “peaking” power plant to be located in unincorporated Alameda County between Livermore and Byron, California. The MEP would consist of four GE simple-cycle LM 6000 PC-Sprint natural gas fired combustion turbine generators with a total nominal capacity of 200 megawatts. This section describes the proposed project’s function as a simple-cycle “peaker” power plant. It also describes the project location, how it would be operated, provides details about project ownership, and the specific equipment being proposed for the project.

3.1 Mariposa Energy Project: A Simple-Cycle Power Plant

The proposed Mariposa Energy Project would be a simple-cycle “peaker” plant, designed to start up and respond quickly to grid demand, and to operate at a wide range of generation rates, in order to provide electricity to the grid at times of peak demand. Peaking power plants generally run during periods of high demand for electricity, most often during the summertime when air conditioning use is highest and typically in the late afternoon when people are returning from work and many businesses remain open. The proposed power plant would operate depending on the demand for electricity in the region. The applicant states that the Pacific Gas and Electric Company (PG&E), through dispatch orders from the California Independent System Operator (CAISO), would be responsible for dispatching the plant to meet electrical demand.”

The proposed project uses a “simple-cycle” design, meaning that it uses natural gas combustion turbines only, without additional generating equipment, to make electricity. This design is different than a “combined-cycle” design, in which waste heat in the turbine exhaust is used to create steam in a heat-recovery steam generator, which powers a steam turbine to generate additional electricity. The simple-cycle design is especially well suited for power plants operating to meet peak demand because the turbines can be started up very quickly when required by demand. With combined-cycle turbines, startups take longer because the heat recovery boilers and steam turbines take additional time to come up to operating temperature. Simple-cycle turbines are also well suited to peaking applications because such plants, by their nature, are not called upon to run for extended periods of time. This is an important consideration because simple-cycle turbines are inherently less efficient than combined-cycle turbines, which recover some of the heat from the turbine exhaust that would otherwise be wasted. Since such plants are operated for a relatively small number of hours per year, this energy penalty – which translates into additional fuel used to generate the same amount of power – is not as much of a concern.

The facility will also help to ensure a reliable supply of power as California transitions to a greater supply of renewable power sources such as solar and wind power. The project will help provide on-demand standby power capacity for grid stability. The simple-cycle turbines have a very short startup time and can come on-line very quickly to fill in during times when solar energy sources or wind power are not available. As the California Energy Commission has recognized, “some efficient, dispatchable, natural-gas-fired generation will be necessary to integrate renewables into California’s electricity system and meet the state’s [Renewable

Portfolio Standard] and [Greenhouse Gas] goals." Simple-cycle aero-derivative turbine plants fired by clean burning natural gas are well suited to filling this need.

The facility will have approximately a 0.7-mile-long, 230-kV transmission line to deliver the plant output to the electrical grid via the existing 230-kV Kelso Substation located north of the project site. The new 4-inch-diameter 580-foot long natural gas pipeline will run directly northeast from the project site to interconnect with PG&E's existing high-pressure natural gas pipeline (Line 2). Service water will be provided from a new connection to the Byron Bethany Irrigation District (BBID) via a new pump station and a 6-inch-diameter, 1.8-mile-long pipeline placed in or along the east side of Bruns Road, from existing Canal 45 south to the MEP site.

3.2 Gas Turbine Selection Process

Two types of gas turbines are commonly used in the power generation industry: the large frame heavy-duty design and the aero-derivative gas turbines based on turbine designs typically found in the aircraft industry. Both gas turbines have been widely used and the selection of the turbine is determined by the amount of energy needed and the anticipated cycling duty and load profile.

Mariposa Energy Project considered the use of heavy-duty (i.e., industrial) turbines for MEP. However, industrial gas turbines, such as the General Electric (GE) Frame 7 or Siemens SGT6-5000 units, typically have electrical-generation capacities in the 80 to 190 MW range and are not capable of operating at less than 60% capacity. In contrast, the aero-derivative turbine technology offers efficient operation over the 25 MW and above operating range and varies in size from 14.3 to 50 MW (GE, 2010). One of the requirements that MEP has to meet is a high degree of unit turndown (a low minimum operating rate relative to the maximum output) with the minimum generation rate of 25 MW. The facility is also intended to be a load-following plant, so the plant may be required to supply as low as 25 MW and as high as a nominal 200 MW (194 MW net at 59 F) , depending on the demand.[2]

In order to meet the minimum dispatch requirements of 25 MW, Mariposa Energy LLC selected the aero-derivative turbine technology. The GE LM6000 turbine is a common aero-derivative turbine widely used at peaking facilities in California, with an operating range from approximately 25 to a nominal 50 MW at 50 percent load and full load, respectively. Mariposa Energy Project considered three LM6000 models available at the time of the release of the Request for Offers (RFO). The three LM6000 models included the LM6000PC (water injected), the LM6000PD (dry low-NOx or DLE), and the LM6000PF (DLE). The LM6000 turbines also have a SPRINT (Spray Inter-cooled Turbine) technology option. The GE SPRINT technology is GE patented technology that reduces compressor discharge temperature by injecting atomized water into the low- and high-pressure compressors.

According to GE product materials, the SPRINT power augmentation feature results in an increased generating output of approximately 15 percent and 11 percent at ISO (International

[2] Application for Certification, Volume 1, Pages 1-9 and 2-32, June 28, 2009

Standards Organization)[3] condition for the water-injected and DLE models, respectively (GE, 2010). As part of the turbine selection process, the turbine vendor provided performance data for both the water-injected and DLE LM6000 SPRINT gas turbines (see Table 1). As presented in Table 1, the water-injected LM6000 gas turbine (LM6000PC) would result in a higher electrical production rate compared to the DLE models. Although the LM6000PF turbine would have a lower NOx emission rate than the PC or PD models, the DLE models would have higher hydrocarbon and CO emission rates (except at the 17°F temperature case) compared to the water-injected PC turbine.

Therefore, the LM6000PC turbine was selected by Mariposa Energy in order to meet the electrical output and reliability requirements outlined in the Mariposa Energy Project PPA with PG&E.

[3] Definition for ISO Condition (International Standards Organization): In order to compare the performance of turbines that can operate in a wide range of atmospheric conditions, the gas turbine output and performance is specified at standard conditions called the ISO ratings.

The three standard conditions specified in the ISO ratings are Ambient Temperature @ 15 deg C, Relative Humidity @ 60 % and Ambient Pressure at Sea Level. The turbines are operated under these conditions and tested to allow comparisons to be made between different sets of test data.

TABLE 1. COMPARISON OF GE LM6000 SPRINT WATER-INJECTED AND DLE COMBUSTION TECHNOLOGIES												
Combustion Technology	**PC**	**PD**	**PF**	**PC**	**PD**	**PF**	**PC**	**PD**	**PF**	**PC**	**PD**	**PF**
Ambient Temperature, °F	17.0	17.0	17	46	46	46	59	59	59	93	93	93
Inlet Conditioning	HEAT	HEAT	HEAT	NONE	NONE	NONE	EVAP	EVAP	EVAP	EVAP	EVAP	EVAP
Load Rate, Percent	100	100	100	100	100	100	100	100	100	100	100	100
Electrical Production, MW	50.2	48.3	47.9	50.7	47.8	47.7	49.7	46.9	46.8	46.3	43.8	43.7
Heat Rate*, Btu/kW-hr, LHV	8461	8115	8128	8548	8238	8248	8566	8276	8283	8647	8407	8414
NOx Control	Water	DLE	DLE	Water	DLE	DLE	Water	DLE	DLE	Water	DLE	DLE
Emissions Rates												
NOx ppmvd Ref 15% O_2	25	25	15	25	25	15	25	25	15	25	25	15
CO ppmvd Ref 15% O_2	53.2	25	25	20.9	25	25	15	25	25	7.6	25	25
HC ppmvd Ref 15% O_2	8.2	15	15	2.2	15	15	2.1	15	15	2.1	15	15

PC = GE LM6000PC SPRINT Turbine
PD = GE LM6000PD SPRINT Turbine
PF = GE LM6000PF SPRINT Turbine
Water = water injected
DLE = dry low NOx
ppmvd Ref 15% O_2 = parts per million by volume dry corrected to 15% oxygen
HC = precursor organic compounds
* estimated

3.3 Project Location

The proposed Mariposa Energy Project is located in northeastern Alameda County, California, approximately 7 miles northwest of Tracy, 7 miles east of Livermore, 6 miles south of Byron, and approximately 2.5 miles west of the community of Mountain House. The facility would be located southeast of Bruns Road and Kelso Road on a 10-acre portion of a 158-acre parcel immediately south of the Pacific Gas and Electric Company, Bethany Compressor Station, and 230-kilovolt Kelso Substation on the southern portion of the Lee Property, between two small hills.

The proposed project site is in an unincorporated area designated for Large Parcel Agriculture by the East County Area Plan. The Assessor's parcel number is 099B-7050-001-10. The site is located in Township 2S, Range 3E, Section 1 (Mount Diablo Base and Meridian). The 6.5-MW Byron Power Cogen Plant currently occupies 2 acres of the 158-acre parcel. The remainder of the parcel is non-irrigated grazing land.

Mariposa Energy Project Site Location:

FIGURE 1
PROJECT SITE LOCATION

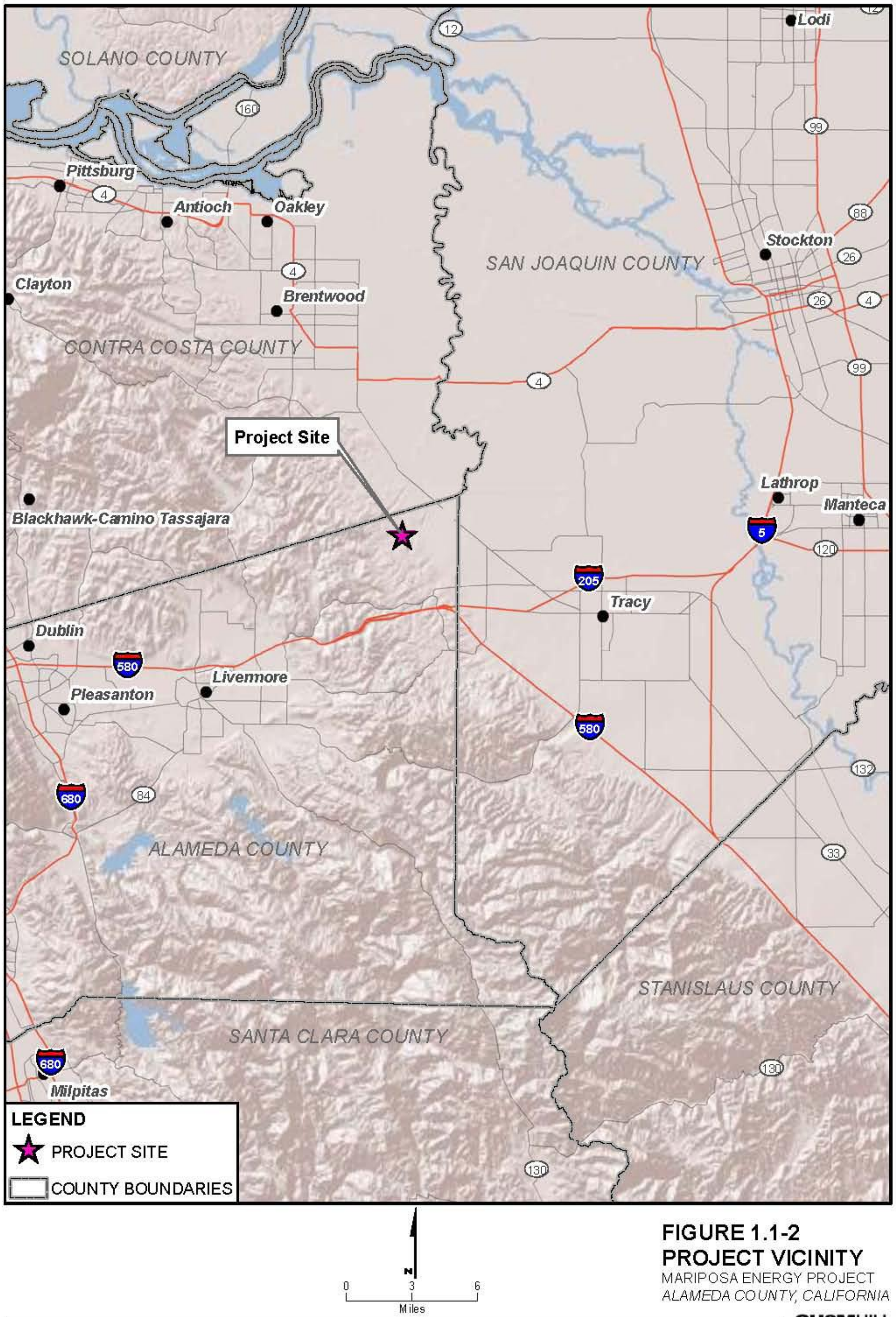

FIGURE 1.1-2
PROJECT VICINITY
MARIPOSA ENERGY PROJECT
ALAMEDA COUNTY, CALIFORNIA

CH2MHILL

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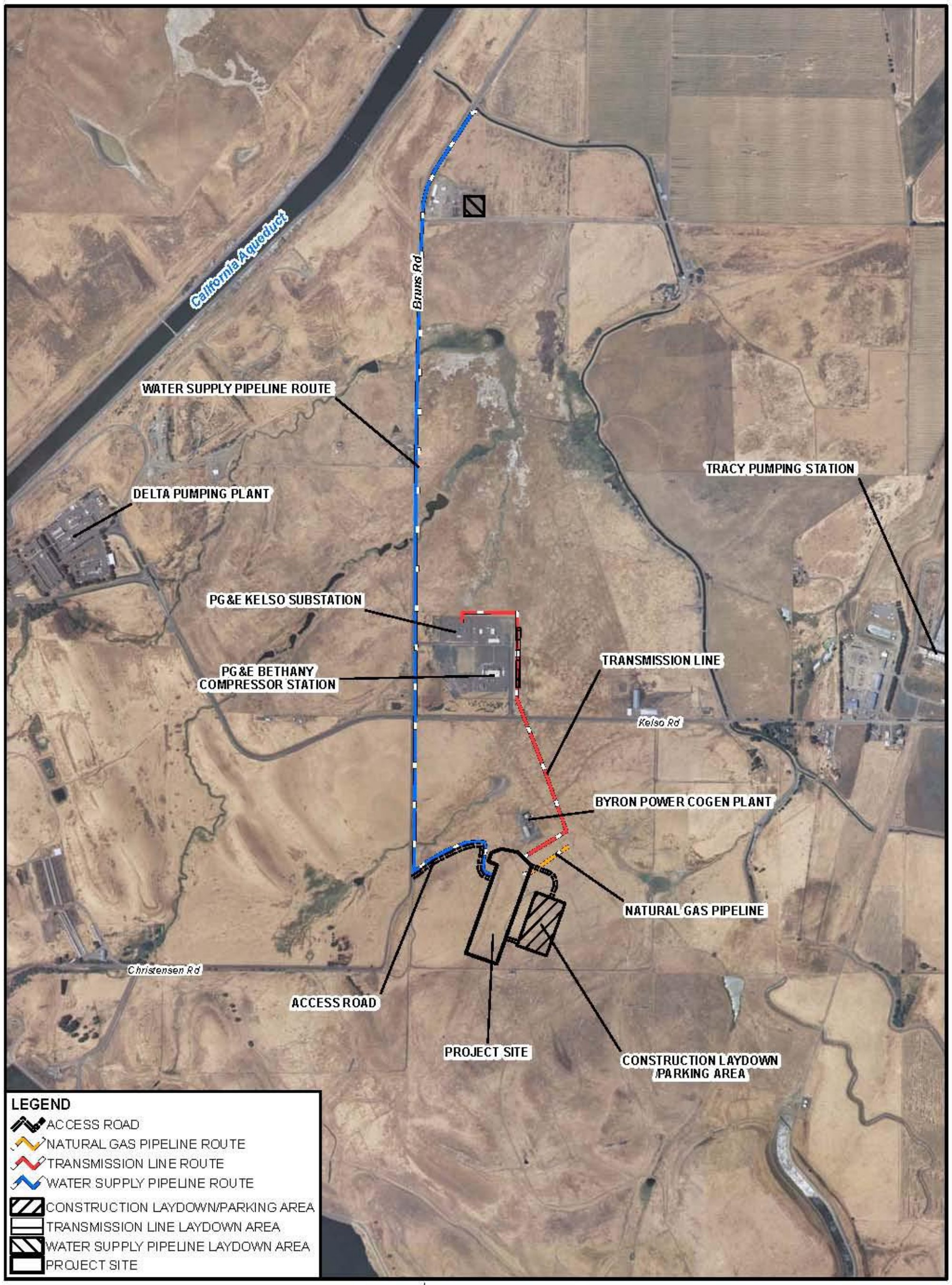

This map was compiled from various scale source data and maps and is intended for use as only an approximate representation of actual locations.

N

0 750 1,500
Feet

FIGURE 1.1-3
SITE LOCATION
MARIPOSA ENERGY PROJECT
ALAMEDA COUNTY, CALIFORNIA

CH2MHILL

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3.4 How The Project Will Operate:

The proposed facility will generate electric power for the grid using simple-cycle combustion turbines. The combustion turbines generate power by burning natural gas, which expands as it burns and turns the turbine blades that rotate an electrical generator to generate electricity. The main components of the system consist of a compressor, combustor, and turbine. The compressor compresses combustion air to the combustor where the fuel is mixed with the combustion air and burned. Hot exhaust gases then enter the power turbine where the gases expand across the turbine blades, rotating a shaft to power the electric generator.

After exiting the combustion turbines, the hot exhaust gases are then sent through the post-combustion emissions controls prior to being exhausted at the stack. The proposed post-combustion emissions controls consist of a Selective Catalytic Reduction (SCR) unit to reduce oxides of nitrogen in the exhaust and an oxidation catalyst to reduce organic compounds and carbon monoxide in the exhaust.

SCR injects ammonia into the exhaust stream, which reacts with the NO_x and oxygen in the presence of a catalyst to form nitrogen and water. A small amount of ammonia is not consumed in the reaction and is emitted in the exhaust stream as what is commonly called "ammonia slip".

An oxidation catalyst oxidizes the carbon monoxide and unburned hydrocarbons in the exhaust gases to form CO_2.

The general operating scenario for each turbine is as follows:

- Operating hours per day – up to 24 hours
- Number of startups and shut downs per day – up to 12
- Operating hours per year – up to 5,200
- Number of startups and shut downs per year - up to 300

The total hours of operation allowed for all four turbines combined will be 16,900.

Including the allowance for startup and shutdown, each turbine at this plant will be allowed to run up to 5,200 hours per year. California Code of Regulations, title 20, sections 2900, et seq., considers base-loaded generation to be "electricity generation from a powerplant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent." Annualized plant capacity factor is the ratio of electricity that is produced over the electricity that could be produced. Since each turbine will be limited to 5,200 hours of operation per year, this plant will not be a base-loaded plant.

In most years, this plant is likely to run for many fewer hours than the permit would allow. A CEC analysis shows that the actual average run time for peakers is about 600 hours per year with 200 stop and start cycles.[4,5] The plant would likely run for longer periods in the case of

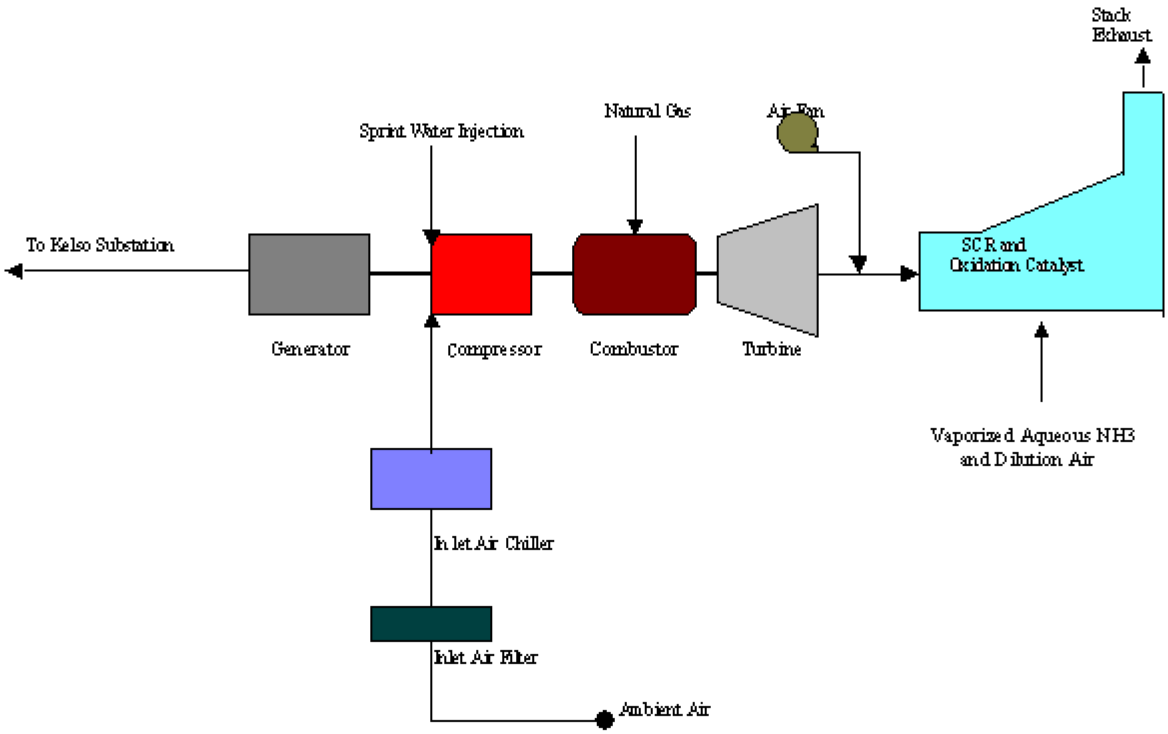
[4] Application for Certification, Volume 1, Page 2-9, June 28, 2009

[5] Errata to the Presiding Member's Proposed Decision, Application for Certification for the Pastoria Energy Facility

sustained failure of a base-loaded plant or some other emergency. The schematic diagram below illustrates how a simple-cycle gas turbine power plant such as the proposed Mariposa Energy Project works.

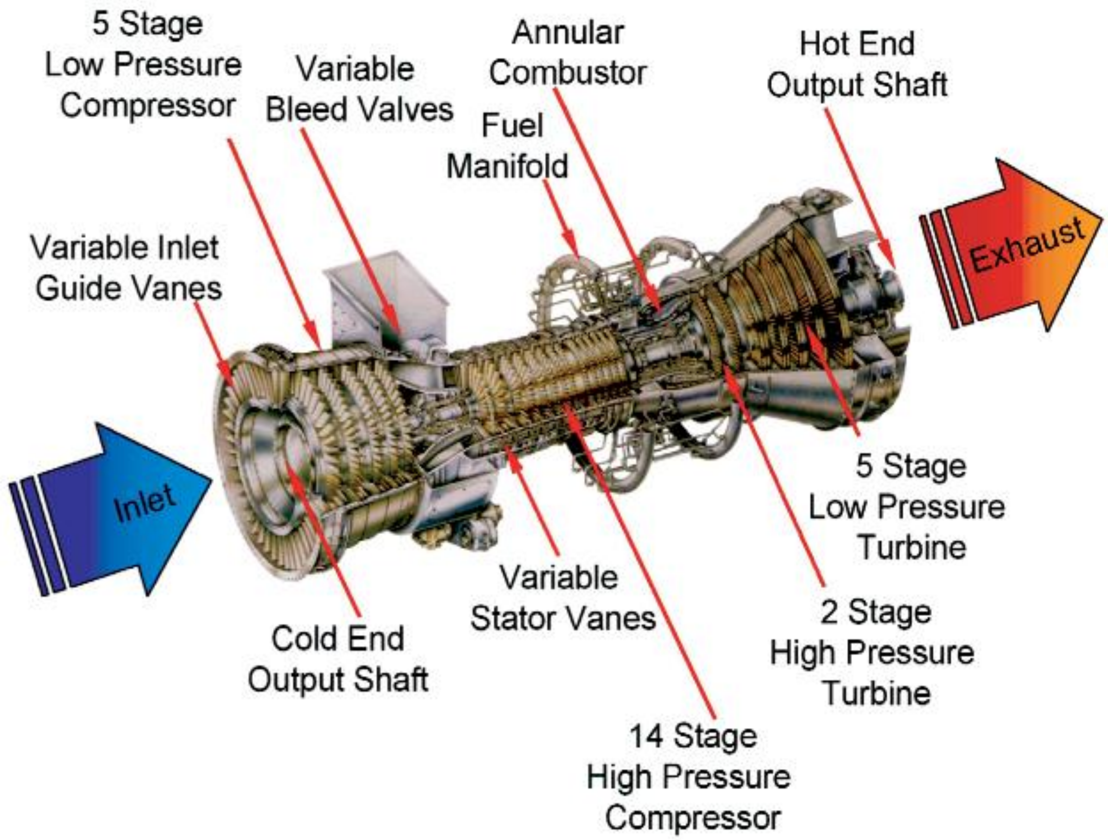
Simple-Cycle Turbine Flow Diagram:

Figure 2



Simple Cycle Turbine 3D Diagram

Figure 3



3.5 **Project Ownership:**

Mariposa Energy, LLC, will construct, own, and operate MEP. Mariposa Energy, LLC, is owned by Diamond Generating Corporation (DGC), a wholly owned subsidiary of Mitsubishi Corporation.

3.6 **Equipment Specifications**

The Mariposa Energy Project will consist of the following permitted equipment:

S-1 Combustion Turbine Generator (CTG) #1, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-1 Oxidation Catalyst and A-2 Selective Catalytic Reduction System (SCR).

S-2 Combustion Turbine Generator (CTG) #2, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-3 Oxidation Catalyst and A-4 Selective Catalytic Reduction System (SCR).

S-3 Combustion Turbine Generator (CTG) #3, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-5 Oxidation Catalyst and A-6 Selective Catalytic Reduction System (SCR).

S-4 Combustion Turbine Generator (CTG) #4, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-7 Oxidation Catalyst and A-8 Selective Catalytic Reduction System (SCR).

S-5 Diesel Fire Pump: Make: Cummins; Model: CFP7E-F40; Model Year: TBD (2009 or later); Rated bhp: 220

4 Facility Emissions

This section describes the air pollutant emissions that the Mariposa Energy Project will have the potential to emit, as well as the principal regulatory requirements to which the equipment will be subject. Detailed emission calculations and the emission factors are presented in the appendices.

4.1 Facility Criteria Pollutant Emissions

A "criteria" air pollutant is an air pollutant that has had a National Ambient Air Quality Standard (NAAQS) established for it by the U.S. EPA. There are currently 7 criteria pollutants: sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, particulate matter less than 10 microns in diameter (PM_{10}), and particulate matter less than 2.5 microns in diameter ($PM_{2.5}$). Precursor organic compounds (POC) are compounds that are precursor to ozone.

4.1.1 Hourly Emissions from Gas Turbines

The Mariposa Energy Project generating equipment will have the potential to emit up to the following amounts of criteria pollutants and precursor organic compounds per hour, as set forth in Table 2a. These are the maximum emission rates for these air pollutants from each turbine during normal steady-state operations, and will be limited by enforceable permit conditions.

TABLE 2a. STEADY-STATE EMISSION RATES

Pollutant	**One Turbine Emission Rates (lbs/hr)**
NO_x (as NO_2)	4.4
CO	2.14
POC (as CH_4)	0.61
SO_x (as SO_2) Maximum[a]	1.35
SOx (as SO_2) Average[b]	0.34

[a] Maximum SOx emissions based on 1 grain sulfur per 100 scf of natural gas

[b] Average SOx emissions based on 0.25 grains sulfur per 100 scf of natural gas and an average annual firing rate of 481 MMbtu/hour.

The Mariposa Energy Project generating equipment will have the potential to emit the following amount of $PM_{10}/PM_{2.5}$ per hour on an average basis. The maximum emission rate from each turbine during normal steady-state operations may be higher. $PM_{10}/PM_{2.5}$ will be limited by an annual limit in permit conditions.

TABLE 2b. STEADY-STATE EMISSION RATES OF PARTICULATE	
Pollutant	**Emission Rate for One Turbine (lbs/hr)**
$PM_{10}/PM_{2.5}$	2.2 (average)

Note that particulate matter from natural gas combustion sources normally has a diameter less than one micron.[6] The particulate matter will therefore be both PM_{10} (particulate matter with a diameter of less than 10 microns) and $PM_{2.5}$ (particulate matter with a diameter of less than 2.5 microns). $PM_{2.5}$ is a subset of particulate matter that has recently come under heightened regulatory scrutiny, and the District is in the process of developing regulations specifically directed to controlling $PM_{2.5}$. Those regulations are not in place yet, but for this facility the District's existing PM_{10} regulations will be equally effective in controlling $PM_{2.5}$ as well because all of the PM emissions from this facility will be both $PM_{2.5}$ and PM_{10}.

4.1.2 Emissions during Gas Turbine Startup and Shutdown

Maximum emissions during turbine startup operations, when the turbines are at low load where they are not as efficient and when emissions control equipment may not be fully operational, are summarized in Table 3. (These operating scenarios are discussed in more detail in Section 5.7, below.) Table 3 shows the startup emission limits for each turbine.

TABLE 3. GAS TURBINE EMISSIONS DURING STARTUP		
Pollutant	**Turbine Emission Rates for Single 30 Minutes Startup (lb/event)[a]**	**Maximum emissions for any hour containing a startup or shutdown**
NO_x (as NO_2)	14.2	18.5
CO	14.1	17.3
POC (as CH_4)	1.1	1.4
$PM_{10}/PM_{2.5}$	1.1[b] (average)	2.2 (average)
SO_x (as SO_2)	0.675[c]	1.35[d]

[a] Startups not to exceed 30 minutes
[b] Pounds per event for PM_{10} are half of the PM_{10} emissions per hour
c Pounds per event for SO_2 are half of the maximum SO_2 emissions per hour
[d] Based on maximum SO2 emissions per hour

Maximum emissions during gas turbine shutdowns (also discussed in detail in Section 5.7) are summarized in Table 4.

[6] *See* AP-42, Table 1.4-2, footnote c, 7/98 available at: http://www.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf

TABLE 4. MAXIMUM EMISSIONS PER SHUTDOWN	
Pollutant	**Turbine Shutdown Emission Rates (lb/event)[a]**
NO_x (as NO_2)	3.2
CO	2.7
POC (as CH_4)	0.12
PM_{10}	0.55[b] (average)
SO_x (as SO_2)	0.338[c]

[a] Shutdowns not to exceed 15 minutes
[b] Pounds per event for PM_{10} is 1/4 of the PM_{10} emissions per hour due to 15-minute shutdown
c Pounds per event for SO_2 are 1/4 of the SO_2 emissions per hour due to 15-minute shutdown

4.1.3 Commissioning Emissions

Commissioning emissions from one simple cycle gas turbine are as shown in table 5. The turbines go through 3 phases of testing: (1) initial load testing and engine checkout, (2) pre-catalyst initial tuning, and (3) post-catalyst tuning. The following commissioning emission estimates are based on the daily maximum of 8 hours of pre-catalyst initial tuning at 100% load.

TABLE 5. COMMISSIONING PERIOD EMISSION LIMITS FOR ONE GAS TURBINE		
Air Pollutant	**Proposed Commissioning Period Emissions Limits for One Gas Turbine**	
	lb/hr	**lb/day**
NO_2	51	408
CO	45	360
POC		36
PM_{10}		17.6 (average)
SO_2		10.8

Note: Please check the appendix A for the detailed calculations

Table 5 does not have lb/hr limits for POC, PM_{10} and SO_2 because these pollutants are not continuously monitored for those pollutants.

The Air District is also proposing to cap the total amount of time that each turbine can operate partially abated and/or without the SCR systems and oxidation catalysts at 200 hours. This limit represents the shortest amount of time in which the facility can reasonably complete the required commissioning activities without jeopardizing safety and equipment warranties. The proposed 200-hour limit is based on the following estimates from General Electric of the time it will take for each specific commissioning activity.

The original estimates of daily emissions were about double the emissions in Table 5. The applicant has agreed to commission only one turbine at a time.

TABLE 6. COMMISSIONING SCHEDULE FOR A SINGLE GAS TURBINE[1]								
Activity	**Duration (hours/ Day)**	**Days**	**Load Range (%)**	**Total Emissions**				
				NO_X (lbs/hr)	**CO (lb/hr)**	**POC (lb/hr)**	**SOx[2] (lb/hr)**	**PM_{10}[2] (lb/hr)**
Initial Load Testing and Engine Checkout[3]	4	2	10%	51	45	4.48	1.35	2.2 (avg)
Pre-Catalyst Initial tuning[4]	8	9	50-100%	51	45	4.48	1.35	2.2 (avg)
Post-Catalyst tuning[4]	8	15	50-100%	34	6.2	1.2	1.35	2.2 (avg)

Notes:
[1] Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test.
[2] Steady state controlled emission rates for SOx and PM10 are 1.35, and 2.2 lbs/hr (average), respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning.
[3] In synchronized operation followed by low load engine check.
[4] Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NOx and CO catalyst use.

TABLE 7. COMMISSIONING SCHEDULE FOR FOUR GAS TURBINES								
Activity	**Duration (hours/Day)**	**Days**	**Number of Turbines**	**Total Emissions**				
				NO_X Total lbs	**CO Total lb**	**POC Total lb**	**SOx[2] Total lb**	**PM_{10} Total lb**
Initial Load Testing and Engine Checkout[3]	4	2	4	1632	1440	143	43	70
Pre-Catalyst Initial tuning[4]	8	9	4	14688	12960	1290	389	634
Post-Catalyst tuning[4]	8	15	4	16320	2976	576	648	1056
Total in lbs				32640	17376	2010	1080	1760
Total in tons				16.3	8.7	1.0	0.54	0.9
Total Hours for 4 turbines	800							

Notes:
[1] Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test.
[2] Steady state controlled emission rates for SOx and PM10 are 1.35, and 2.2 lbs/hr (average), respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning.
[3] In synchronized operation followed by low load engine check.
[4] Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NOx and CO catalyst use.

Compliance with the commissioning period will be monitored by continuous emissions monitors that the applicant will be required to install before any commissioning work begins, and through a written commissioning plan laying out all commissioning activities in advance, which the applicant will be required to submit to the Air District for review and approval.

4.1.4 Fire Pump Emissions

The facility will have a fire pump with a Cummins 220-hp engine. The CARB certification that was submitted with the application is based on Executive Order U-R-002-0476 for Model Year 2009, Engine Family 9CEXL0409AAB.

The emission factors in the CARB Certification are shown in table 8 below:

TABLE 8. CARB CERTIFIED EMISSION FACTORS	
Pollutant	Emission Factors g/kw-hr
NOx + POC	3.7
CO	1.6
PM_{10}	0.17

The emission factors are converted to g/bhp-hr by multiplying by the following conversion factor: 0.746. 95% of the combined NMHC and NOx emissions are assumed to be NOx; the remainder is NMHC, which is equivalent to POC in this case. Therefore, the emission factors in g/bhp-hr are shown in table 9 below:

TABLE 9. EMISSION FACTORS IN G/BHP-HR	
Pollutant	Emissions Factors g/bhp-hr
NOx	2.62
CO	1.19
POC	0.138
PM_{10}	0.127
SO_2*	0.0055

Note:
* SO_2 is calculated based on the sulfur in the fuel. The sulfur content of diesel fuel is limited to 0.0015% by weight. The weight of SO_2 is about double the weight of the sulfur in the fuel. The engine will use 11.3 gal diesel fuel/hr. The density of the fuel is about 6.88 lb/gal. (Based on No. 2 fuel oil spec in attachment 3-4: Typical analyses and properties of fuel oils, APTI Course 427, Combustion Evaluation, EPA 450/2-80-063.).
SO_2: 8.09E-3 (% S in fuel oil) lb/hp-hr = 8.09E-3 (0.0015% S) (453.6 g/lb) = 0.0055 g/hp-hr

For the purposes of the risk screen analysis, the District includes only the emissions during testing and maintenance in accordance with BAAQMD Regulation 2-5-111. The hypothetical emissions during a fire are not considered. The District will allow 50 hours/yr for testing and maintenance in accordance with Section 93115.6(a)(3)(A)(1) of the CARB ATCM "Airborne Toxic Control Measure for Stationary Compression Ignition (CI) Engines" because the engine emits less than 0.15 g of PM/bhp-hr.

For the purposes of the annual potential to emit, the maximum usage is estimated at 500 hours/yr, in accordance with EPA's memorandum of September 6, 1995, by Lydia Wegman entitled "Calculating Potential to Emit (PTE) for Emergency Generators." This policy considers that in a year containing an emergency, an engine could run for a maximum of 500 hours.

TABLE 10. MAXIMUM DAILY AND ANNUAL REGULATED CRITERIA AIR POLLUTANT EMISSIONS FOR ENGINE					
	Nitrogen Oxides	**Carbon Monoxide**	**Precursor Organic Compounds**	**Particulate Matter (PM_{10})**	**Sulfur Dioxide**
	(as NO_2)	**CO**	**POC**		**SO_2**
lb/hr	1.27	0.58	0.07	0.06	0.0027
lb/day	30.48	13.89	1.68	1.44	0.06
lb/yr (50 hr/yr)*	63.50	28.95	3.50	3.00	0.14
lb/yr (500 hr/yr)**	635.00	289.45	35.00	30.0	1.35

* 50 hours per year are the hours of operation allowed for maintenance.
* * 500 hours per year are the maximum hours assumed for emergencies.

4.1.5 Daily Facility Emissions

Maximum daily emissions of regulated air pollutants emissions for the Mariposa Energy Project are set forth in Table 11 below. Table 11 shows emissions from the diesel engine and the gas turbines without startup and shutdown. Table 12 has the total daily emissions from the facility including startups and shutdowns.

These daily emission rates are used to determine what sources at the facility are subject to the requirement to use "Best Available Control Technology" pursuant to District New Source Review regulation (29Regulation 2, Rule 2). Pursuant to District Regulation 2-2-301.1, any new source that has the potential to emit 10 pounds or more per highest day of POC, NO_x, SO_2, PM_{10}, or CO is subject to the BACT requirement for that pollutant.

TABLE 11. MAXIMUM DAILY STEADY STATE REGULATED CRITERIA AIR POLLUTANT EMISSIONS FOR FACILITY WITHOUT STARTUP/SHUTDOWN					
	Pollutant (lb/day)				
Source	**Nitrogen Oxides (as NO_2)**	**Carbon Monoxide CO**	**Precursor Organic Compounds POC**	**Particulate Matter (PM_{10})**	**Sulfur Dioxide SO_2**
One Unit (No Tuning)	105.6	51.4	14.7	53 (avg)	32.4
Four Units (No Tuning)	422.4	205.4	58.8	212 (avg)	129.6
Diesel Engine Fire Pump	30.5	13.9	1.7	1.4	0.06
Total subject to District Regulations (without Combustor Tuning)	452.9	219.3	60.5	213 (avg)	130

TABLE 12. MAXIMUM DAILY STEADY STATE REGULATED CRITERIA AIR POLLUTANT EMISSIONS FOR FACILITY INCLUDING TWELVE 30-MINUTE STARTUPS AND TWELVE 15-MINUTE SHUTDOWNS					
	Pollutant (lb/day)				
Source	**Nitrogen Oxides (as NO_2)**	**Carbon Monoxide CO**	**Precursor Organic Compounds POC**	**Particulate Matter (PM_{10})**	**Sulfur Dioxide SO_2 [d]**
One Unit (No Tuning)	66.0[a]	32.1[a]	9.2[a]	33[a] (avg)	20.25[a]
Four Units (No Tuning)	264	128.4	36.72	132 (avg)	129.6
Diesel Engine Fire Pump	30.5	13.9	1.7	1.44	0.06
Startup (4 units)	681.6[b]	677[b]	52.8[b]	53[b] (avg)	32.4[b]
Shutdown (4 units)	153.6[c]	130[c]	5.8[c]	26[c] (avg)	16.2[c]
Total subject to District Regulations (without Combustor Tuning)	1130	949	97	212 (avg)	130

Note: Please check appendix A for detail calculations.
[a] Total hours for steady state operation: 15 hrs
[b] Total hours for startup operation: 6 hrs for twelve 30-minute startups
[c] Total hours for shutdown: 3 hrs for twelve 15-minute shutdowns
[d] Daily SO2 emissions based on maximum fuel sulfur content

As Table 12 shows, each gas turbine will emit over 10 pounds per day of NO_x, CO, POC, PM_{10}, and SO_2. The Fire Pump Engine will also emit over 10 pounds per day of NO_x and CO. Therefore the facility will be required to use Best Available Control Technology per Regulation 2-2-301 to limit emissions of these pollutants.

The District's analysis of the Best Available Control Technology emission limits for this equipment is described in Section 5 below.

4.1.6 Annual Facility Emissions

The maximum annual emissions of regulated air pollutants for the proposed Mariposa Energy Project are set forth in Table 13 below without startups and shutdowns. Table 14 shows the annual emissions from the facility including startups and shutdowns. Annual facility emissions are used to determine whether the facility will need to offset its emissions with Emissions Reduction Credits under District Regulations 2-2-202 and 2-2-203. Offsets are required for NO_x and POC emissions over 10 tons per year, and for PM_{10} and SO_2 emissions over 100 tons per year.

TABLE 13. MAXIMUM ANNUAL STEADY STATE CRITERIA AIR POLLUTANT EMISSIONS FROM THE TURBINES AND DIESEL ENGINE WITHOUT STARTUP/SHUTDOWN					
	NO_2 (ton/yr)	**CO (ton/yr)**	**POC (ton/yr)**	**PM_{10} (ton/yr)**	**SO_2[a] (ton/yr)**
One Gas Turbine[b]	8.8	4.28	1.22	4.4	0.68
Four Gas Turbines	35.2	17.12	4.90	17.6	2.72
Diesel Engine Fire Pump[c]	0.3	0.1	0.02	0.02	0.0
Total subject to District Regulations	35.5	17.2	4.9	17.6	2.7

Note: See appendices for emission calculations.

[a] Annual SO2 emissions based on average fuel sulfur content

[b] Based on 4000 hours of steady-state operation per year

[c] Based on 500 hours of emergency operation per year

TABLE 14. MAXIMUM ANNUAL STEADY STATE CRITERIA AIR POLLUTANT EMISSIONS FOR THE FACILITY INCLUDING STARTUP AND SHUTDOWN					
	NO_2 (ton/yr)	**CO (ton/yr)**	**POC (ton/yr)**	**PM_{10} (ton/yr)**	**SO_2[e] (ton/yr)**
One Gas Turbine	8.8	4.28	1.22	4.4	0.68
Four Gas Turbines	35.2	17.12	4.88	17.6	2.72
Diesel Engine Fire Pump[f]	0.3	0.1	0.02	0.02	0.0
Startup (4 units)	8.5	8.5	0.66	0.66[a]	0.102[c]
Shutdown (4 units)	1.9	1.6	0.02	0.33[b]	0.051[d]
Total subject to District Regulations	45.9	27.3	5.6	18.6	2.9

[a] PM_{10} = 2.2 lb/hr/turbine. For 300 30-minute startups per year = (2.2/2)*300 = 330 lb/year *4 turbines = 1320 lb/year = 0.66 tpy for four turbines

[b] PM_{10} = 2.2 lb/hr/turbine. For 15 minutes per shutdown and for 300 shutdowns per year = 2.2/4 = 0.55 lb/shutdown = 0.55 * 300 = 165 lb/year * 4 turbines = 660 lb/year = 0.33 tpy for four turbines

[c] SO_2 = 0.34 lb/hr/turbine. For 300 30-minute startups per year = (0.34/2)*300 = 51 lb/year *4 turbines = 204 lb/yr = 0.102 tpy for four turbines

[d] SO_2 = 0.34 lb/hr/turbine. For 15 minutes per shutdown and for 300 shutdowns per year = (0.034/4)*300 = 2.55 lb/year * 4 turbines = 10.2 lb/year =0.051 tpy for four turbines

[e] Annual SO2 emissions based on average fuel sulfur content

[f] Based on 500 hours of emergency operation per year

These annual emissions rates show that the facility will be required to offset its NO_x emissions under District Regulation 2-2-302. NO_x credits, at a ratio of 1.15 tons of credits per 1 ton of emissions, are required because emissions will be over 35 tons per year. The facility will not be required to offset its POC emissions under District Regulation 2-2-302 because emissions will be less than 10 tons per year. The facility will not be required to offset its PM_{10} and SO_2 emissions under District Regulation 2-2-303 because emissions will be less than 100 tons per year of each pollutant.

4.2 Toxic Air Contaminants

Toxic Air Contaminants (TACs) are a subset of air pollutants that can be harmful to health and the environment even in small amounts. Table 15 and Table 16 provide a summary of the maximum annual facility toxic air contaminant (TAC) emissions from the project.

TABLE 15. MAXIMUM FACILITY TOXIC AIR CONTAMINANT (TAC) EMISSIONS

Toxic Air Contaminant	EF lb/MMbtu	Per Turbine lb/hour	Per Turbine lb/year	Total for 4 Turbines lb/hour	Total for 4 Turbines lb/year	Acute Risk Screening Trigger Level (lb/hr)	Chronic Risk Screening Trigger Level (lb/yr)
1,3-Butadiene	0.00000012	0.000060	0.258	0.00024	1.0307	None	0.63
Acetaldehyde	0.00013431	0.064645	277.974	0.25858	1111.8974	1	38
Acrolein	0.00001853	0.008918	38.348	0.03567	153.3931	0.0055	14
Ammonia	0.00680000	3.272840	14073.212	13.09136	56292.8480	7.1	7700
Benzene	0.00001304	0.006276	26.986	0.02510	107.9433	2.9	3.8
Benzo(a)anthracene	0.00000002	0.000011	0.046	0.00004	0.1834	None	None
Benzo(a)pyrene	0.00000001	0.000007	0.028	0.00003	0.1128	None	0.0069
Benzo(b)fluoranthene	0.00000001	0.000005	0.023	0.00002	0.0917	None	None
Benzo(k)fluoranthene	0.00000001	0.000005	0.022	0.00002	0.0893	None	None
Chrysene	0.00000002	0.000012	0.051	0.00005	0.2045	None	None
Dibenz(a,h)anthracene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Ethylbenzene	0.00001755	0.008446	36.319	0.03379	145.2771	None	43
Formaldehyde	0.00045000	0.216585	931.316	0.86634	3725.2620	0.21	18
Hexane	0.00025392	0.122212	525.514	0.48885	2102.0542	None	270000
Indeno(1,2,3-cd)pyrene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Naphthalene	0.00000163	0.000783	3.368	0.00313	13.4726	None	None
Propylene	0.00075588	0.363806	1564.367	1.45522	6257.4662	None	120000
Propylene Oxide	0.00004686	0.022555	96.987	0.09022	387.9467	6.8	29
Toluene	0.00006961	0.033502	144.060	0.13401	576.2388	82	12000
Xylene (Total)	0.00002559	0.012316	52.957	0.04926	211.8286	49	27000
Sulfuric Acid Mist (H2SO4)	0.00058950	0.283550	1197.997	1.1342	4791.9866	0.26	39
Benzo(a)pyrene equivalents	0.0000000448	0.000022	0.093	0.00009	0.3706	None	0.0069
PAH	0.001132	0.000062	0.266	0.00025	1.0632	None	None

Notes: PAH impacts are evaluated as Benzo (a) pyrene equivalents.
Based on total fuel input of 481 MMbtu/hr

Equivalency PAHs	Factor
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1.0
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Chrysene	0.01
Dibenz(a,h)anthracene	1.05
Indeno(1,2,3-cd)pyrene	0.1

TABLE 16. DIESEL ENGINE TOXIC AIR CONTAMINANT (TAC) EMISSIONS						
Source	PM_{10} in g/bhp-hr	BHP	For 50 hours PM_{10} in lb/yr	For 500 hours PM_{10} in lb/yr	Acute Rick Screening Trigger Level lb/hr	Chronic Risk Screening Trigger Level lb/hr
S-5	0.127	220	3.07	30.07	None	0.63

Table 15 and Table 16 are also used as input data for air pollutant dispersion models used to assess the increased health risk to the public resulting from the project. The ammonia emissions shown are based upon a worst-case ammonia emission concentration of 5 ppmvd @ 15% O_2 from the gas turbine SCR systems. The chronic and acute screening trigger levels shown are per Table 2-5.1 of Regulation 2, Rule 5.

If emissions are above certain established screening levels prescribed in Table 2-5-1 of Regulation 2, Rule 5, a health risk assessment is required. Where no acute trigger level is listed for a TAC, none has been established for that TAC. Based on the information contained in Table 12 a health risk assessment is required by District Regulation 2, Rule 5. The health risk assessment is conducted to determine the potential impact on public health resulting from the worst-case TAC emissions from the project.

The results of the health risk assessment are discussed in full in Section 8 of this document. Briefly, the health risk assessment found a maximum increased cancer risk of 0.3 in one million for the maximally exposed resident near the facility and 1.3 in one million for the maximally exposed worker near the facility. These cancer risks are less than significant under District Regulation 2, Rule 5, because they are less than 10.0 in a million for the project.

The highest chronic non-cancer hazard index for the project is 0.015 and the highest acute non-cancer hazard index for the project is 0.026. These non-cancer risks are less than significant under District Regulation 2, Rule 5, because they are less than 1.0.

4.3 Hazardous Air Pollutants

Hazardous air pollutants (HAPs) are hazardous pollutants that are listed in Section 112(b) of the Federal Clean Air Act. Not all of the pollutants that are designated as toxic air contaminants by BAAQMD Regulation 2, Rule 5, New Source Review of Toxic Air Contaminants, are considered to be "112(b)" pollutants by Federal EPA. Three notable pollutants that are TACs and not HAPs are ammonia, hydrogen sulfide, and sulfuric acid mist.

TABLE 17. MAXIMUM FACILITY HAZARDOUS AIR POLLUTANT (HAP) EMISSIONS

Hazardous Air Pollutant	Project lb/year	Project ton/year
1,3-Butadiene	1.0307	< 1.0
Acetaldehyde	1111.8900	< 1.0
Acrolein	153.3930	< 1.0
Benzene	107.9430	< 1.0
Benzo(a)anthracene	0.1834	< 1.0
Benzo(a)pyrene	0.1128	< 1.0
Benzo(b)fluoranthene	0.0917	< 1.0
Benzo(k)fluoranthene	0.0893	< 1.0
Chrysene	0.2045	< 1.0
Dibenz(a,h)anthracene	0.1907	< 1.0
Ethylbenzene	145.2770	< 1.0
Formaldehyde	3725.2600	1.86
Hexane	2102.0500	1.05
Indeno(1,2,3-cd)pyrene	0.1907	< 1.0
Naphthalene	13.4726	< 1.0
Propylene Oxide	387.9460	< 1.0
Toluene	576.2380	< 1.0
Xylene (Total)	211.8280	< 1.0
Benzo(a)pyrene equivalents	0.3706	< 1.0
Total: lb/yr	8537.7622	
Total: ton/yr	4.27	

The purpose for summing the hazardous air pollutants is to determine whether a facility is major for hazardous air pollutants as defined by BAAQMD Regulation 2, Rule 6, which states that a facility is major if it emits more than 10 tons/year of any hazardous air pollutant and more than 25 tons/year of a combination of hazardous air pollutants.

4.4 Greenhouse Gas Emissions

The greenhouse gases have been estimated on the following basis:

- Fuel usage of 481 MMbtu/hr of natural gas/turbine/hr
- 4225 hours of operation/turbine/yr
- Fuel usage of 11.3 gal of diesel fuel/hr for engine
- 500 hours of operation/yr for engine
- SF6: 150 lbs in one circuit breaker; 0.1% leak rate

TABLE 18. ESTIMATED ANNUAL GHG EMISSIONS FROM MEP

	Fuel Usage, MMbtu/yr	Emission Factor, (kg CO2/MMbtu)	Emission Factor, (g CH4/MMbtu)	Emission Factor, (g N2O/MMbtu)	GHG (metric tons/yr)	Global Warming Potential	CO2 Equivalents (Metric tons/yr)
GHG							
Gas Turbines							
CO2	8,128,900	52.87			429775	1	429775
CH4	8,128,900		0.9		7	21	154
N2O	8,128,900			0.1	1	310	252
Engine	Fuel Usage, gal/yr, @ 500 hr/yr	Emission Factor, (kg CO2/gal)					
CO2	5,650	10.14			57	1	57
CH4	5,650		3		0.02	21	0
N2O	5,650			0.6	0.00	310	1
Circuit Breakers							
SF6					0.001160	23,900	28
Total							430267

Note:
Emission Factors from the REGULATION FOR THE MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS, Appendix A, Title 17, California Code of Regulations, Subchapter 10, Article 2, Sections 95100 to 95133

CO_2 Emission Factor from Table 4 Appendix A-6 for Natural Gas with a heat content between 1000 Btu/scf and 1025 Btu/scf
CH_4 Emission Factor from Table 6 Appendix A-9
N_2O Emission Factor from Table 6 Appendix A-9
Global Warming Potentials from Table 2 Appendix A-4
Applicant estimates SF_6 emissions for 1 circuit breaker at 0.15 lb/yr per unit (based on 0.1% leak rate for 150 lb SF_6 per unit). Circuit breaker is hermetically sealed per applicant.[7]

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[7] Email of July 13th, 2010 from Keith McGregor to Brenda Cabral

5 Best Available Control Technology (BACT)

The District's New Source Review regulations require the proposed Mariposa Energy Project to utilize the "Best Available Control Technology" ("BACT") to minimize air emissions, as discussed in more detail below. This section describes how the BACT requirements will apply to the facility.

5.1 Introduction

District Regulation 2-2-301 requires that the Mariposa Energy Project use the Best Available Control Technology to control NO_x, CO, POC, PM_{10}, and SO_x emissions from sources that will have the potential to emit over 10 pounds per highest day of each of those pollutants. Pursuant to Regulation 2-2-206, BACT is defined as the more stringent of:

(a) "The most effective control device or technique which has been successfully utilized for the type of equipment comprising such a source; or

(b) The most stringent emission limitation achieved by an emission control device or technique for the type of equipment comprising such a source: or

(c) Any emission control device or technique determined to be technologically feasible and cost-effective by the APCO, or

(d) The most effective emission control limitation for the type of equipment comprising such a source which the EPA states, prior to or during the public comment period, is contained in an approved implementation plan of any state, unless the applicant demonstrates to the satisfaction of the APCO that such limitations are not achievable. Under no circumstances shall the emission control required be less stringent than the emission control required by any applicable provision of federal, state or District laws, rules or regulations."

The type of BACT described in definitions (a) and (b) must have been demonstrated in practice and is referred to as "BACT 2". This type of BACT is termed "achieved in practice". The BACT category described in definition (c) is referred to as "technologically feasible/cost-effective" and it must be commercially available, demonstrated to be effective and reliable on a full-scale unit, and shown to be cost-effective on the basis of dollars per ton of pollutant abated. This is referred to as "BACT 1". BACT specifications (for both the "achieved in practice" and "technologically feasible/cost-effective" categories) for various source categories have been compiled in the BAAQMD BACT Guideline.

The simple-cycle turbines are subject to BACT under the District's New Source Review regulations (Regulation 2, Rule 2, Section 301) for NO_x, CO, POC, PM_{10}, and SO_x because each unit will have the potential to emit more than 10 pounds per highest day of those pollutants.

The fire pump engine, S5, is subject to BACT under the District's New Source Review regulations (Regulation 2, Rule 2, Section 301) for NO_x and CO because the engine will have the potential to emit more than 10 pounds per highest day of those pollutants.

The following sections provide the basis for the District BACT analyses for this equipment.

5.2 Best Available Control Technology for Oxides of Nitrogen (NO_x) for Turbines

Oxides of Nitrogen (NO_x) are a byproduct of the combustion of an air-and-fuel mixture in a high-temperature environment. NO_x is formed when the heat of combustion causes the nitrogen molecules in the combustion air to dissociate into individual nitrogen atoms, which then combine with oxygen atoms to form nitric oxide (NO) and nitrogen dioxide (NO_2). This reaction primarily forms NO (95% to 98%) and only a small amount of NO_2 (2% to 5%), but the NO eventually oxidizes and converts to NO_2 in the atmosphere. NO_2 is a reddish-brown gas with a detectable odor at very low concentrations. NO and NO_2 are generally referred to collectively as "NO_x".[8] NO_x is a precursor to the formation of ground-level ozone, the principal ingredient in smog.

The District has examined technologies that may be effective to control NO_x emissions in two general areas: combustion controls that will minimize the amount of NO_x created during combustion; and post-combustion controls that can remove NO_x from the exhaust stream after combustion has occurred.

Combustion Controls

The formation of NO_x during combustion is highly dependent on the primary combustion zone temperature, as the formation of NO_x increases exponentially with temperature. There are therefore three basic strategies to reduce thermal NO_x in the combustion process:

- Reduce the peak combustion temperature
- Reduce the amount of time the air/fuel mixture spends exposed to the high combustion temperature
- Reduce the oxygen level in the primary combustion zone

It should be noted, however, that techniques that control NO_x by reducing combustion temperatures might involve a trade-off with the formation of other pollutants. Reducing combustion temperatures to limit NO_x formation can decrease combustion efficiency, resulting in increased byproducts of incomplete combustion such as carbon monoxide and unburned hydrocarbons. (Unburned hydrocarbons from natural gas combustion consist of methane, ethane and precursor organic compounds.)

The District prioritizes NO_x reductions over carbon monoxide, however, because the Bay Area is not in compliance with applicable ozone standards, but does comply with carbon monoxide standards. The District therefore requires applicants to minimize NO_x emissions to the greatest

[8] NOx can also be formed when a nitrogen-bound hydrocarbon fuel is combusted, resulting in the release of nitrogen atoms from the fuel (fuel NOx) and NOx can be formed by organic free radicals and nitrogen in the earliest stages of combustion (prompt NOx). Natural gas does not contain significant amounts of fuel-bound nitrogen, therefore thermal NOx is the primary formation mechanism for natural gas fired gas turbines. References to NOx formation during combustion in this analysis refer to "thermal NOx", NOx formed from nitrogen in the combustion air.

extent feasible, and then to optimize CO and POC emissions for that level of NO_x control. This is a trade-off that must be kept in mind when selecting appropriate emissions control technologies for these pollutants.

The District has identified the following available combustion control technologies for reducing NO_x emissions from the combustion turbines.

Steam/Water Injection: Steam or water injection was one of the first NO_x control techniques utilized on gas turbines. Water or steam is injected into the combustion zone to act as a heat sink, lowering the peak flame temperature and thus lowering the quantity of thermal NO_x formed. The injected water or steam exits the turbine as part of the exhaust. The lower peak flame temperature can also reduce combustion efficiency and prevent complete combustion, however, and so carbon monoxide and POC emissions can increase as water/steam-to-fuel ratios increase. In addition, the injected steam or water may cause flame instability and can cause the flame to quench (go out). Water/steam injection in the combustion turbines can achieve NO_x emissions as low as 25 ppm @ 15% O_2.

Dry Low-NO_x Combustors (DLE): Another technology that can control NO_x without water/steam injection is Dry Low-NO_x combustion technology. Dry Low-NO_x Combustors reduce the formation of thermal NO_x through (1) "lean combustion" that uses excess air to reduce the primary combustion temperature; (2) reduced combustor residence time to limit exposure in a high temperature environment; (3) "lean premixed combustion" that reduces the peak flame temperature by mixing fuel and air in an initial stage to produce a lean and uniform fuel/air mixture that is delivered to a secondary stage where combustion takes place; and/or (4) two-stage rich/lean combustion using a primary fuel-rich combustion stage to limit the amount of oxygen available to combine with nitrogen and then a secondary lean burn-stage to complete combustion in a cooler environment. Dry Low-NO_x combustors can achieve NO_x emissions as low as 9 ppm.

Catalytic Combustors: Catalytic combustors, marketed under trade names such as XONON™, use a catalyst to allow the combustion reaction to take place with a lower peak flame temperature in order to reduce thermal NO_x formation. XONON™ uses a flameless catalytic combustion module followed by completion of combustion (at lower temperatures) downstream of the catalyst. Catalytic combustors such as XONON™ have not been demonstrated on Aero-derivative simple-cycle gas turbines such as the GE LM 6000 PC Sprint or Siemens F Class. The technology has been successfully demonstrated in a 1.5-megawatt simple-cycle pilot facility, and it is commercially available for turbines rated up to 10 megawatts, but it is not currently available for turbines of the size proposed for the Mariposa Energy Project.

Post-Combustion Controls

The District has identified the following post-combustion controls that can remove NO_x from the emissions stream after it has been formed.

Selective Catalytic Reduction (SCR): Selective catalytic reduction injects ammonia into the exhaust stream, which reacts with the NO_x and oxygen in the presence of a catalyst to form nitrogen and water. NO_x conversion is sensitive to exhaust gas temperature, and performance can be limited by contaminants in the exhaust gas that may mask or poison the catalyst. A small amount of ammonia is not consumed in the reaction and is emitted in the exhaust stream as what is commonly called "ammonia slip". The SCR catalyst requires replacement periodically. SCR is a widely used post-combustion NO_x control technique on gas turbines, usually in conjunction with combustion controls.

Selective non-catalytic reduction (SNCR): Selective non-catalytic reduction involves injection of ammonia or urea with proprietary conditioners into the exhaust gas stream without a catalyst. SNCR technology requires gas temperatures in the range of 1400° to 2100° F[9] and is most commonly used in boilers because combustion turbines do not have exhaust temperatures in that range. Selective non-catalytic reduction (SNCR) requires a temperature window that is higher than the exhaust temperatures from utility combustion turbine installations.

EMx™: EMx™ (formerly SCONOx™) is a catalytic oxidation and absorption technology that uses a two-stage catalyst/absorber system for the control of NO_x, CO, POC and optionally SO_x emissions for gas turbine applications. A coated catalyst oxidizes NO to NO_2, CO to CO_2, and POCs to CO_2 and water, and the NO_2 is then absorbed onto the catalyst surface where it is chemically converted to and stored as potassium nitrates and nitrites. A proprietary regenerative gas is periodically passed through the catalyst to desorb the NO_2 from the catalyst and reduce it to elemental nitrogen (N_2). The EMx™ process uses no ammonia. The EMx™ catalyst requires replacement periodically. EMx™ has been successfully demonstrated on several small combined-cycle combustion turbine projects up to 45 megawatts. The District is not aware of any EMx™ installations for simple-cycle gas turbines or peaking units.

Proposed BACT for NO_x for Simple-Cycle Gas Turbines

Combustion Controls

Based on the preceding discussion, water-injection and dry low-NO_x combustion are both technically feasible simple-cycle combustion turbine control technologies that are available to control NOx emissions. As part of the turbine selection process, the turbine vendor provided performance data for water-injected LM 6000 PC Sprint, dry-low NOx LM 6000 PD Sprint gas turbines and dry-low NOx LM 6000PF Sprint gas turbines (See Table 1). Although the LM 6000 PD turbine would have a similar NOx emission rate and the PF turbine would have a lower NOx emission rate than the PC turbine, the DLE models would have higher hydrocarbon and CO emission rates generally (except at the 17°F temperature case) when compared to the water-injected PC turbine. The applicant considered this tradeoff in the selection of the PC turbine, taking into account that any turbine selected would have to meet a 2.5-ppm NOx BACT limit utilizing post combustion technology.

The applicant has proposed the use of water-injection as BACT for the simple-cycle gas turbines. Water-injection is technologically feasible and commonly used at facilities of this type. This emissions control technology therefore satisfies the District's BACT requirement for combustion controls.

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9 NSCR discussion is from Institute of Clean Air Companies website: www.icac.com/i4a/pages/index.cfm?pageID=3399

Post-Combustion Controls

The applicant has proposed the use of Selective Catalytic Reduction (SCR) as BACT for the simple-cycle gas turbines.

Selective Catalytic Reduction (SCR) and EMx can achieve NO_x emissions of 2.5 ppm for simple-cycle turbines. These are the most effective level of controls that can be achieved by post combustion controls. EMx™ technology was first installed at the Redding Power Plant Unit #5, a 45-MW combined-cycle facility in Shasta County, California. The Shasta County Air Quality Management District evaluated EMx™ at that facility under a demonstration NO_x limit of 2.0 ppm (equivalent to what SCR can achieve for a combined-cycle unit).

After three years of operation, the Shasta County AQMD evaluated whether the facility was meeting this demonstration limit with EMx™, and concluded that "Redding Power is not able to reliably and continuously operate while maintaining the NO_x demonstration limit of 2.0 ppmvd @ 15% O_2." Based on Shasta County's negative experience with Redding Power, the District decided to accept SCR as a NOx control technology.

In addition to NO_x, the District also compared the potential ancillary environmental impacts inherent in SCR and EMx™ to determine whether EMx™ should be considered more "effective" for purposes of the BACT analysis. In particular, the District evaluated the potential impacts from ammonia emissions that would occur from using SCR. The use of SCR will result in ammonia emissions because some of the ammonia used in the reaction to convert NO_x to nitrogen and water does not get reacted and remains in the exhaust stream. The excess or unreacted ammonia emissions are known as "ammonia slip". Ammonia is a toxic chemical that can irritate or burn the skin, eyes, nose, and throat, and it also has the potential for reacting with nitric acid under certain atmospheric conditions to form particulate matter (Secondary PM).

With respect to the potential toxic impacts from ammonia slip emissions, the District has conducted a health risk assessment using air dispersion modeling to evaluate the potential health impacts of all toxics emissions from the facility, including ammonia slip. This assessment showed an acute hazard index of 0.026 and a chronic hazard index of 0.015. (*See* Health Risk Assessment in the Appendices.) A hazard index under 1.0 is considered less than significant. This minimal additional toxic impact of the ammonia slip resulting from the use of SCR is not significant and is not a sufficient reason to eliminate SCR as a control alternative.

The District also considered the potential environmental impact that may result from the use of SCR involves ammonia transportation and storage. The proposed facility will utilize aqueous ammonia in a 19% (by weight) solution for SCR ammonia injection, which will be transported to the facility and stored on-site in tanks. The transportation and storage of ammonia presents a risk of an ammonia release in the event of a major accident. However, this risk is much smaller for aqueous ammonia than it would be for gaseous (anhydrous) ammonia. These risks will be addressed in a number of ways under safety regulations and sound industry safety codes and standards. These safety measures include the Risk Management Plan requirement pursuant to the California Accidental Release Prevention Program, which must include an off-site consequences analysis and appropriate mitigation measures; a requirement to implement a Safety

Management Plan (SMP) for delivery of ammonia and other liquid hazardous materials; a requirement to instruct vendors delivering hazardous chemicals, including aqueous ammonia, to travel certain routes; a requirement to install ammonia sensors to detect the occurrence of any potential migration of ammonia vapors offsite; a requirement to use an ammonia tank that meets specific standards to reduce the potential for a release event; and a requirement to conduct a "Vulnerability Assessment" to address the potential security risk associated with storage and use of aqueous ammonia onsite. With these safeguards in place, the risks from catastrophic ammonia releases from SCR systems can be mitigated to a less than significant level. The Energy Commission will also be evaluating these risks further through its CEQA-equivalent environmental review process and will impose mitigating conditions as necessary to ensure that the risks are less than significant. For all of these reasons, the potential environmental impact from aqueous ammonia transportation and storage does not justify the elimination of SCR as a control alternative.

Finally, the District also evaluated the potential for ammonia slip to have ancillary impacts on secondary particulate matter. Secondary particulate matter in the Bay Area is mostly ammonium nitrate.[10] The District has historically believed that ammonia was not a significant contributor to secondary particulate matter because the Bay Area is "nitric-acid limited". This means that the formation of ammonium nitrate is constrained by the amount of nitric acid in the atmosphere and not driven by the amount of ammonia in the atmosphere. Where an area is nitric acid limited, emissions of additional ammonia will not contribute to secondary particulate matter formation because there is not enough nitric acid for it to react with.

The District has recently started reconsidering the extent to which this situation is correct, however. This further evaluation has generally confirmed (preliminarily at least) that the Bay Area is in fact nitric acid limited, although it has shown that secondary particulate formation mechanisms are highly complex and that the District's historical assumptions that ammonia emissions play no role whatsoever in secondary PM formation may, in hindsight, have been overly simplistic. The focus of the District further evaluation has been a computer modeling exercise designed to predict what $PM_{2.5}$ levels will be around the Bay Area, given certain assumptions about emissions of $PM_{2.5}$ and its precursors, about regional atmospheric chemistry, and about prevailing meteorological conditions. This information was used to create a computer model of regional $PM_{2.5}$ formation in the Bay Area from which predictions can be drawn about how emissions of $PM_{2.5}$ precursors will impact regional ambient $PM_{2.5}$ concentrations. The District's report on its computer modeling exercise has not been finalized, but the draft report concludes that regional ammonium nitrate buildup is limited by nitric acid, not by ammonia.[11] The draft report does find that the amount of available nitric acid is not uniform but varies in different locations around the Bay Area, and consequently the potential for ammonia emissions to impact $PM_{2.5}$ formation varies around the Bay Area. Specifically, according to the draft report, the model predicts that a reduction of 20% in total ammonia emissions throughout the Bay Area would result in changes in ambient $PM_{2.5}$ levels of between 0% and 4%, depending on the availability of nitric acid, leaving open the potential that ammonia restrictions could form a

[10] *See* BAAQMD, Draft Report, *Fine Particulate Matter Data Analysis and Modeling in the Bay Area* (Draft, Oct. 1, 2009), at p. 8 (Draft PM2.5 Modeling Report). The Air District anticipates issuing a final report in the near future.

[11] Draft PM2.5 Modeling Report at p. E-3 & p. 30

useful part of a regional strategy to reduce $PM_{2.5}$.[12] The draft report therefore restates the general conclusion that the Bay Area is nitric acid limited, although it finds that reductions in the region's ammonia inventory could potentially achieve reductions in $PM_{2.5}$ concentrations in areas that may have sufficient available nitric acid.[13] (The draft report cautions that its assumptions regarding the availability of nitric acid may be misleading, however, because of the preliminary nature of the ammonia emissions inventory used for modeling.) Notably, the model also predicts that the Byron area where the facility would be located has low levels of available nitric acid, in the vicinity of 0.30 ppb.[14]

The District does not believe that these indications from its draft $PM_{2.5}$ data and modeling analysis provide a sufficient basis to disqualify SCR as a BACT technology at Mariposa based on its potential for ammonia slip emissions. As the report itself notes, the District's work in this area is still at a preliminary stage and it is difficult to draw any firm conclusion about secondary PM formation from it at this time. Moreover, secondary particulate formation is a highly complex atmospheric process, making it especially difficult to estimate how a specific facility's ammonia slip emissions might impact ambient PM levels. The District therefore notes the results of its recent work on secondary particulate matter and will be conducting additional work in this area going forward, but has concluded that there is not enough conclusive evidence at this stage that this facility could have a significant particulate matter impacts because of ammonia slip emissions from the SCR system.

In addition, the District notes that secondary PM formation from ammonia slip is a cold weather phenomenon that occurs only in the winter. This is because ammonium nitrate volatilizes at higher temperatures and only exists in a particulate phase in cold weather[15]. Moreover, the times when the Bay Area experiences problems with high ambient PM levels in the air are during the winter months (primarily November through February). The Mariposa Energy Project will be a peaker plant, however, which operates during periods of peak demand, which normally occur during the hot summer months, when air conditioning use is heavy.

The District therefore concludes that potential secondary PM formation from ammonia slip would not be a significant concern at Mariposa Energy Project because the facility will operate primarily in weather conditions where ammonium nitrate secondary PM cannot form, and at times of the year when PM pollution is less of a concern.

Finally, the District also notes that although the manufacturer claims that EMx™ can be effectively scaled up from the smaller turbines on which it has demonstrated to the larger turbines at the proposed Mariposa Energy Project, earlier attempts to demonstrate the technology in practice have not been without problems. For example, the first attempt to scale the technology up from very small turbines (~5 MW) to the 50-MW range was at the Redding Power Plant Unit #5, a 45-MW combined-cycle facility in Shasta County, CA. The Shasta County Air

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[12] Draft PM2.5 Modeling Report at pp. E-3 – E-4

[13] Draft PM2.5 Modeling Report at p. 30

[14] Draft PM2.5 Modeling Report, Figure 17, p. 31

[15] Draft PM2.5 Modeling Report at p. 10 (For all of the above notes, please check following link.) http://www.baaqmd.gov/~/media/Files/Engineering/Public%20Notices/2010/18404/Footnotes/PM-data-analysis-and-modeling-report_DRAFT.ashx

Quality Management District evaluated EMx™ at that facility under a demonstration NO_x limit of 2.0 ppm (equivalent to what SCR can achieve for a combined-cycle unit).

After three years of operation, the Shasta County AQMD evaluated whether the facility was meeting this demonstration limit with EMx™, and concluded that "Redding Power is not able to reliably and continuously operate while maintaining the NO_x demonstration limit of 2.0 ppmvd @ 15% O_2."[16].

These concerns would be further compounded by the fact that Mariposa Energy Project will be a simple-cycle peaker plant, not a combined-cycle or cogeneration facility like other facilities where EMx™ has been installed. The EMx™ requires steam as part of the catalyst regeneration process. Unlike combined-cycle and cogeneration facilities, simple-cycle facilities like Mariposa Energy Project do not have any steam production. And there is an additional concern involving the damper systems that would be required with EMx™ to ensure proper regeneration gas distribution. Peaker plants require more rapid startups and more frequent load changes than combined-cycle and cogeneration plants, and to the District's knowledge the effectiveness and longevity of these damper systems has not been demonstrated under these conditions.

Given the uncertainties that still remain in understanding how secondary PM formation is impacted by ammonia slip, the significant additional cost that would be necessary to implement EMx™, and the concern that scaling EMx™ up to fit this facility could involve significant implementation problems, the District has concluded that EMx™ should not be required here as a BACT technology.

Based on this review, the District has concluded that SCR meets the District's BACT requirement. The proposed project would therefore comply with BACT for NO_x.

Determination of BACT emissions limit for NO_x for Simple-Cycle Gas Turbines

The District is also proposing to establish a BACT emissions limit in the permit of 2.5 ppm (averaged over one hour), which is the most stringent limit that has been achieved in practice at any other similar facility and is the most stringent limit that would be technologically feasible.

To determine the most stringent emissions limit that has been achieved in practice, the District evaluated other similar simple-cycle natural gas fired turbines. Common simple-cycle gas turbine units proposed for use for intermediate peaking and peaking power in California are General Electric LMS-100 gas turbines (100 MW), and LM6000 (nominal 50 MW) gas turbines. LMS-100 gas turbines operate in a similar fashion and are appropriate for comparison with this facility. Numerous projects have been permitted with the LMS-100 gas turbines. The LM6000 gas turbines have also been installed at numerous sites across the state to provide peaking power.

The District reviewed the NO_x emission limits of power plants using large turbines in a simple-cycle mode abated by SCR systems. The District also reviewed BACT determinations at the EPA RACT/BACT/LAER Clearinghouse, ARB BACT Clearinghouse and recent projects

[16] Letter from R. Bell, Air Quality District Manager, Shasta County Air Quality Management District, to R. Bennett, Safety & Environmental Coordinator, Redding Electric Utility, June 23, 2005

undergoing CEC licensing. Some of the LMS100 simple-cycle gas turbine permits and LM6000 simple-cycle gas turbine permits with NO_x limits are shown in the Table 19 below.

TABLE 19. NO_X EMISSION LIMITS FOR LARGE SIMPLE-CYCLE POWER PLANTS USING SCR	
Facility	**NO_x (ppmvd @ 15% O_2)**
Los Esteros Critical Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	5.0 (3-hr)
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2.5 (1-hr)
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 48.5 MW each	2.5 (1-hr)

As the Table 19 shows, emissions of 2.5 ppm NO_x averaged over 1-hour is the most stringent emission limitation that has been determined to be achievable at any similar facility using SCR for NO_x control.

The District examined only simple-cycle turbines in this review because simple-cycle turbines operate differently than combined-cycle turbines and cannot achieve the same NO_x emissions performance as combined-cycle turbines, which are typically capable of meeting a 2.0-ppm limit. Simple-cycle turbines have higher exhaust gas temperatures than combined-cycle turbines because they do not use a heat recovery steam boiler, which removes some of the heat from the exhaust and reduces the exhaust gas temperature. For this facility, the turbine exhaust temperatures from the simple-cycle turbines will exceed 863 degrees F, according to the permit application. These high exhaust temperatures can damage a standard SCR catalyst. As a result, simple-cycle turbines must use less-efficient high-temperature SCR catalysts, or must introduce a large amount of dilution air to cool the exhaust if they use a standard SCR catalyst. Both of these approaches lead to less efficient SCR performance as compared to a combined-cycle operation. High-temperature catalysts typically have a lower NO_x conversion efficiency as compared to conventional SCR catalysts operating at a lower operating temperature. These catalysts have NO_x conversion efficiency below 90% at elevated temperatures above 800ºF,[17] whereas standard catalysts have NO_x conversion efficiencies of greater than 90% at 600 to

[17] BASF, High Temperature SCR for simple-cycle gas turbine applications, 2007

700ºF.[18] Dilution air fans can be used to cool the exhaust prior to entering the SCR system, but this approach has its own drawbacks. The introduction of dilution air may cool the exhaust into the appropriate temperature window, but there may be exhaust hot spots that lower catalyst NO_x conversion rates. Optimum SCR performance requires uniform temperature profile, flow profile, and NO_x concentration profile across the SCR catalyst face, and introducing large amounts of dilution air disrupts this uniformity. Changing turbine loads also tends to disrupt this uniformity, which makes controlling NO_x more difficult with the simple-cycle peaking turbines proposed for the Mariposa Energy Project. The facility will operate in a load-following mode some of the time and this would mean non-steady-state operation where the exhaust temperature, flowrate, and NO_x concentration all vary as the turbine load is changing. For all of these reasons, the District has concluded that the NO_x emissions performance that can be achieved with combined-cycle turbines would not be achievable for simple-cycle turbines. The District has therefore reviewed only simple-cycle turbines in evaluating what emissions limits have been achieved in practice by other facilities. As shown in Table 19, 2.5 ppm is the most stringent emissions limitation that has been achieved by such facilities.

The District has therefore determined that 2.5 ppm, averaged over 1-hour, is the BACT emission limit for NO_x for the simple-cycle gas turbines. The District is also proposing corresponding hourly, daily and annual mass emissions limits. Compliance with the NO_x permit limits will be demonstrated on a continuous basis using a Continuous Emissions Monitor (CEM).

This proposed BACT emissions limit is consistent with the District's BACT Guidelines for this type of equipment. District BACT Guideline 89.1.3 does not specify BACT 1 (technologically feasible and cost-effective) for NO_x for a simple-cycle gas turbine with a rated output > 40 MW. District BACT Guideline 89.1.3 does specify BACT 2 (achieved in practice) as 2.5 ppmvd @ 15% O_2 averaged over one hour, typically achieved through the use of High Temperature Selective Catalytic Reduction (SCR) with ammonia injection in conjunction with steam or water injection.

5.3 Best Available Control Technology for Carbon Monoxide (CO) for Turbines

Carbon monoxide is a colorless odorless gas that is a product of incomplete combustion. The District is proposing a BACT permit limit of 2.0 ppm CO (averaged over three hours). A 2.0-ppm BACT limit for this facility would be lower than what has been achieved in practice with other similar simple-cycle turbines, and would be the lowest emissions limit that would be technologically feasible and cost-effective. This emissions rate will be achieved through the use of good combustion practice and an oxidation catalyst, which are the most stringent available controls.

The District began its BACT analysis by evaluating the most effective control device and/or technique that has been achieved in practice at similar facilities, or is technologically feasible and cost-effective, pursuant to the District's definition of BACT in Regulation 2-2-206. As with NO_x, the District has examined both combustion controls to reduce the amount of carbon

[18] BASF, NOx Cat™ VNX SCR Catalyst for natural gas turbines and stationary engines, 2009

monoxide generated and post-combustion controls to remove carbon monoxide from the exhaust stream.

Combustion Controls

Carbon monoxide is formed by incomplete combustion. Incomplete combustion occurs when there is not enough air to fully combust the fuel, and when the air and fuel are not properly mixed due to poor combustor tuning. Maximizing complete combustion by ensuring an adequate air/fuel mixture with good mixing will reduce carbon monoxide emissions by preventing its formation in the first place.

Increasing combustion temperatures can also promote complete combustion, but doing so will increase NO_x emissions due to thermal NO_x formation as described in the previous section. The District prioritizes NO_x control over carbon monoxide control because the Bay Area is not in compliance with the federal standards for ozone, which is formed by NO_x emissions reacting with other pollutants in the atmosphere. The District therefore does not favor increasing combustion temperatures to control carbon monoxide. Instead, the District favors approaches that reduce NO_x to the lowest achievable rate and then optimize carbon monoxide emissions for that level of NO_x emissions.

Good Combustion Practice: The District has identified good combustion practice as an available combustion control technology for minimizing carbon monoxide formation during combustion. Good combustion practice utilize "lean combustion" – large amount of excess air – to produce a cooler flame temperature to minimize NO_x formation, while still ensuring good air/fuel mixing with excess air to achieve complete combustion, thus minimizing CO emissions. This good combustion practice can be used with the water injection technology selected for minimizing NO_x emissions.

Post-Combustion Controls

The District has also identified two post-combustion technologies to remove carbon monoxide from the exhaust stream.

Oxidation Catalysts: An oxidation catalyst oxidizes the carbon monoxide in the exhaust gases to form CO_2. Oxidation catalysts are a proven post-combustion control technology widely in use on large gas turbines to abate CO and POC emissions.

EMx™: EMx™, described above in the NO_2 discussion, is a multimedia control technology that abates CO and POC emissions as well as NO_x. EMx™ technology uses a catalyst to oxidize carbon monoxide emissions to form CO_2, and is therefore also an oxidation catalyst. However, it is not a stand-alone oxidation catalyst since the EMx™ is also a NO_x reduction device. Hence, it is identified as a device separate from the oxidation catalyst. EMx™ has been demonstrated on a 45 MW Alstom GTX 100 combined-cycle gas turbine at the Redding Electric Municipal Plant in Redding, CA, and the manufacturer has indicated that it could feasibly be scaled up to larger size gas turbines as discussed above in the NO_x BACT analysis. The District is not aware of any EMx™ installations on simple-cycle peaker units.

Oxidation catalysts are capable of maintaining carbon monoxide below 2 ppmvd @ 15% O_2 (3-hour average), depending on load and combustor tuning (as emissions from the gas turbines vary greatly depending on these factors). This is the most effective level of control that can be achieved by post combustion controls. There is no CO emissions data for EMx™ installation on a gas turbine of this size and in peaking service. Therefore, the District has determined that the use of good combustion practice and an oxidation catalyst is BACT for simple-cycle gas turbines.

Based on the foregoing analysis, the District has determined that the proposed combination of good combustion practice to reduce the formation of carbon monoxide during combustion and an oxidation catalyst to remove carbon monoxide from the gas turbines exhaust satisfies the BACT requirement.

Determination of BACT Emissions Limit for Carbon Monoxide (CO) for Simple-Cycle Gas Turbines

The District is also proposing a CO BACT limit of 2.0 ppm, which is more stringent than what has been achieved in practice at other similar simple-cycle facilities and is the most stringent limit that is technologically feasible and cost-effective.

To establish what level of emissions performance has been achieved in practice for this type of facility, the District reviewed the CO emission limits of other large simple-cycle power plants using oxidation catalyst systems. As with the NO_x comparison set forth in Table 18 above, the District reviewed BACT determinations for CO at the EPA RACT/BACT/LAER Clearinghouse, ARB BACT Clearinghouse and recent projects undergoing CEC licensing.

TABLE 20. CO EMISSION LIMITS FOR LARGE SIMPLE-CYCLE POWER PLANTS USING OXIDATION CATALYSTS	
Facility	**CO (ppmvd @ 15% O_2)**
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	6 (3-hr)
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6 (1-hr)
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6 (1-hr)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6 (1-hr)
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	6 (3-hr)
Los Esteros Critical Energy Facility, BAAQMD GE LM6000 Gas Turbines, 49 MW each	4 (3-hr)

A CO permit limit of 4 ppm was the lowest for a simple-cycle gas turbine abated by an oxidation catalyst. The District therefore determined that 4-ppm (3-hour average) is the most stringent emission limitation that has been achieved in practice for this type of facility.

These BACT emission rates are consistent with the District's BACT Guidelines for this type of equipment. District BACT Guideline 89.1.3 specifies BACT 2 (achieved in practice) for CO for simple-cycle gas turbines with a rated output of $\geq$ 40 MW as a CO emission concentration of $\leq$ 6.0 ppmvd @ 15% O_2 and the use of an oxidation catalyst. This BACT specification is based upon several GE LM6000 gas turbine permits in the Bay Area. BACT 1 (technologically feasible/cost-effective) is currently not specified.

The District also considered whether it would be technically feasible and cost-effective to require the proposed facility to meet an emission limit below the 4.0-ppm that has been achieved by other similar facilities. The District has concluded that the facility should be able to achieve a limit of 2.0 ppm (averaged over three hour), which is consistent with what combined-cycle facilities can typically achieve. As previously discussed, the simple-cycle gas turbines utilize water injection and are very similar to many combined cycle gas turbine projects. The primary difference is the lack of a heat recovery steam generator and the higher stack exhaust temperatures. The higher exhaust temperatures may negatively impact the SCR performance, but the higher exhaust temperatures will not adversely impact the oxidation catalyst performance.

The District then considered whether it would be technically feasible and cost-effective to require the proposed facility to meet an emission limit of 2.0-ppm for one hour. The District found that although it may be technically feasible to do so, it would not be cost-effective under the District's BACT cost-effectiveness guidelines given the large costs involved. Additionally, a large catalyst capable of meeting a CO permit limits as 2.0 ppm for one hour may have other implementation problems such as a high back pressure which could adversely impact turbine operating performance and efficiency.

Following is the information that was submitted by the applicant to determine whether the reduction of CO from 2 ppm, 3-hr average to 2 ppm, 1-hr average was cost effective. Table 20 has the necessary capital costs and Table 21 has the operating costs.

TABLE 21. CAPITAL COSTS TO REDUCE CO EMISSIONS FROM 2 PPM FOR 3-HOURS TO 2 PPM FOR 1-HOUR		
DIRECT CAPITAL COSTS (2009 $)		**Explanation of Cost Estimates Per Turbine**
1. Purchase Equipment		Base Cost
A) Pollution Control Equipment	$100,000	EIT Proposal C10-109 (2 ppm 3-hr average to 2 ppm for 1-hr average CO emission levels)
B) Instrumentation & Controls (No CEMS)	$0	EPA1998 10% of Base Cost (assumed $0 for incremental assessment)
C) Freight & Taxes	$13,000	8% Taxes; 5% Freight; on 1A & 1B
Total Purchased Equip. Costs (TEC):	$113,000	Sum 1A, 1B, 1C
2. Installation Costs:		
A) Foundation & Supports	$0	EPA1998 8% of TEC
B) Erection and Handling	$0	EPA1998 14% of TEC
C) Electrical	$0	EPA1998 4% of TEC
D) Piping	$0	EPA1998 2% of TEC
E) Insulation	$0	1% of TEC
F) Painting	$0	EPA1998 1% of TEC
G) Site Preparation	$0	0% of TEC
Total Installation Costs (TINC):	$0	Sum 2A, 2B, 2C, 2D, 2E, 2F, 2G
Total Direct Capital Costs (TDCC):	$113,000	Sum TEC, TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	$11,300	EPA1998 10% of TEC
2. Construction and Field Exp.	$5,650	OAQPS 5% of TEC
3. Contractor Fees	$11,300	OAQPS 10% of TEC
4. Start-up	$2,260	OAQPS 2% of TEC
5. Performance Testing	$1,130	OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	$31,640	Sum 1, 2, 3, 4, 5
Total Direct & Indirect Capital Costs (TDICC):	$144,640	Sum TDCC, TICC
Contingency (@12%):	$17,357	12% TDICC (std engineering accuracy)
TOTAL CAPITAL COSTS (TCC):	$161,997	Sum TDICC, Contingency

TABLE 22. ANNUAL OPERATING COSTS TO REDUCE CO EMISSIONS FROM 2 PPM FOR 3-HOURS TO 2 PPM FOR 1-HOUR		
DIRECT OPERATING COSTS (2003 $)	Cost in $	Explanation of Cost Estimates per Turbine
1. Operating Labor	$0	EPA1998 3 hr/day, @ 41.50 hr
2. Supervisory Labor	$0	OAQPS 15% Operating Labor
3. Maintenance Labor & Materials	$7,574	0.5 hr/day, $41.50/hr, + 100% materials (estimated at $0)
4. Electricity Expense ($0.0527/kWh)	$0	
5. Catalyst Cost (replace)	$0	
6. Fuel Penalty ($0.0041/scf gas)	$7,850	0.15% fuel increase/inch wc (0.7 EIT Proposal)
7. Annual Catalyst Cost	$0	Initial Catalyst will last 15 year period
Total Direct Operating Costs (TDOC):	$15424	Sum 1 through 7
INDIRECT OPERATING COSTS		
1. Overhead	$4,544	OAQPS 60% Total Labor
Total Indirect Operating Costs (TIOC):	$4,544	Sum 1
CAPITAL CHARGES COSTS		
1. Property Tax	$1,620	OAQPS 1% TCC
2. Insurance	$1,620	OAQPS 1% TCC
3. General Administrative	$3,240	OAQPS 2% TCC
4. Capital Recovery Cost (7%, 15 years)	$17,787	10.98%, TCC
Total Capital Charges Costs (TCCC):	$24,267	Sum 1, 2, 3, 4
TOTAL ANNUALIZED OPERATING COSTS:	$44,235	Sum TDOC, TIOC, TCCC
		Per Turbine
Base Uncontrolled Case	2.0	ppm - 3 hour - assumed CO concentration of 2 ppm
Annual Emission Rate	4.2	tpy (100.8 TPY @ 48 ppm * 2/48) Startup/Shutdown Excluded
Controlled Case Emissions		
CO Concentration	1.5	ppm (1-hr) assumed CO concentration of 1.5 ppm
Annual Emission Rate:	3.1	tpy (4.2 TPY @ 2 ppm * 1.5/2) Startup/Shutdown Excluded
CO Reduction from Uncontrolled Case:	1.0	tpy
Control Cost Effectiveness:	**$42,500**	per ton CO per turbine

The Air District evaluated information from the applicant on the costs and emissions reduction benefits of installing a larger oxidation catalyst capable of consistently maintaining emissions at 2 ppm for 1-hour. Based on these analyses, the cost of achieving a 2-ppm for 1-hour permit limit would be an additional $42,500 per year per ton of CO for each turbine (above what it would cost to achieve a 2.0 ppm 1-hour limit).

Based on these high costs (on a per-ton basis) and the relatively little additional CO emissions benefit to be achieved (on a per-dollar basis), requiring a 2 ppm for 1-hour CO permit limit cannot reasonably be justified. The Air District has not adopted its own cost-effectiveness. A review of other districts in California found none that consider additional CO controls appropriate as BACT where the total (average) cost-effectiveness will be greater than $400 per ton.

The District has therefore determined that BACT for CO for this facility is the use of good combustion practice with abatement by an oxidation catalyst, and a permit limit of 2 ppmvd @ 15% O_2 averaged over 3 hours. This proposed BACT limit for CO is based on a review of the feasible BACT CO control technologies, a review of comparable permit limits for simple-cycle gas turbines, and the fact that CO emissions from a simple-cycle gas turbine equipped with water injection should be equivalent to a similar combined-cycle gas turbine. The proposed 2 ppmvd @ 15% O_2 averaged over 3-hours permit limit for CO is the lowest that the District is aware of for a simple-cycle gas turbine. CO exhaust gas concentrations will be continuously monitored by a continuous emissions monitor while the turbines are in operation.

Good combustion practice is maximizing complete combustion by ensuring an adequate air-to-fuel mixture with good mixing. This mixing would be difficult to monitor, but low CO levels, measured by the CO CEM, are an indication of good combustion practice.

5.4 Best Available Control Technology for Precursor Organic Compounds (POC) for Turbines

The Precursor Organic Compound (POC) emissions from the simple-cycle gas turbines are subject to District BACT requirements since the potential to emit exceeds 10 pounds of POC per highest day. The emissions of POC from combustion sources are products of incomplete combustion like CO emissions. Emissions control techniques for CO are also applicable to POC emissions from combustions sources. The appropriate BACT control device or technique for CO is therefore also the BACT control device or technique for POC.

The District has reviewed the available control technologies in the BACT analysis for CO (equally applicable to POC) and determined that good combustion practice and abatement using an oxidation catalyst are the BACT technologies for controlling POC from the proposed simple-cycle combustion turbines at Mariposa Energy Project.

There currently is no BACT 1 (technologically feasible/cost-effective) specification for POC for the simple-cycle turbines in the District BACT guidelines. Currently, District BACT Guideline 89.1.3 specifies BACT 2 (achieved in practice) for POC for simple-cycle gas turbines with an output rating $\geq$ 40 MW as 2.0 ppmv, dry @ 15% O_2, which is typically achieved through the use of an oxidation catalyst. This is based upon several LM6000 gas turbine permits which were originally permitted with a POC emission limits in pound per hour or pounds per million Btu equivalents to 2.0 ppmvd @ 15% O_2.

The District then evaluated what the appropriate BACT emission limit should be for POC. The District reviewed permit limits from similar facilities, as summarized in Table 22.

TABLE 23. POC EMISSION LIMITS FOR LARGE SIMPLE-CYCLE GAS TURBINES	
Facility	**POC (ppmvd @ 15% O_2)**
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	2 (3-hr)
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2 (1-hr)
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2 (1-hr)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	2 (1-hr)
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)
Los Esteros Critical Energy Facility, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2 (1-hr)

The District has reviewed the POC permit emissions limits for similar facilities shown in Table 23 and determined that 2.0 ppm is the lowest emissions limit that has been achieved in practice for a simple-cycle gas turbine abated by an oxidation catalyst.

Then District considered whether it would be technically feasible and cost-effective to require the proposed facility to meet an emission limit below the proposed 2.0 ppm POC limit. The Air District evaluated information from the applicant, below, on the costs and emissions reduction benefits of installing a larger oxidation catalyst capable of consistently maintaining emissions at 1 ppm for 1 hour. Based on these analyses, the cost of achieving 1 ppm would be an additional $8,822 per year per ton of POC for each turbine.

Based on these costs (on a per-ton basis) and the additional POC emissions benefit to be achieved (on a per-dollar basis), requiring a 1-ppm @ 1 hour POC permit limit is reasonable. (See the applicant quote below in Table 23 and Table 24 supplied on May 26, 2010). The guidelines for POC and a review of other districts in California found that additional POC controls are appropriate as BACT where the total (average) cost-effectiveness will be less than $17,500 per ton.

TABLE 24. CAPITAL COSTS TO REDUCE POC EMISSIONS FROM 2 PPM TO 1 PPM FOR 1-HOUR		
DIRECT CAPITAL COSTS (2009 $)		**Explanation of Cost Estimates Per Turbine**
1. Purchase Equipment		Base Cost
A) Pollution Control Equipment	$50,000	EIT Email dated May 18, 2010.
B) Instrumentation & Controls (No CEMS)	$0	EPA1998 10% of Base Cost (assumed $0 for incremental assessment)
C) Freight & Taxes	$0	8% Taxes; 5% Freight; on 1A & 1B
Total Purchased Equip. Costs (TEC):	$50,000	Sum 1A, 1B, 1C
2. Installation Costs:		
A) Foundation & Supports	$0	EPA1998 8% of TEC
B) Erection and Handling	$0	EPA1998 14% of TEC
C) Electrical	$0	EPA1998 4% of TEC
D) Piping	$0	EPA1998 2% of TEC
E) Insulation	$0	1% of TEC
F) Painting	$0	EPA1998 1% of TEC
G) Site Preparation	$0	0% of TEC
Total Installation Costs (TINC):	$0	Sum 2A, 2B, 2C, 2D, 2E, 2F, 2G
Total Direct Capital Costs (TDCC):	$50,000	Sum TEC, TINC
INDIRECT CAPITAL COSTS		
1. Engineering & Supervision	$5,000	EPA1998 10% of TEC
2. Construction and Field Exp.	$2,500	OAQPS 5% of TEC
3. Contractor Fees	$5,000	OAQPS 10% of TEC
4. Start-up	$1,000	OAQPS 2% of TEC
5. Performance Testing	$500	OAQPS 1% of TEC
Total Indirect Capital Costs (TICC):	$14,000	Sum 1, 2, 3, 4, 5
Total Direct & Indirect Capital Costs (TDICC):	$64,000	Sum TDCC, TICC
Contingency (@12%):	$7,680	12% TDICC (std engineering accuracy)
TOTAL CAPITAL COSTS (TCC):	$71,680	Sum TDICC, Contingency
DIRECT OPERATING COSTS (2003 $)	**Cost in $**	**Explanation of Cost Estimates per Turbine**
1. Operating Labor	$0	EPA1998 1 hr/day, @ 80.50 hr
2. Supervisory Labor	$0	OAQPS 15% Operating Labor
3. Maintenance Labor & Materials	$11470	140 hr/year, $80.50/hr, + $200 materials (estimated at $0)
4. Electricity Expense ($0.0527/kWh)	$0	
5. Catalyst Cost (replace)	$0	NA

TABLE 24. CAPITAL COSTS TO REDUCE POC EMISSIONS FROM 2 PPM TO 1 PPM FOR 1-HOUR		
6. Fuel Penalty ($0.0041/scf gas)	$2,243	0.15% fuel increase/inch wc (0.7 EIT Proposal)
7. Annual Catalyst Cost	$0	Initial Catalyst will last 15 year period
Total Direct Operating Costs (TDOC):	$13713	Sum 1 through 7
INDIRECT OPERATING COSTS		
1. Overhead	$6762	OAQPS 60% Total Labor
Total Indirect Operating Costs (TIOC):	$6762	Sum 1
CAPITAL CHARGES COSTS		
1. Property Tax	$717	OAQPS 1% TCC
2. Insurance	$717	OAQPS 1% TCC
3. General Administrative	$1,434	OAQPS 2% TCC
4. Capital Recovery Cost (7%, 15 years)	$7,870	10.98%, TCC
Total Capital Charges Costs (TCCC):	$10,738	Sum 1, 2, 3, 4
TOTAL ANNUALIZED OPERATING COSTS:	$20555	Sum TDOC, TIOC, TCCC
		Per Turbine
Base Uncontrolled Case	3.0	ppm (GE Guarantee)
Annual Emission Rate	3.5	TPY (3.74 Lb POC/hr * 3.0 ppm POC/6.4 ppm POC * 4000 hr/yr * 2000 lb/ton)
Controlled Case Emissions		
POC Concentration	1.0	ppm (3 hour)
Annual Emission Rate:	1.2	TPY (3.5 TPY * 1 ppm POC /3 ppm POC)
POC Reduction from Uncontrolled Case:	2.34	tpy
Control Cost Effectiveness:	**$13,339**	per ton of POC per turbine
References: OAQPS - OAQPS Cost Control Manual, 5th ED., February 1996. EPA1998 - Cost Effectiveness for Oxidation Catalyst Control of HAP Emissions from Stationary Combustion Turbines, * EPA memo dated 12-30-99, Emissions Standards Division, Docket A-95-51, and May 14, 1999 memo on Stationary CT control cost options.		

The District has therefore determined that BACT for the simple-cycle gas turbines for POC is the use of good combustion practice and abatement with an oxidation catalyst to achieve a permit limit for each gas turbine of 0.616 lb per hour or 0.00127 lb/MMbtu, which is equivalent to 1 ppm POC, 1-hr average.

5.5 Best Available Control Technology for Particulate Matter (PM) for Turbines

For emissions of particulate matter (PM), the District is proposing to require the use of PUC-quality low-sulfur natural gas, high efficiency inlet air filtration, and good combustion practice as BACT control technologies. The District is not proposing an hourly PM emission limit as BACT. The District's proposed BACT determination is explained below.[19]

Control Technology Review:

Control technologies for PM can be grouped into two categories: (1) combustion controls, and (2) post-combustion controls.

Pre-Combustion Controls

- Inlet Air Filter: An inlet air filter is commonly used to protect the turbine from contaminants in the air, which can damage the turbine. There are two main types of filters, static filters and self-cleaning filters. Self-cleaning filters are cleaned periodically by a pulse of backflow air that dislodges the layer of dust collected on the outside surface of the filter. Self-cleaning filters require less maintenance than static filters and can be used in harsher environments. Both filter types can utilize high-efficiency filters capable of filtering particles less than 10 μm in diameter.

Combustion Controls

- **Good Combustion Practice:** The District has identified good combustion practice as an available combustion control technology for minimizing unburned hydrocarbon formation during combustion. Good combustion will ensure proper air/fuel mixing to achieve complete combustion, thus minimizing emissions of unburned hydrocarbons that can lead to formation of PM at the stack.

- **Clean-burning fuels:** The use of clean-burning fuels, such as natural gas that has only trace amounts of sulfur that can form particulates, will result in minimal formation of PM during combustion. The use of natural gas is commercially available and demonstrated for the Mariposa Energy Project gas turbines.

Post-Combustion Controls

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[19] This facility is subject to BACT requirements for PM_{10} only. $PM_{2.5}$, a subset of PM_{10}, is regulated under federal requirements in 40 C.F.R. Section 52.21 (PSD) and 40 C.F.R. Part 51, Appendix S (Non-Attainment NSR). The facility is not subject to PSD or $PM_{2.5}$ Non-Attainment NSR permit requirements under Section 52.21 or Appendix S because the facility is not a "major facility" for the purposes of these regulations. The District is therefore not conducting a PSD permitting analysis or an Appendix S permitting analysis for $PM_{2.5}$. The District notes, however, that for combustion turbines essentially all of the PM emissions are less than one micron in diameter, so it is both PM_{10} and $PM_{2.5}$. (*See* AP-42, Table 1.4-2, footnote c, 7/98 (available at http://www.epa.gov/ttnchie1/ap42/ch01/final/c01s04.pdf). Moreover, the same emissions control technologies that will be effective for PM_{10} for this facility will also be similarly effective for $PM_{2.5}$. The District's BACT analysis and emissions limit for PM_{10} will also therefore effectively be a BACT limit on $PM_{2.5}$ emissions as well, even though the facility is not subject to the federal $PM_{2.5}$ BACT requirements.

- **Electrostatic precipitators:** Electrostatic precipitators are used on solid fuel boilers and incinerators to remove PM from the exhaust. Electrostatic precipitators use a high-voltage direct-current corona to electrically charge particles in the gas stream. The suspended particles are attracted to collecting electrodes and deposited on collection plates. Particles are collected and disposed of by mechanically rapping the electrodes and plates and dislodging the particles into collection hoppers.

- **Baghouses:** Baghouses are used to collect PM by drawing the exhaust gases through a fabric filter. Particulates collect on the outside of filter bags that are periodically shaken to release the particulates into hoppers.

Inlet filtration, good combustion practice and clean-burning fuels are common control devices/techniques that are technically feasible for simple-cycle natural gas fired combustion turbines and are often used to control emissions from sources of this type. The District has therefore determined that these technologies are achieved-in-practice and are technically feasible and cost-effective for the Mariposa Energy Project.

With respect to the add-on controls – electrostatic precipitators and baghouses – these control devices are not achieved-in-practice for natural gas fired combustion turbines and are not technically feasible here. These devices are normally used on solid-fuel fired sources or others with high PM emissions, and are not used in natural gas fired applications, which have inherently low PM emissions. The District is not aware of any natural gas fired combustion turbine that has ever been required to use add-on controls such as these. The District also reviewed the EPA BACT/LAER Clearinghouse and confirmed that EPA has no record of any post-combustion particulate controls that have been required for natural gas fired gas turbines. The District has therefore determined that these control devices are not achieved-in-practice for purposes of the BACT analysis.

The District has also determined that these devices would not be technologically feasible here. If add-on control equipment were installed it would create significant backpressure that would significantly reduce the efficiency of the plant and would cause more emissions per unit power produced. Moreover, these devices are designed to be applied to emissions streams with far higher particulate emissions, and they would have very little effect on the low-PM emissions streams from this facility in further reducing PM emissions.[20] It takes an emissions stream with a much higher grain loading for these types of abatement devices to operate efficiently. This low level of abatement efficiency (if any) also means that these types of control devices would not be cost-effective, even if they could feasibly be applied to this type of source. For all of these reasons, post-combustion particulate control equipment is not technologically feasible for the proposed Mariposa Energy Project.

[20] For example, if a baghouse were installed on the turbines, the turbine exhaust at the *inlet* to the baghouse would contain less PM than is normally seen in baghouse *output*, after abatement. PM emissions from a baghouse are normally in the range 0.0013 to 0.01 grains per standard cubic foot (*see BAAQMD BACT/TBACT Workbook*, Section 11: Miscellaneous Sources), whereas PM emissions from the proposed Mariposa Energy Project turbines would be 0.00118 gr/dscf (@ 15% O_2).

The District has therefore determined that low-sulfur natural gas, inlet filtration, and good combustion practice are the BACT control technologies for the proposed Mariposa Energy Project. For low-sulfur fuel, the highest quality commercially available natural gas is natural gas that meets the PG&E Gas Rule 21, Section C standard of less than 1.0 grains of sulfur per 100 scf. This PG&E standard is the maximum sulfur content at any point in time. [21] The District is therefore proposing a BACT limit for fuel sulfur content of 1.0 grains of sulfur per 100 scf for maximum daily emissions.

This proposed BACT determination is consistent with guidance from the California Air Resources Board in setting BACT for natural gas fired gas turbines. This proposed BACT determination is also consistent with District BACT Guideline 89.1.3, which specifies BACT for PM_{10} for simple-cycle gas turbines with rated output of $\geq$ 40 MW as the exclusive use of clean-burning natural gas with a maximum sulfur content of $\leq$ 1.0 grains per 100 scf.

Tables 25 and 26, and the graphical representation of the data in Table 26 below are presented for comparison. Table 25 below presents PM permit limits for projects similar to the simple-cycle gas turbines proposed for the Mariposa Energy Project in descending order by emission rate in lb/MMbtu.

TABLE 25. RECENT BACT PM_{10} PERMIT LIMITS FOR LARGE SIMPLE-CYCLE GAS TURBINES

Facility	PM_{10} (lb/hr)	Size (MMbtu/hr)	PM_{10} (lb/MMbtu)
CPV Sentinel Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6.0	875.7	0.0069
Panoche Energy Center, SJVAPCD GE LMS100 Gas Turbines, 100 MW each	6.0	909.7	0.0066
Walnut Creek Energy Park, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6.0	904	0.0066
Sun Valley Energy Project, SCAQMD GE LMS100 Gas Turbines, 100 MW each	6.0	904	0.0066
Lambie Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Riverview Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Wolfskill Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Goosehaven Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	3.0	500	0.0060
Gilroy Energy Center, BAAQMD GE LM6000 Gas Turbines, 49 MW each	2.5	467.6	0.0053
Los Esteros Critical Energy Facility,	2.5	472.6	0.0053

[21] The 1.0-grain per 100 scf PUC standard is the maximum sulfur content of the gas at any point in time. The actual average content is expected to be less than 0.25 grains per 100 scf. The District has based its calculations of annual emissions on this 0.25-grain per 100 scf average sulfur content. Note that a portion of the sulfur contained in natural gas is intentionally added as an odorant to allow for the detection of leaks, which would be a safety concern.

TABLE 25. RECENT BACT PM_{10} PERMIT LIMITS FOR LARGE SIMPLE-CYCLE GAS TURBINES			
Facility	**PM_{10} (lb/hr)**	**Size (MMbtu/hr)**	**PM_{10} (lb/MMbtu)**
BAAQMD GE LM6000 Gas Turbines, 49 MW each			

Notes: 1. Please note the lb/MMbtu values are not the permit limits and simply allow comparison of limits for different sized units.

The District also reviewed PM source test data for a number of comparable facilities. The data set below is for GE LM6000 simple-cycle gas turbines abated by an oxidation catalyst and SCR and is shown in Table 26 below.

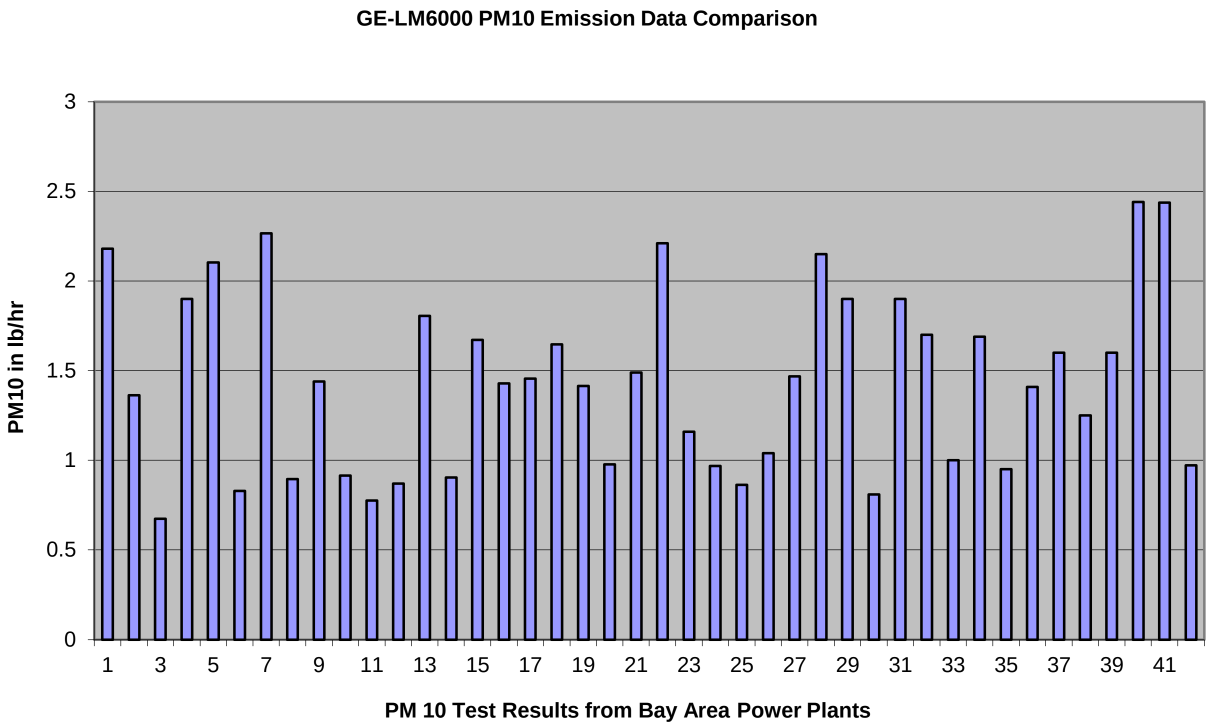
TABLE 26. SUMMARY OF GENERAL ELECTRIC LM-6000 SIMPLE-CYCLE GAS TURBINE PARTICULATE EMISSIONS DATA

Facility	Test Date	Source	PM lb/hour	PM FH lb/hour	PM BH lb/hour	Front %	Back %	Reported PM lb/MMBtu
Creed Energy Center	1/31/2003	S-1	2.18	1.05	1.13	48.2	51.8	0.0047
Creed Energy Center	7/6/2006	S-1	1.363	0.553	0.81	40.6	59.4	0.0028
Creed Energy Center	5/7/2009	S-1	0.6746	0.1948	0.4798	28.9	71.1	0.0012
Lambie Energy Center	1/16/2003	S-1	1.9	0.56	1.34	29.5	70.5	0.0042
Lambie Energy Center	5/5/2006	S-1	2.104	1.429	0.674	67.9	32.0	0.0039
Lambie Energy Center	5/11/2009	S-1	0.83	0.3488	0.4807	42.0	57.9	0.0016
Los Esteros Energy	7/26-7/27/05	S-1	2.266	1.016	1.25	44.8	55.2	0.0042
Los Esteros Energy	7/26-7/27/05	S-2	0.896	0.363	0.533	40.5	59.5	0.0016
Los Esteros Energy	7/28/2005	S-3	1.44	0.578	0.862	40.1	59.9	0.0025
Los Esteros Energy	7/27-7/29/05	S-4	0.915	0.326	0.589	35.6	64.4	0.0016
Los Esteros Energy	9/8/2006	S-1	0.775	0.307	0.468	39.6	60.4	0.0015
Los Esteros Energy	9/8/2006	S-2	0.871	0.331	0.54	38.0	62.0	0.0015
Los Esteros Energy	9/6-9/7/06	S-3	1.805	0.398	1.407	22.0	78.0	0.0033
Los Esteros Energy	9/6-9/7/06	S-4	0.904	0.318	0.586	35.2	64.8	0.0017
Los Esteros Energy	7/25-7/26/07	S-1	1.672	0.967	0.705	57.8	42.2	0.0030
Los Esteros Energy	7/25-7/26/07	S-2	1.429	0.541	0.888	37.9	62.1	0.0025
Los Esteros Energy	7/24-7/25/07	S-3	1.456	0.666	0.79	45.7	54.3	0.0025
Los Esteros Energy	7/24-7/25/07	S-4	1.646	0.973	0.673	59.1	40.9	0.0027
Los Esteros Energy	5/29-5/30/07	S-1	1.4145	0.6957	0.7189	49.2	50.8	0.0026
Los Esteros Energy	5/28-5/29/07	S-2	0.9769	0.3191	0.6578	32.7	67.3	0.0018
Los Esteros Energy	5/28-5/29/07	S-3	1.49	0.4393	1.0555	29.5	70.8	0.0027
Los Esteros Energy	5/29-5/30/07	S-4	2.21	1.345	0.8629	60.9	39.0	0.0041
Los Esteros Energy	5/13/2009	S-1	1.16	0.4811	0.68	41.5	58.6	0.0020
Los Esteros Energy	5/14-5/15/09	S-2	0.969	0.4702	0.4983	48.5	51.4	0.0018
Los Esteros Energy	5/14-5/15/09	S-3	0.864	0.4082	0.4561	47.2	52.8	0.0016
Los Esteros Energy	5/13-5/14/09	S-4	1.04	0.3226	0.7186	31.0	69.1	0.0019
Riverview	5/8/2009	S-1	1.469	0.789	0.68	53.7	46.3	0.0030
Wolfskill	6/2/2004	S-1	2.15	1.3	0.85	60.5	39.5	0.0047
Wolfskill	7/5/2006	S-1	1.9	0.582	1.319	30.6	69.4	0.0034
Wolfskill	5/4/2009	S-1	0.81	0.29	0.52	35.8	64.2	0.0010
Gilroy Energy Center	7/19/2005	S-3	1.9					0.0029
Gilroy Energy Center	7/21/2005	S-4	1.7					0.0022
Gilroy Energy Center	7/21/2005	S-5	1					0.0016
Gilroy Energy Center	5/23/2006	S-3	1.69					0.0020
Gilroy Energy Center	5/24/2006	S-4	0.95					0.0010
Gilroy Energy Center	5/22/2006	S-5	1.41					0.0020
Gilroy Energy Center	5/23/2007	S-3	1.6	0.6132	0.9856	38.3	61.6	0.0030
Gilroy Energy Center	5/24/2007	S-4	1.25	0.5443	0.7016	43.5	56.1	0.0019
Gilroy Energy Center	5/25/2007	S-5	1.6	0.6769	0.9193	42.3	57.5	0.0027
Goosehaven	1/23/2003	S-1	2.44					0.0047
Goosehaven	7/6/2006	S-1	2.438	1.327	1.112	54.4	45.6	0.0040
Goosehaven	5/6/2009	S-1	0.9716	0.1481	0.8235	15.2	84.8	0.0017
							Average	0.0026
							Maximum	0.0047

Notes: All of these facilities use an oxidation catalyst to reduce CO emissions and an SCR system to reduce NO_x emissions, as the proposed Mariposa Energy Project will.

Following is a graphical representation of the data in Table 26:

General Electric LM-6000 simple-cycle gas turbine particulate emissions data comparison



It can be seen that there is significant variation in the data. The main sources of variation are as follows: a) ambient air quality conditions, b) fuel quality, c) water quality, and d) measurement uncertainty.

The data from these facilities shows that PM emissions from sources of this type can be highly variable. Although at most times, turbines of this type will emit less than 0.0052 lb/MMbtu PM, the data shows that it not reasonable to impose a hourly not-to-exceed limit below 2.5 lb/hr for the Mariposa Energy Project (corresponding to 0.0052 lb/MMbtu).

The District has also concluded that simple-cycle turbines of the type that will be used at the proposed Mariposa Energy Project cannot achieve PM emissions as low as combined-cycle turbines (2 lb/hr). Simple-cycle turbines have a higher exhaust temperature than combined-cycle turbines, which use a heat recovery boiler to recover some of the waste heat in the turbine exhaust in order to generate additional power.

The higher exhaust temperatures seen by the oxidation catalyst and SCR system in simple-cycle facilities cause more PM to be formed in the abatement equipment compared with lower-temperature combined-cycle facilities. The increased catalyst temperatures may cause the conversion of SO_2 to SO_3 in the exhaust stream. This additional SO_3 will then convert to H_2SO_4 or ammonium sulfate salts, which add to the mass of particulate matter contained in the facility's exhaust stream. For these reasons, PM emissions from simple-cycle turbines equipped with oxidation catalysts and SCR systems for NO_x and CO control will inherently have higher PM emissions than combined-cycle turbines.

In summary, the District has determined that the use of inlet air filtration, low sulfur natural gas and with good combustion practice is BACT for PM.

The high level of control of CO (discussed in Section 5.3) indicates unburned hydrocarbons are also well controlled, thereby minimizing PM emissions. Compliance with the stringent CO emission limits will ensure that good combustion practice is being maintained.

The District is not proposing to impose a numerical emissions limit in addition to the BACT requirement to use low-sulfur natural gas and good combustion practice. The District's BACT regulations require the District to implement BACT either as a control device or technique (Regulation 2-2-206.1 and 2-2-206.3) or as an emission limitation (Regulation 2-2-206.2 and 2-2-206.4), and do not require both types of BACT limits. The District is therefore proposing the control techniques described above to fulfill the BACT requirement for PM in accordance with Regulations 2-2-206.1 and 2-2-206.3. The District considered whether to require a numerical emissions limit as well, but has concluded that doing so would not be warranted here, given that there are no add-on control devices that the facility can use to control PM emissions. In a facility using good combustion practice, PM emissions will be determined by the amount of sulfur in the fuel and the way that the combustion equipment functions, which are factors that are not within the control of the operator. PM therefore presents a different situation than other pollutants such as NOx or CO where the project owner can design its add-on control systems to achieve the required level of emissions and ensure that it will comply with its emission limits by operating the add-on control systems properly.

This proposed BACT determination is consistent with guidance from the California Air Resources Board in setting BACT for natural gas-fired gas turbines. This proposed BACT determination is also consistent with District BACT Guideline 89.1.6, which specifies BACT for PM10 for combined-cycle gas turbines with rated output of > 40 MW as the exclusive use of clean-burning natural gas with a maximum sulfur content of < 1.0 grains per 100 scf. These guidance documents do not suggest that a numerical emissions limit should be required as a BACT permit condition.

5.6 **Best Available Control Technology for Sulfur Dioxide (SO_2) for Turbines**

The potential emissions of SO_2 from the simple-cycle gas turbines exceed 10 lb per highest day for each turbine. These sources are therefore subject to District BACT requirements for SO_2.

There are two primary mechanisms used to reduce SO_2 emissions from combustion sources: (i) reduce the amount of sulfur in the fuel, and (ii) remove the sulfur from the combustion exhaust gases.

Limiting the amount of sulfur in the fuel is a common practice for natural gas fired power plants. Such plants in California are typically required to combust only California PUC grade natural gas with a sulfur content of less than 1 grain per 100 standard cubic feet (scf). This control technique has been achieved in practice at other facilities, and it is technologically feasible and cost-effective. The District is therefore proposing to require the use of PUC-grade natural gas with a sulfur content of less than 1 grain/100 scf as a BACT control technique for SO_2.

Add-on controls that remove sulfur from the combustion exhaust, such as flue gas desulfurization, are not feasible for natural gas fired power plants and have not been used at such facilities. These types of control devices are typically installed on coal fired power plants that burn fuels with much higher sulfur contents. There are two main types of SO_2 post-combustion control technologies: wet scrubbing and dry scrubbing. Wet scrubbers use an alkaline solution to remove the SO_2 from the exhaust gases and may remove up to 90% of the SO_2 from the exhaust stream. Dry scrubbers use an SO_2 sorbent injected as a powder or slurry to remove the SO_2 and the SO_2 and sorbent are removed by a particulate control device. The abatement efficiencies vary with different types of dry scrubbing technologies, but are generally lower than efficiencies for wet scrubbing technologies. These technologies are not feasible for combustion sources burning low sulfur content natural gas. The SO_x concentrations in the natural gas combustion exhaust gases are too low (less than 1 ppm) for the scrubbing technologies to work effectively or be technologically feasible and cost effective. These control technologies require much higher sulfur concentrations in the combustion exhaust gases to become feasible as a control technology. For this reason, they have not been used at natural gas fired power plants such as the proposed Mariposa Energy Project. As these control technologies have not been achieved in practice at other similar facilities and are not technologically feasible here, the District is not proposing to require them as BACT for this facility.

Fuel sulfur limits are therefore the only feasible SO_2 control technology for natural gas combustion sources, and the District is proposing to require this technology as BACT. The District is proposing BACT permit limits based on a natural gas specification of a maximum of 1 grain of sulfur per 100 scf of natural gas. As stated in Section 5.5 of this document, the highest quality commercially available natural gas is natural gas that meets the PG&E Gas Rule 21, Section C standard of less than 1.0 grains of sulfur per 100 scf. This PG&E standard is the maximum sulfur content at any point in time. The permit limits are based on maximum sulfur content of the fuel and are expressed in units of pounds per hour and pounds per day of SO_2. The emission calculations are shown in Appendix A.

This proposed BACT determination is consistent with the District's BACT Guidelines for SO_2. District BACT Guideline 89.1.3 specifies BACT 2 ("achieved in practice") for SO_2 for simple-cycle gas turbines with an output rating of $\geq$ 40 MW as the exclusive use of clean-burning natural gas with a sulfur content of $\leq$ 1.0 grains per 100 scf.

5.7 Best Available Control Technology For Startup and Shutdown Conditions for Turbines

Startup and shutdown periods are a normal part of the operation of natural gas-fired power plants. They involve emission rates that are greater than emissions during steady-state operation and that are highly variable. Emissions are greater during startup and shutdown for several reasons. One reason is that during startup and shutdown, the turbines are not operating at full load where they are most efficient. Another reason is that the exhaust temperatures are lower than during steady-state operations. Post-combustion emissions control systems such as the SCR catalyst and oxidation catalyst do not function optimally at lower temperatures, and so there may be partial or no abatement for NO_x, carbon monoxide and precursor organic compounds for a portion of the startup period.[22] Thus, emissions can be minimized by reducing the duration of the startup sequence and by reducing emissions during the startup.

Simple-cycle turbines have inherently low startup emissions because they can quickly come up to full load. This is one reason that they are used to provide peaking load duty with the capability to rapidly accelerate to synchronous speed, synchronize with the grid, ramp up to 100 percent load, and then down to zero load. Simple-cycle turbines are different in this respect than combined-cycle turbines, which incorporate a heat-recovery steam boiler that recovers some of the waste heat in the turbine exhaust to create steam to generate additional power. The combined-cycle system requires additional steam-generating components, and it takes additional time for this equipment to come up to full operating temperature. Nevertheless, simple-cycle turbines still have startup and shutdown periods in which they are not capable of complying with their steady-state emissions limits.

Finally, the Mariposa Energy Project turbines are designed for quick starts and also rapidly changing loads to meet electrical system needs. The simple-cycle gas turbines will have the ability to change loads at rates exceeding 12 MW per minute. It is difficult for the NO_x control system to respond to these rapid changes in load.

Because emissions are greater during startup and shutdown periods than during steady-state operation, the BACT limits established in the previous sections for steady-state operations are not technically feasible during these periods. The District is therefore establishing separate BACT limits representing the most stringent emissions limits that have are achieved-in-practice or technologically feasible/cost-effective for this type of facility. To do so, the District has conducted an additional BACT analysis specifically for startup and shutdown periods.

Control Devices and Techniques to Limits Startup and Shutdown Emissions:

The only available approach to reducing startup and shutdown emissions from simple-cycle turbines is to use best work practices. By following the plant equipment manufacturers' recommendations, power plant operators can limit the duration of each startup and shutdown to the minimum duration achievable. Plant operators also use their own operational experience with their particular turbines and ancillary equipment to optimize startup and shutdown emissions. There is no other available control technology or technique beyond implementing best work practices that can further reduce startup and shutdown emissions from simple-cycle turbines.[23]

[22] Note that emission rates of particulate matter and sulfur oxides are not affected by startups and shutdowns and will be the same as for full load operation as during startup and shutdown periods (2.2 lb/hour for particulate matter, average, 1.35 lb/hour for SO_x maximum, 0.34 lb/hour SO_x annual average).

[23] The lack of additional control technologies for simple-cycle turbines is different than with combined-cycle turbines. For combined-cycle turbines, there have been several technological advances that have recently been developed, or are currently under development, that will allow those types of turbines to start up more quickly and

Determination of BACT Emissions Limit for Startup and Shutdown Conditions:

The District is proposing time limits and numerical emissions limits for startups and shutdowns, periods to implement the BACT requirement here. The proposed limits for each operating scenario are outlined below.

Startups

Using best work practices, the facility should be able to complete a typical startup in 10 minutes, based on information provided by the gas turbine manufacturer. Emissions during a typical startup are expected to be 3.5 pounds of NOx, 3.0 pounds of CO, and 0.058 pounds of POC.

Typical startup emissions are summarized in Table 27.

TABLE 26. TYPICAL STARTUP EMISSION ESTIMATES FOR FIRST 10 MINUTES

	Typical Startup - Estimated Emissions (Pounds Per Period Per Turbine per Startup)
Pollutant	**(lb/event)**
NO_x as (NO_2)	3.5
CO	3.0
POC	0.058

Note: Please check appendix A for details

Although in a typical startup the turbine will begin producing power within 10 minutes, it will typically take longer for the abatement devices to become fully operational. This is because the control devices do not control NOx and CO until the catalysts reach the proper operating temperature. In the case of the SCR catalyst, ammonia is not injected until the catalyst reaches a minimum temperature of 600^{o}F. Nonetheless, typical startup emissions are minimal due to the short duration of the typical start time and due to the quick turbine ramp rate that minimizes low-load operation during startup. But these emission estimates are not guaranteed emission rates for every startup. Moreover, startup emissions are highly variable, and it is expected that some startups will take longer than 10 minutes. A number of factors influence startup duration and can lead to longer startup times, including: allowance for the CEM system lag of several minutes to relay compliant NOx and CO CEM readings, allowance for the ammonia injection rate to stabilize with NOx concentration, allowance for the oxidation and SCR catalysts time to reach normal operating temperature, and allowance for the adjustment of dilution air required to maintain optimum catalyst temperatures. The District estimates over the life of the facility that a given startup may take as long as 30 minutes to allow the gas turbine and post combustion

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with fewer emissions. These include startup procedures that heat up the additional steam-generating equipment used in combined-cycle turbines more quickly, allowing them to reach their optimal operating temperature more quickly; and advances that reduce emissions at lower loads where combined-cycle turbines must operate for extended periods while waiting for the equipment to heat up. These types of advances are not applicable to simple-cycle turbines. Simple-cycle turbines do not have any additional steam generating equipment that needs to be warmed up; and they ramp up very quickly to full load at rates as high as 25 MW per minute and do not spend any significant time operating at lower loads during startups.

controls to reach steady-state operation. The District is therefore proposing to establish the not-to-exceed BACT limit for startups at 30 minutes to provide an adequate compliance margin that allows the operators to make appropriate adjustments to system controls in response to system operational conditions. This is the shortest time limit that the turbines can reasonably be expected to meet under all operating conditions over the life of the equipment. Individual startups may be shorter than this proposed 30-minute limit, but an enforceable BACT permit limit must provide 30 minutes to allow an adequate margin of compliance to ensure that the equipment can consistently meet the limit.

In addition, the District has conservatively estimated the emissions that would result from a 30-minute startup at 14.2 pounds of NOx, 17.3 pounds of CO, and 1.4 pounds of POC, which the District is proposing as BACT limits on the emissions for startups. The District calculated these emission rates by taking the emissions performance that the manufacturer estimates the turbines could achieve for the first 10 minutes in a typical startup as summarized in Table 27, and then assuming that emissions are at the maximum uncontrolled rate for 14 minutes, and then at the maximum controlled rate for 6 minutes. In other words, the emissions would be uncontrolled for the initial 24 minutes. This is a conservative limit because if a startup takes longer than the manufacturer's estimate of 10 minutes, emissions will still have to reach the controlled level within 24 minutes. Using this conservative approach, the District calculated maximum emission rates for startups as set forth in Table 28 below:

TABLE 27. PROPOSED STARTUP EMISSION LIMITS FOR A 30-MINUTE STARTUP	
Pollutant	**Typical Startup - Estimated Emissions (Pounds Per Event Per Turbine Per Startup)**
NO_x as (NO_2)	14.2
CO	14.1
POC	1.1

Note: Please check appendix A for detail calculations for pounds per event

In addition, in order to protect hourly air quality standards, the District is also proposing additional hourly limits for operating hours during which startups occur.

TABLE 28. MAXIMUM HOURLY PERMIT LIMITS FOR STARTUPS	
Pollutant	**Maximum Startup Emissions (lb/hour)**
NO_x as (NO_2)	18.5
CO	17.3
POC	1.4

The Air District has concluded that using best work practices, the proposed simple-cycle gas turbines will be able to meet the startup permit limits shown above. The basis for these limits is emissions information provided by the gas turbine supplier General Electric.

Shutdowns

General Electric, the gas turbine manufacturer, supplied the following emission estimates for a typical shutdown occurring over 8 minutes.

TABLE 29. SIMPLE-CYCLE GAS TURBINES SHUTDOWN EMISSION ESTIMATES FOR FINAL 8 MINUTES	
	Typical Shutdown - Estimated Emissions (Pounds Per Period Per Turbine Per Shutdown)
Pollutant	**(lb/event)**
NO_x as (NO_2)	3.2
CO	2.7
POC	0.12

The Air District proposes to have maximum pound-per-event limits for shutdowns. The District estimates over the life of the facility that a given shutdown may take as long as 15 minutes to allow the gas turbine time to ramp down from full load operation and allow time for the turbine to decelerate after fuel flow stops. Each shutdown would be limited to a maximum of 15 minutes for a worst-case shutdown.

The District then conservatively estimated the emissions during a 15-minute shutdown using an approach similar to the approach for estimating maximum startup emissions above. The District conservatively assumed that emissions that the typical shutdown emissions as summarized in Table 31 occur over the first 8 minutes of the shutdown, and that the rest of the 7-minute shutdown period had emissions at normal steady-state emissions rates. These are the worst-case pound-per-event values for the simple-cycle gas turbines during a shutdown.

TABLE 30. PROPOSED SHUTDOWN EMISSION LIMITS FOR A 15 MINUTE SHUTDOWN	
	Typical Shutdown - Estimated Emissions (Pounds Per Event Per Turbine Per Shutdown)
Pollutant	**(lb/event)**
NO_x as (NO_2)	3.2
CO	2.7
POC	0.12

Thus, the Air District has concluded that using best work practices, the proposed simple-cycle gas turbines will be able to meet the permit limits shown above in Table 28, Table 29 and Table 31.

Conclusion

The Air District is proposing stringent emission limits for startups and shutdowns conditions that can reasonably be achieved by the proposed Mariposa Energy Project, based on a review of the gas turbine supplier's emission estimates.
Emissions from specific startup and shutdown events may be significantly less than the proposed not-to-exceed permit limits, given the great variability of such events. The District is proposing

to require the limits described above as the enforceable BACT limits to ensure that emissions are minimized to the greatest extent feasible while ensuring that the limits are achievable under all operating circumstances.

5.8 Best Available Control Technology During Commissioning of Gas Turbines

The simple-cycle gas turbines and associated equipment are highly complex and have to be carefully tested, adjusted, tuned and calibrated after the facility is constructed. These activities are generally referred to as "commissioning" of the facility. During the commissioning period, each of the combustion turbine generators needs to be fine-tuned at zero load, partial load, and full load to optimize its performance. The water injection system also needs to be tuned to ensure that the turbines run efficiently while meeting both the performance guarantees and emission guarantees. In addition, the selective catalytic reduction (SCR) systems and oxidation catalysts need to be installed and tuned.

The simple-cycle gas turbines will not be able to meet the stringent BACT limits for normal operations during the commissioning period for a number of reasons. First, the SCR systems and oxidation catalysts cannot be installed immediately when the turbines are initially started up. There may be oils or lubricants in the equipment from the manufacture and installation of the equipment, which would damage the catalysts if they were installed immediately. Instead, the turbines need to be operated without the SCR systems and oxidation catalysts for a period of time to burn off any impurities that may be left in the equipment. In addition, once all of the pollution control equipment is installed, it needs to be tuned in order to achieve optimum emissions performance. Until the equipment is tuned, it will not be able to achieve the very high levels of emissions reductions reflected in the stringent BACT limits for normal operations.

Because the BACT limits established for normal operations are not technically feasible during the commissioning period, these limits are not BACT for this phase of the facility's operation. Alternate BACT limits must therefore be specified for this mode of operation. To do so, the Air District has conducted an additional BACT analysis specifically for the required commissioning activities.

The only control technology available for limiting emissions during commissioning is to use best work practices to minimize emissions as much as possible during commissioning, and to expedite the commissioning process so that compliance with the stringent BACT limits for normal operations can be achieved as quickly as possible. There are no add-on control devices or other technologies that can be installed for commissioning activities.

To implement best work practices as an enforceable BACT requirement, the Air District is proposing conditions that will require the simple-cycle gas turbines to minimize emissions to the maximum extent possible during commissioning. The Air District is also proposing numerical emissions limits based upon the equipment manufacturer's best estimates of uncontrolled emissions at the operating loads that the simple-cycle gas turbines will experience during commissioning. The proposed permit conditions will limit emissions to below the following levels:[24]

TABLE 31. COMMISSIONING PERIOD EMISSIONS LIMITS FOR ONE SIMPLE-CYCLE GAS TURBINE		
Air Pollutant	**Proposed Commissioning Period Emissions Limits for One Simple-Cycle Gas Turbine**	
	lb/hr	**lb/day**
NO_2	51	408
CO	45	360
POC		36
PM_{10}		17.6 (average)
SO_2		(10.8)

Notes: Please see Appendix A for detail lb/hr and lb/day commissioning emission estimates. NO2 daily maximum assumes 8 hours of gas turbine testing at 10% load, 8 hours of Pre-Catalyst Initial tuning at 50-100% load and 8 hours of Post-Catalyst tuning at 50-100% load

Table 32 does not have lb/hr limits for of emissions POC, PM_{10} and SO_2 because these pollutants are not continuously monitored for those pollutants.

The original estimates of daily emissions were about double the emissions in Table 31. The applicant has agreed to commission only one turbine at a time.

Commissioning emissions will also be subject to the annual emissions limits applicable to normal operations. All emissions from commissioning activities will be counted towards the facility's annual limits. Because commissioning is a relatively short-term period, the facility should be able to stay within those limits over the course of the entire year. Counting commissioning emissions towards the annual limits will also provide an additional incentive for the facility operator to minimize emissions as much as possible.

The Air District is also proposing permit conditions to minimize the duration of commissioning activities. The proposed conditions require the facility to tune the combustion turbine to minimize emissions at the earliest feasible opportunity; and to install, adjust and operate the SCR systems and oxidation catalysts at the earliest feasible opportunity. The Air District is also proposing to cap the total amount of time that each turbine can operate partially abated and/or without the SCR systems and oxidation catalysts at 200 hours. This limit represents the shortest amount of time in which the facility can reasonably complete the required commissioning activities without jeopardizing safety and equipment warranties. The proposed 200-hour limit is based on the following estimates from General Electric of the time it will take for each specific commissioning activity.

[24] See Appendix A for Commissioning Emissions.

TABLE 32. COMMISSIONING SCHEDULE FOR A SINGLE SIMPLE-CYCLE GAS TURBINE1								
Activity	**Duration (hours/Day)**	**Days**	**Load Range (%)**	**Total Emissions**				
				NO_X (lbs/hr)	**CO (lb/hr)**	**POC (lb/hr)**	**SO_x[2] (lb/hr)**	**PM_{10}[2] (lb/hr)**
Initial Load Testing and Engine Checkout[3]	4	2	10%	51	45	4.48	10.8	2.2 (avg)
Pre-Catalyst Initial tuning[4]	8	9	50-100%	51	45	4.48	10.8	2.2 (avg)
Post-Catalyst tuning[4]	8	15	50-100%	34	6.2	1.2	10.8	2.2 (avg)

Notes:
[1] Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test.
[2] Steady state controlled emission rates for SOx and PM10 are 0.91, and 2.5 lbs/hr respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning.
[3] In synchronized operation followed by low load engine check.
[4] Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NOx and CO catalyst use.

TABLE 33. COMMISSIONING SCHEDULE FOR FOUR SIMPLE-CYCLE GAS TURBINES								
Activity	**Duration (hours/Day)**	**Days**	**Number of Turbines**	**Total Emissions**				
				NO_X Total lbs	**CO Total lb**	**POC Total lb**	**SOx[2] Total lb**	**PM_{10} Total lb**
Initial Load Testing and Engine Checkout[3]	4	2	4	1632	1440	143	43	70
Pre-Catalyst Initial tuning[4]	8	9	4	14688	12960	1290	389	634
Post-Catalyst tuning[4]	8	15	4	16320	2976	576	648	1056
Total in lbs				32640	17376	2010	1080	2000
Total in tons				16.3	8.7	1.0	0.54	0.9
Total Hours for 4-turbines	800							

Notes:
[1] Assumes SCR and oxidation catalyst will limit emissions to BACT levels during the final tuning period, which includes performance test.
[2] Steady state controlled emission rates for SOx and PM10 are 1.35 and 2.2 lbs/hr (average), respectively. These rates have been used to conservatively estimate hourly and total emissions during commissioning.
[3] In synchronized operation followed by low load engine check.
[4] Includes the period both before and after SCR and CO catalyst loading. Post-catalyst period includes NOx and CO catalyst use.

Compliance with these proposed conditions for the commissioning period will be monitored by continuous emissions monitors that the applicant will be required to install before any commissioning work begins, and through a written commissioning plan laying out all commissioning activities in advance, which the applicant will be required to submit to the Air District for review and approval.

5.9 Best Available Control Technology for Fire Pump Engine

The fire pump engine is subject to Best Available Control Technology for NOx and CO because the engine will emit more than 10 lb/highest day of both NOx and CO. BACT for emergency engines has been determined and published in the District's BACT/TBACT Workbook because the District issues permits to many emergency engines every year.

The District's BACT limit for NOx is equivalent to the current EPA standard in 40 CFR 89. At this time, for a 220-hp engine, the limit for NOx + NMHC combined is 3.0 g/bhp-hr.

The District's BACT limit for CO is the lower of 2.75 g/bhp-hr or the current EPA standard in 40 CFR 89. At this time, for a 220-hp engine, the limit for CO in 40 CFR 98 is 2.6 g/bhp-hr.

As shown in Section 4.1.4 of this FDOC, the engine complies with the BACT NOx and CO limits.

6 Offsets Required by Pollutant

District regulations require that new facilities must provide Emission Reduction Credits (ERCs) to offset the increases in air emissions that they will cause. ERCs are generated when old facilities sources are shut down, or when sources are controlled below regulatory limits. The emissions reductions granted by the District are used to offset the increases from new facilities, so that there will be no overall increase in emissions from facilities subject to this offset program.

Pursuant to Regulation 2-2-302, federally enforceable emission offsets are required for POC and NO_x emission increases from permitted sources at facilities that will emit 10 tons per year or more on a pollutant-specific basis. For facilities that will emit more than 35 tons per year of NO_x offsets must be provided by the applicant at a ratio of 1.15 to 1.0. Pursuant to Regulation 2-2-302.2, POC offsets may be used to offset emission increases of NO_x.

The applicable offset ratios and the quantity of offsets required are summarized in Table 27.

6.1 NO_x Offsets

Because the proposed Mariposa Energy Project will emit greater than 35 tons per year of NO_x) from permitted sources, the NO_x emissions must be offset at a ratio of 1.15 to 1.0 pursuant to District Regulation 2-2-302. The facility will emit up to 45.9 tons/yr of NO_x, and will therefore be required to provide offsets for 52.8 tons per year of NO_x emissions. The applicant has identified ERCs available for it to use sufficient to offset this level of NO_x emissions.

6.2 POC Offsets

Because the total POC emissions from permitted sources will not exceed 10 tons per year, the proposed Mariposa Energy Project is not required to offset its POC emissions under Regulation 2-2-302.

6.3 PM_{10} Offsets

Because the total PM_{10} emissions from permitted sources will not exceed 100 tons per year, the proposed Mariposa Energy Project is not required to offset its PM_{10} emissions under District Regulation 2-2-303.

6.4 SO_2 Offsets

Pursuant to Regulation 2-2-303, emission reduction credits are not required for the SO_2 emission increases associated with this project since the facility's SO_2 emissions will not exceed 100 tons per year. Regulation 2-2-303 allows for the voluntary offsetting of SO_2 emission increases of less than 100 tons per year. The applicant has opted not to provide such emission offsets.

6.5 **Offset Package**

Table 35 summarizes the offset obligation of the proposed Mariposa Energy Project. The emission reduction credits presented in Table 35 exist as federally-enforceable, banked emission reduction credits that have been reviewed for compliance with District Regulation 2, Rule 4, "Emissions Banking", and were subsequently issued as banking certificates by the District under the certificates cited in the Tables below. If the quantity of offsets issued under any certificate exceeded 35 tons per year for any pollutant, the application was required to fulfill the public notice and public comment requirements of District Regulation 2-4-405. Accordingly, such applications were reviewed by the California Air Resources Board, U.S. EPA, and adjacent air pollution control districts to insure that all applicable federal, state, and local regulations were satisfied.

As indicated below, Mariposa Energy Project is in possession of valid emission reduction credits to offset the emission increase of NOx from the sources for the Mariposa Energy Project. These credits were generated by Owens Corning Insulating Systems, LLC, in Santa Clara.

TABLE 34. EMISSION REDUCTION CREDITS IDENTIFIED BY MARIPOSA ENERGY PROJECT (TON/YR)

Emissions	NO_x[b]
Valid Emission Reduction Credits[a]	55.9
Permitted Source Emission Limits	45.9
Offsets Required	52.8

[a] From Banking Certificates 1182
[b] Reflects applicable offset ratio of 1.15:1.0 pursuant to Regulation 2-2-302

TABLE 35. CERTIFICATE DETAILS

Current Certificate	**Original Certificate**	**Company**	**Location**	**Original Issue Dates**
1182	**564**	**Owens Corning Insulating Systems, LLC**	**Santa Clara**	**12/29/03**

Note: The numbers of each certificate change with each transaction in the emissions bank. The certificate number below is the original certificate number issued when the emission reduction was generated.

Certificate 564 was generated by modifying the M-Electric and O-Electric Furnaces.

7 Health Risk Screening Analysis

Pursuant to the BAAQMD Risk Management Regulation 2, Rule 5, a health risk screening must be conducted to determine the potential impact on public health resulting from the worst-case emissions of toxic air contaminants (TACs) from the proposed Mariposa Energy Project. The potential TAC emissions (both carcinogenic and non-carcinogenic) from the Mariposa Energy Project are summarized in Table 15 in Section 4.0. Table 36 presents the Health Risk Assessment Results for the Mariposa Energy Project. In accordance with the requirements of District Regulation 2, Rule 5 and California Office of Health Hazard Assessment (OEHHA) guidelines, the impact on public health due to the emission of these compounds was assessed utilizing EPA approved air pollutant dispersion models.

TABLE 36. HEALTH RISK ASSESSMENT RESULTS

Receptor	Cancer Risk	Non-cancer Hazard Index (HI)	Max. Acute Non-cancer HI
Resident	0.3 in a million	0.015	N/A
Worker	1.3 in a million	0.001	N/A
Any	N/A	N/A	0.026

The health risk assessment has been prepared by the District Toxics Evaluation Section pursuant to BAAQMD Regulation 2, Rule 5. The increased carcinogenic risk attributed to this project is 1.3 in one million. Almost all of the worker cancer risk is due to S5, Fire Pump. This risk is considered acceptable in accordance with Section 2-5-301, because S5, Fire Pump, complies with the requirement for Best Available Control Technology for Toxics (TBACT). For an emergency engine, TBACT is a particulate emission rate lower than 0.15 gr/bhp.

The chronic hazard index and the acute hazard index attributed to the emission of non-carcinogenic air contaminants are not significant since they are less than 1.0.

Therefore, the proposed Mariposa energy Project will be in compliance with District Regulation 2, Rule 5. Please see Appendix B (Memo dated August 11, 2010 prepared by Ted Hull, Air Toxics Section) for further discussion.

8 Other Applicable Requirements

8.1 Applicable District Rules and Regulations

Regulation 1, Section 301: Public Nuisance

None of the project's 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.

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

Pursuant to Sections 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 all regulated sources at the proposed Mariposa Energy Project. Those permits will be issued after the CEC completes its licensing process.

Regulation 2, Rule 1, Section 412: Public Notice, Schools

The facility is not within 1000 feet of a school and therefore is not subject to Section 2-1-412.

Regulation 2, Rule 2: New Source Review

The primary requirements of New Source Review that apply to the proposed Mariposa Energy Project are Section 2-2-301; "Best Available Control Technology Requirement", Section 2-2-302; "Offset Requirements, Precursor Organic Compounds and Nitrogen Oxides, NSR", Section 2-2-303, "Offset Requirement, PM_{10} and Sulfur Dioxide, NSR".

Regulation 2, Rule 2, Section 301: BACT

The District has performed a BACT analysis for NO_x, CO, POC, $PM_{10}/PM_{2.5}$ and SO_x as shown in Section 5. The proposed Mariposa Energy Project meets the BACT requirements under Section 2-2-301.

Regulation 2, Rule 2: Sections 302 and 303

The District has presented the offsets for the project for NO_x, POC, and PM_{10} as shown in Section 6. The proposed Mariposa Energy Project meets the offset requirements under Sections 2-2-302 and 2-2-303.

Regulation 2, Rule 2: Sections 304, 305, 306, and 414

The proposed Mariposa Energy Project will not be subject to these requirements because it will not emit more than 100 tons per year of any air pollutant and because it will not exceed the thresholds for non-criteria pollutants in Section 306.

Regulation 2, Rule 3: Power Plants

Pursuant to Section 2-3-304, the Preliminary Determination of Compliance was subject to the public notice, public comment, and public inspection requirements contained in Sections 2-2-406 and 407. This document presents the Final Determination of Compliance (FDOC) for the project. The District has considered all of the comments received during the comment period prior to issuing the Final Determination of Compliance for the project. The comments and the Response to Comments document are attached to FDOC. The Final Determination of Compliance will be relied upon by the CEC in their licensing amendment proceeding. If the CEC grants a license to the project, then the District may issue an Authority to Construct.

Regulation 2, Rule 5: New Source Review of Toxic Air Contaminants

A risk screening analysis was performed to estimate the health risk resulting from the toxic air contaminant (TAC) emissions from the proposed Mariposa Energy Project. The analysis is attached in Appendix B. It is also discussed in Section 7 of this FDOC. Results from this analysis indicate that the maximally exposed individual cancer risk is estimated at 1.3 in a million, the chronic non-cancer hazard index at 0.015 in a million, and the acute non-cancer hazard index at 0.026 in million. Therefore, the proposed Mariposa Energy Project will be in compliance with the requirements of Section 2-5-301.

Regulation 2, Rule 6: Major Facility Review

After construction, the facility will be subject to Regulation 2, Rule 6, which implements the Title V program of the Federal Clean Air Act and 40 CFR 70, State Operating Permit Programs.

Pursuant to Section 404.1, the owner/operator of the Mariposa Energy Project shall submit an application to the District for a major facility review permit within 12 months after the facility becomes subject to Regulation 2, Rule 6. Pursuant to Sections 2-6-212.1 and 2-6-218, the Mariposa will become subject to Regulation 2, Rule 6, upon completion of construction as demonstrated by first firing of the gas turbines.

Regulation 2, Rule 7: Acid Rain

District Regulation 2, Rule 7 incorporates the provisions of 40 CFR Part 72 by reference. 40 CFR 72 through 78 implements Title IV, Acid Rain, of the Federal Clean Air Act. These requirements are discussed in more detail in Section 8.3 of this FDOC, Federal Requirements.

Regulation 6, Rule 1: Particulate Matter – General Requirements

Through the use of proper combustion practice, the combustion of natural gas at the gas turbines is not expected to result in visible emissions. Specifically, the facility's combustion sources are expected to comply with Sections 301 (Ringelmann No. 1 Limitation), and 310 (Particulate Weight Limitation) with particulate matter emissions of less than 0.15 grains per dry standard cubic foot of exhaust gas volume. As calculated in accordance with Section 310, the grain loading resulting from the operation of each gas turbine is 0.0012 gr/dscf @ 15% O_2. See Appendix A for the grain loading calculations.

Particulate matter emissions associated with the construction of the facility are exempt from District permit requirements, but are subject to Regulation 6, Rule 1. However, the California Energy Commission will impose requirements for construction activities including the use of water and/or chemical dust suppressants to minimize PM_{10} emissions and prevent visible particulate emissions.

Regulation 7: Odorous Substances

Section 302 prohibits the discharge of odorous substances, which remain odorous beyond the facility property line after dilution with four parts odor-free air. Section 303 limits ammonia emissions to 5000 ppm. Because the ammonia slip emissions from the turbines will be limited by permit condition to 5 ppmvd @ 15% O_2 respectively, the facility is expected to comply with the requirements of Regulation 7.

Regulation 8: Organic Compounds

The gas turbines are exempt from Regulation 8, Rule 2, "Miscellaneous Operations" Section 110 since natural gas will be fired exclusively at those sources.

The use of solvents for cleaning and maintenance at the Mariposa Energy Project is expected to be at a level that is exempt from permitting in accordance with Regulation 2, Rule 1, Section 118. The facility may utilize less than 20 gallons per year of solvent for wipe cleaning per Section 118.9 and remain exempt from permitting requirements. The facility may also utilize a cold cleaner for maintenance cleaning as long as the unit meets the exemption set forth in Section 118.4. The facility may also perform solvent cleaning and preparation-using aerosol cans meeting the exemption set forth in Section 118.10. Any solvent usage exceeding the amounts in Section 118 would require a permit. In addition, any solvent usage in excess of a toxic air contaminant trigger level contained in Regulation 2, Rule 5 would require a permit.

Regulation 9: Inorganic Gaseous Pollutants

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 SO_2 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 SO_2 emissions in excess of 300 ppm (dry). With maximum projected SO_2 emissions of < 1 ppm, the gas turbines are not expected to cause ground level SO_2 concentrations in excess of the limits specified in Section 301 and will easily comply with Section 302.

Regulation 9, Rule 7, Nitrogen Oxides and Carbon Monoxide from Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters

The simple-cycle gas turbines are not subject to Regulation 9, Rule 7 requirements.

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

Because each of the combustion gas turbines will be limited by permit condition to NO_x emissions of 2.5 ppmvd @ 15% O_2, they will comply with the NO_x limitation in Section 301.2 of 9 ppmvd @ 15% O_2 or 0.43 lb/MW-hr.

Regulation 10: Standards of Performance for New Stationary Sources

Generally Regulation 10 incorporates by reference the provisions of Title 40 CFR Part 60. However, the District has not sought delegation of the New Source Performance Standard (NSPS) contained in Subparts IIII or KKKK.

Subpart IIII, “Standards of Performance for Stationary Compression Ignition Internal Combustion Engines” applies to the fire pump engine. The engine will comply with all applicable standards and limits required by these regulations. The applicable emission limitations are summarized in Section 9.3.

Subpart KKKK, “Standards of Performance for Stationary Gas Turbines” applies to this facility. The gas turbines will comply with all applicable standards and limits required by these regulations. The applicable emission limitations are summarized in Section 9.3.

8.2 State Requirements

The proposed Mariposa Energy Project will be subject to the Air Toxic “Hot Spots” Program contained in the California Health and Safety Code Section 44300 et seq. The facility will be required to prepare inventory plans and reports as required.

The fire pump engine, S5, will be subject to the Stationary Diesel Engine ATCM contained in Title 17, Public Health, California Code of Regulations section 93115 et seq. The engine family (9CEXL0409AAB) has been certified by CARB and the engine will comply with the emission requirements for new emergency standby diesel-fueled compression ignition engines in Section 93115(a)(3)(A), which are:.

- NMHC + NOx < 3 g/bhp-hr
- CO < 2.6 g/bhp-hr
- PM < 0.15 g/bhp-hr

The engine will be subject to BAAQMD Standard Condition 22850, which has a limit of 50 hours/yr operation for maintenance and testing and other ATCM requirements.

The facility will be subject to the California Accidental Release regulations because the facility will inject a solution containing 19% ammonia into the selection catalytic reductions systems for NOx control. These regulations are contained in California Code of Regulations, title 19, section 2735, *et seq.*

The turbines will not be subject to the requirements in California Code of Regulations, title 20, sections 2900, *et seq.*, because they are not base-loaded turbines. The definition of "baseload generation" in Section 2901(b) states that " 'Baseload generation' means electricity generation from a powerplant that is designed and intended to provide electricity at an annualized plant capacity factor of at least 60 percent", which is equivalent to 5,256 hours/any consecutive 12 months. A permit condition limiting operation of any single turbine for more than 5,200 hours/any consecutive 12 months has been added to part 15a of the condition.

The facility will be subject to the mandatory greenhouse gas reporting requirements contained in Title 17, California Code of Regulations section 95100, *et seq.*, and is expected to comply with these requirements.

8.3 Federal Requirements

40 CFR Part 52.21, Prevention of Significant Deterioration of Air Quality

The facility will not be subject to these requirements because it will not be a "major stationary source" as defined in Section 52.21(b)(1)(i)(a). The facility would be a major stationary source for the purposes of this requirement if its potential to emit were over 250 tons per year of any regulated air pollutant.

On June 3, 2010, EPA promulgated the "Tailoring Rule," which contains amendments to 40 CFR Part 52.21. On July 1, 2011, greenhouse gases will become subject to regulation if a facility has the potential to emit more than 100,000 tons per year of carbon dioxide equivalents as defined by 40 CFR 52.21(b)(49)(i)-(v). MEP will emit more than the threshold, but will not be subject to 40 CFR 52.21 if construction commences before July 1, 2011.

40 CFR Part 60 Subpart KKKK

Subpart KKKK "Standards of Performance for Stationary Gas Turbines" applies to this facility. The gas turbines will comply with all applicable standards and limits required by these regulations. The applicable emission limitations are summarized below:

TABLE 37. NEW SOURCE PERFORMANCE STANDARDS FOR SIMPLE-CYCLE GAS TURBINES			
Source	**Requirement**	**Emission Limitation**	**Compliance Demonstration**
Gas Turbines	Subpart GG	Not Applicable	
	Subpart KKKK	1.2 lb NO_x/MW-hr, or 25 ppm NO_x as NO_2 @ 15%O_2; 0.9 lb SO_2/MW-hr, or 0.06 lb SO_2/MMbtu maximum No CO limit in Subpart KKKK No PM limit in Subpart KKKK	2.5 ppm NO_x as NO_2 @ 15%O_2 Permit Limit; 0.0028 lb/MMbtu of SO_2 Permit Limit

Section 60.4375 requires submittal of reports of excess emissions and monitoring of downtime for all periods of unit operation, including startup, shutdown, and malfunction. The applicant is expected to maintain adequate records for Subpart KKKK reporting requirements. The gas turbines will be equipped with continuous emissions monitors for NO_x. An annual NO_x emission test will not be required for Subpart KKKK as long as a compliant CEM is used to monitor emissions.

No sulfur content monitoring of the natural gas is required by Subpart KKKK if the facility demonstrates the fuel meets the sulfur content requirements contained in Section 60.4365 using the information required by Section 60.4365(a).

40 CFR Part 60, Subpart IIII

The fire pump engine is subject to the requirements of Subpart IIII, Standards of Performance for Stationary Compression Ignition Internal Combustion Engines. It is expected to comply because the engine family (9CEXL0409AAB) has been certified by CARB to meet the emission limits in Table 4 of the standard, which are:

- NMHC + NOx < 3 g/bhp-hr
- CO < 2.6 g/bhp-hr
- PM < 0.15 g/bhp-hr

40 CFR Part 63 Subpart YYYY

Subpart YYYY contains the National Emission Standards for Hazardous Air Pollutants (NESHAPS) for Stationary Combustion Turbines. This regulation does not apply to the Mariposa Energy Project because it will not emit more than 10 tons per year of a hazardous air pollutant (HAP) or more than 25 tons per year of a combination of hazardous air pollutants. Note that the Federal Clean Act does not define ammonia and sulfuric acid as HAPs.

The detail of the estimated HAP emissions is found in Section 4.3 of this FDOC.

40 CFR 64, Compliance Assurance Monitoring (CAM)
Requirements for enhanced monitoring may apply to facilities that are required to obtain Part 70 (Title V or Major Facility Review) permits. If applicable, the requirements would apply at the time of issuance of the Major Facility Review permit. Although these requirements would not apply at the completion of construction, it is prudent to determine at this time if they will apply so that it can be determined whether the monitoring strategy would comply with CAM.

In general, the requirement applies if an emission unit, as defined in Section 64.1, is subject to a federally-enforceable emission limit for a pollutant, has emissions of the pollutant that are greater than the major source thresholds (100 tpy of any regulated air pollutant or 10 tpy of a HAP) and the emissions of that pollutant are abated by a control device. There are several exemptions.

In this case, NOx and CO are controlled by SCR and a CO catalyst.

Monitoring for the NOx limits is exempt in accordance with 40 CFR 64.2(b)(iii) because the monitoring is subject to the Acid Rain monitoring requirements in 40 CFR 75.

Monitoring for the CO limits is required if the potential to emit of CO before control for any turbine is more than 100 tons/yr.

The potential to emit is calculated using the following parameters:
Hours of steady state operation: up to 5,200 hr/yr
CO concentrations at steady state operation depending on the ambient temperature:[25]

17F 53.2 ppmv CO before control
46F 20.9 ppmv CO before control
59F 15 ppmv CO before control
93F 7.6 ppmv CO before control

An average concentration of 24.2 ppmv CO before control will be assumed.

Fuel input: 481 MMbtu/hr
lb-mol CO = 28 lb CO
8710 scf flue gas/MMbtu @ 0% O2
30,668 scf flue gas/MMbtu @ 15% O2
385.3 dscf/lbmol
14.1 lb/startup
2.9 lb/shutdown
300 startups and shutdowns per year
Commissioning emissions: 0.18 tons CO/yr

(481 MMbtu/hr) (30,668 dscf/MMbtu) (lbmol/385.3 dscf) (24.2 ppm/10^6) (28 lb CO/lbmol)
= 25.9 lb CO/hr

[25] Check Table 1 for CO ppmv before control.

At 5,200 hr/yr:
= 67.34 tpy CO/turbine for steady state operations

Including startup, shutdown, and commissioning:
67.34 tpy + ((14.1 lb/event + 2.7 lb/event) x 300 events/yr) x (ton/2000 lb)
+ 0.18 tpy CO = 70.05 tpy CO before control

Because the CO emissions for each turbine will be less than 100 ton/year before control, the turbines are not subject to the requirements of 40 CFR 64.

40 CFR Part 68
This part regulates the unanticipated emission of an extremely hazardous substance into the ambient air from a stationary source. The ammonia used by Mariposa Energy Project is below the Federal thresholds, therefore the facility will not be subject to these requirements.

40 CFR Part 70, State Operating Permit Programs

These requirements are discussed in Section 8.2 under Regulation 2, Rule 6: Major Facility Review, which implements Part 70.

40 CFR Parts 72 Through 78, Acid Rain

The Mariposa gas turbine units 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. 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.

40 CFR Part 72, Subpart A - Acid Rain Program

Part 72, Subpart A, establishes general provisions and operating permit program requirements for sources and affected units under the Acid Rain program, pursuant to Title IV of the Clean Air Act. The gas turbines are affected units subject to the program in accordance with 40 CFR Part 72, Subpart A, Section 72.6(a).

40 CFR Part 72, Subpart C – Acid Rain Permit Applications

Part 72, Subpart C, requires that the applicant submit a complete Acid Rain Permit application 24 months prior to first firing of the gas turbines.

40 CFR Part 73 – Sulfur Dioxide Allowance System

Part 73 establishes the sulfur dioxide allowance system for tracking, holding, and transferring allowances. The applicant will be required to obtain sufficient SO2 allowances for each operating year on March 1st (or February 29th in a leap year) of the following year.

40 CFR Part 75 – Continuous Emission Monitoring

Part 75 contains the continuous emission monitoring requirements for units subject to the Acid Rain program. The applicant will be required to meet the Part 75 requirements for monitoring, recordkeeping and reporting of SO_2, NO_x, and CO_2 emissions.

40 CFR Part 98

This part establishes mandatory greenhouse gas (GHG) reporting requirements for owners and operators of certain facilities that directly emit GHG. The applicant will be required to meet Part 98 requirements for reporting recordkeeping and monitoring the CO_2 emissions year-round through 40 CFR Part 75.

8.4 **Greenhouse Gases**

Climate change poses a significant risk to the Bay Area with such impacts such as rising sea levels, reduced runoff from snow pack in the Sierra Nevada, increased air pollution, impacts to agriculture, increased energy consumption, and adverse changes to sensitive ecosystems. The generation of electricity from burning natural gas produces air emissions known as greenhouse gases (GHGs) in addition to the criteria air pollutants. GHGs are known to contribute to the warming of the earth’s atmosphere. These include primarily carbon dioxide, nitrous oxide (N_2O, not NO or NO_2, which are commonly known as NO_x or oxides of nitrogen), and methane (unburned natural gas). Also included are sulfur hexafluoride (SF6) from transformers, and hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) from refrigeration/chillers.

The California Global Warming Solutions Act of 2006 (AB32) requires the California Air Resources Board (ARB) to adopt a statewide GHG emissions limit equivalent to the statewide GHG emissions levels in 1990 to be achieved by 2020. To achieve this, ARB has a mandate to adopt rules and regulations to achieve the maximum technologically feasible and cost-effective GHG emission reductions.

The ARB is expected to adopt early action GHG reduction measures in the near future to reduce greenhouse gas emissions by 2020. ARB has adopted regulations requiring mandatory GHG emissions reporting. The facility is expected to report all GHG emissions to meet ARB requirements.

The facility will also be required to report GHG emissions to CARB, the District, and US EPA. In 2008, the District placed a fee on GHG emissions from large stationary sources of GHGs.

The GHG emissions estimates for Mariposa Energy Project are shown below.

Mariposa Energy Project has the potential to emit 430,240 metric tons/year of CO_2 equivalents using the ARB Mandatory Reporting Rule calculation methodology.

The Mariposa simple-cycle gas turbines will have a gross electrical efficiency of 40% at 59ºF and a relative humidity of 60% (Efficiency estimate provided by Applicant).

The Mariposa simple-cycle gas turbines will have a heat rate of 8591 (LHV) Btu/Kw-hr at 59ºF and a relative humidity of 60%.

The EPA Administrator has recently stated that by April of 2010, the Administrator will take actions to ensure that no stationary sources will be required to get a Clean Air Act permit to cover GHG emissions in calendar year 2010.[26] In addition, in the first half of 2011, only sources required by non-GHG emissions to obtain a permit under the Clean Air Act will need to address their GHG emission in their permit applications. Therefore, the Mariposa Energy Project is not required to address GHG emissions under the Clean Air Act at this time.

The California Energy Commission (CEC) is the primary permitting authority for new power plants in California. The California Legislature has granted the Energy Commission exclusive licensing authority for all thermal power plants in California of 50 megawatts or more. (See Warren-Alquist State Energy Resources Conservation and Development Act, Cal. Public Resources Code §§ 25000 et seq.) As the lead permitting agency, the CEC conducts an in-depth review of environmental and other issues posed by the proposed power plant. This comprehensive environmental review is the equivalent of the review required for major projects under the California Environmental Quality Act (CEQA), and the Energy Commission's license satisfies the requirements of CEQA for these projects. This CEQA-equivalent review encompasses air quality issues within the purview of the Air District, and also includes all other types of environmental and other issues, including water quality issues, endangered species issues, land use issues and Green House Gas issues, among others.

As the lead agency under the CEQA-equivalent process, the CEC will be required to quantify and assess GHG emissions from the Mariposa Energy Project to evaluate the facility's compliance with applicable laws, ordinances, regulations and standards, and the potential impacts and benefits associated with adding Mariposa Energy Project to the electricity system.

The GHG emissions estimates for the Mariposa Energy Project are shown below.

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[26] Letter dated February 22, 2010 from Lisa Jackson to Senator Rockefeller, Letter summarizing EPA proposals on regulating green house gases

TABLE 38. ESTIMATED ANNUAL GHG EMISSIONS FROM MEP

	Fuel Usage, MMbtu/yr	Emission Factor, (kg CO2/MMbtu)	Emission Factor, (g CH4/MMbtu)	Emission Factor, (g N2O/MMbtu)	GHG (metric tons/yr)	Global Warming Potential	CO2 Equivalents (Metric tons/yr)
GHG							
Gas Turbines							
CO2	8,128,900	52.87			429775	1	429775
CH4	8,128,900		0.9		7	21	154
N2O	8,128,900			0.1	1	310	252
Engine	Fuel Usage, gal/yr, @ 500 hr/yr	Emission Factor, (kg CO2/gal)					
CO2	5,650	10.14			57	1	57
CH4	5,650		3		0.02	21	0
N2O	5,650			0.6	0.0000	310	1
Circuit Breakers							
SF6					0.001160	23,900	28
Total							430267

Note:
Emission Factors from the REGULATION FOR THE MANDATORY REPORTING OF GREENHOUSE GAS EMISSIONS, Appendix A, Title 17, California Code of Regulations, Subchapter 10, Article 2, Sections 95100 to 95133

CO2 Emission Factor from Table 4 Appendix A-6 for Natural Gas with a heat content between 1000 Btu/scf and 1025 Btu/scf
CH4 Emission Factor from Table 6 Appendix A-9
N2O Emission Factor from Table 6 Appendix A-9
Global Warming Potentials from Table 2 Appendix A-4
Applicant estimates SF6 emissions for 1 circuit breaker at 0.15 lb/yr per unit (based on 0.1% leak rate for 150 lb SF6 per unit)

8.5 Environmental Justice

The District is committed to implementing its permit programs in a manner that is fair and equitable to all Bay Area residents regardless of age, culture, ethnicity, gender, race, socioeconomic status, or geographic location in order to protect against the health effects of air pollution. The District has worked to fulfill this commitment in the current permitting action.

The emissions from the proposed project will not cause or contribute to any significant public health impacts in the community. As described in detail above, the District has undertaken a detailed review of the potential public health impacts of the emissions authorized under the proposed permitting action, and has found that they will involve no significant public health risks. The District has found that the maximum lifetime cancer risk associated with the facility is 1.3 in one million, and that the maximum chronic Hazard Index would be 0.015 and the maximum acute Hazard Index would be 0.026. These risk levels are far below what the District, EPA, or any other public health agency considers to be significant. The District anticipates that there will be no significant impacts due to air emissions related to the Mariposa project after all of the mitigations required by District Rules and the California Energy Commission are implemented. District Rules require offsets for NO_x emissions from this facility. The CEC will require numerous mitigation measures as part of the CEC licensing proceeding for the facility. The District does not anticipate an adverse impact on any community due to air emissions from the Mariposa project and therefore there is no disparate adverse impact on any Environmental Justice community located near the facility.

9 Permit Conditions

The District is proposing the following permit conditions to ensure that the project complies with all applicable District, state, and federal Regulations. The proposed conditions would limit operational parameters such as fuel use, stack gas emission concentrations, and mass emission rates. The permit conditions specify abatement device operation and performance levels. To aid enforcement efforts, conditions specifying emission monitoring, source testing, and record keeping requirements are included. Furthermore, pollutant mass emission limits (in units of lb/hr) will insure that daily and annual emission rate limitations are not exceeded.

To provide maximum operational flexibility, no limitations are being proposed on the type or quantity of gas turbine start-ups or shutdowns. Instead, the facility would be required to comply with daily and annual (consecutive twelve-month) mass emission limits at all times. Compliance with CO and NO_x limitations would be verified by continuous emission monitors (CEMs) that will be in operation during all turbine operating modes, including start-up, shutdown, commissioning, and transient conditions. Compliance with POC, SO_2, and PM_{10} mass emission limits would be verified by annual source testing.

In addition to permit conditions that apply to steady-state operation of each gas turbine power train, the District is proposing conditions that govern equipment operation during the initial commissioning period when the gas turbine power trains will operate without their SCR systems and/or oxidation catalysts in place. Commissioning activities include, but are not limited to, the testing of the gas turbines, and adjustment of control systems. Parts 1 through 10 of the proposed permit conditions for the simple-cycle gas turbines apply to this commissioning period and are intended to minimize emissions during the commissioning period.

Following are the proposed Mariposa Energy Project combustion equipment and the abatement devices regulated by the District.

Proposed Mariposa Energy Project Combustion Equipment and Abatement Devices

S-1 Combustion Turbine Generator (CTG) #1, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-1 Oxidation Catalyst and A-2 Selective Catalytic Reduction System (SCR).

S-2 Combustion Turbine Generator (CTG) #2, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-3 Oxidation Catalyst and A-4 Selective Catalytic Reduction System (SCR).

S-3 Combustion Turbine Generator (CTG) #3, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-5 Oxidation Catalyst and A-6 Selective Catalytic Reduction System (SCR).

S-4 Combustion Turbine Generator (CTG) #4, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-7 Oxidation Catalyst and A-8 Selective Catalytic Reduction System (SCR).

S-5 Diesel Fire Pump: Make: Cummins; Model: CFP7E-F40; Model Year: TBD (2009 or later); Rated bhp: 220

Proposed Mariposa Energy Project Permit Conditions

Definitions:

Hour:	Any continuous 60-minute period
Clock Hour:	Any continuous 60-minute period beginning on the hour
Calendar Day:	Any continuous 24-hour period beginning at 12:00 AM or 0000 hours
Year:	Any consecutive twelve-month period of time
Rolling 3-hour period:	Any consecutive three hour period, not including start-up or shutdown periods
Rolling 3-hour period for CO:	Any consecutive three-hour period, not including commissioning, start-up or shutdown periods. Rolling 3-hour periods shall be calculated for normal steady state operation. The minutes shall be summed across normal operating periods and days until 180 minutes have accrued. Compliance with the CO limit shall be based on this 3-hour period. After each 3-hour period has elapsed, a new 3-hour period begins every 60 minutes after the beginning of the previous 3-hour period.
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 minutes
MMbtu:	million British thermal units
Gas Turbine Start-up Mode:	The lesser of the first 30 minutes of continuous fuel flow to the Turbine after fuel flow is initiated or the period of time from Gas Turbine fuel flow initiation until the Gas Turbine achieves two consecutive CEM data points in compliance with the emission concentration limits of conditions 17(b) and 17(d).
Gas Turbine Shutdown Mode:	The lesser of the 15 minute period immediately prior to the termination of fuel flow to the Gas Turbine or the period of time from non-compliance with any requirement listed in Conditions 17(b) and 17(d) until termination of fuel flow to the Gas Turbine

Gas Turbine Combustor Specified PAHs:	The polycyclic aromatic hydrocarbons listed below shall be considered to be Specified PAHs for these permit conditions. Any emission limits for Specified PAHs refer to the sum of the emissions for all six of the following compounds Benzo[a]anthracene Benzo[b]fluoranthene Benzo[k]fluoranthene Benzo[a]pyrene Dibenzo[a,h]anthracene Indeno[1,2,3-cd]pyrene
Corrected Concentration:	The concentration of any pollutant (generally NO_x, CO, or NH_3) corrected to a standard stack gas oxygen concentration. For emission points P-1 (exhaust of S-1 Gas Turbine), P-2 (exhaust of S-2 Gas Turbine) P-3 (exhaust of S-3 Gas Turbine), P-4 (exhaust of S-4 Gas Turbine), the standard stack gas oxygen concentration is 15% O_2 by volume on a dry basis
Commissioning Activities:	All testing, adjustment, initial tuning, and calibration activities recommended by the equipment manufacturers and the MEP construction contractor to insure safe and reliable steady-state operation of the gas turbines, and associated electrical delivery systems during the commissioning period
Commissioning Period:	For each turbine, the period shall commence when all mechanical, electrical, and control systems are installed and individual system start-up has been completed, or when the gas turbine is first fired, whichever occurs first. The period shall terminate when the plant has completed performance testing for the turbine, the turbine is available for commercial operation, and the owner/operator has initiated sales to the power exchange from that turbine.
Precursor Organic Compounds (POCs):	Any compound of carbon, excluding methane, ethane, carbon monoxide, carbon dioxide, carbonic acid, metallic carbides or carbonates, and ammonium carbonate
CEC CPM:	California Energy Commission Compliance Program Manager
MEP:	Mariposa Energy Project
Total Particulate Matter:	The sum of all filterable and all condensable particulate matter.

Applicability:

Parts 1 through 10 of this condition shall only apply during the commissioning period as defined above. Unless otherwise indicated, Parts 11 through 38 of this condition shall apply after the commissioning period has ended.

Conditions for the Commissioning Period for GE LM 6000 PC Sprint Gas Turbines

1. The owner/operator of the MEP shall minimize emissions of carbon monoxide and nitrogen oxides from S-1, S-2, S-3 and S-4 Gas Turbines to the maximum extent possible during the commissioning period. (Basis: BACT, Regulation 2, Rule 2, Section 409)

2. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator shall tune the S-1, S-2, S-3 and S-4 Gas Turbines combustors to minimize the emissions of carbon monoxide and nitrogen oxides. (Basis: BACT, Regulation 2, Rule 2, Section 409)

3. At the earliest feasible opportunity in accordance with the recommendations of the equipment manufacturers and the construction contractor, the owner/operator shall install, adjust, and operate the A-1, A-3, A-5 and A-7 Oxidation Catalysts and A-2, A-4, A-6 and A-8 SCR Systems to minimize the emissions of carbon monoxide and nitrogen oxides from S-1, S-2, S-3, and S-4 Gas Turbines. (Basis: BACT, Regulation 2, Rule 2, Section 409)

4. The owner/operator of the MEP shall submit a plan to the District Engineering Division and the CEC CPM at least four weeks prior to first firing of S-1, S-2, S-3, and S-4 Gas Turbines describing the procedures to be followed during the commissioning of the gas 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 initial tuning of the combustors, 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 Gas Turbines (S-1, S-2, S-3 & S-4) without abatement by their respective oxidation catalysts and/or SCR Systems. The owner/operator shall not fire any of the Gas Turbines (S-1, S-2, S-3 or S-4) sooner than 28 days after the District receives the commissioning plan. (Basis: Regulation 2, Rule 2, Section 419)

5. During the commissioning period, the owner/operator of the MEP shall demonstrate compliance with Parts 7, 8, 9, and 10 through the use of properly operated and maintained continuous emission monitors and data recorders for the following parameters and emission concentrations:
   - 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 Gas Turbines (S-1, S-2, S-3, and S-4). 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 clock hour and each calendar day. The owner/operator shall retain records on site for at least 5 years from the date of entry and make such records available to District personnel upon request. (Basis: Regulation 2, Rule 2, Section 419)

6. The owner/operator shall install, calibrate, and operate the District-approved continuous monitors specified in Part 5 prior to first firing of the Gas Turbines (S-1, S-2, S-3 and S-4). After first firing of the turbines, the owner/operator shall adjust the detection range of these continuous emission monitors as necessary to accurately measure the resulting range of CO and NOx emission concentrations. The instruments shall operate at all times of operation of S-1, S-2, S-3, and S-4 including start-up, shutdown, upset, and malfunction, except as allowed by BAAQMD Regulation 1-522, BAAQMD Manual of Procedures, Volume V. If necessary to comply with this requirement, the owner/operator shall install dual-span monitors. The type, specifications, and location of these monitors shall be subject to District review and approval. (Basis: Regulation 2, Rule 2, Section 419)

7. The owner/operator shall not fire S-1, S-2, S-3, or S-4 Gas Turbine without abatement of nitrogen oxide emissions by the corresponding SCR System A-2, A-4, A-6, or A-8 and/or abatement of carbon monoxide emissions by the corresponding Oxidation Catalyst A-1, A-3, A-5, or A-7 for more than 200 hours each during the commissioning period. Such operation of any Gas Turbine (S-1, S-2, S-3, S-4) without abatement shall be limited to discrete commissioning activities that can only be properly executed without the SCR system and/or oxidation catalyst in place. Upon completion of these activities, the owner/operator shall provide written notice to the District Engineering and Enforcement Divisions and the unused balance of the 200 firing hours for each turbine without abatement shall expire. (Basis: BACT, Regulation 2, Rule 2, Section 409)

8. The total mass emissions of nitrogen oxides, carbon monoxide, precursor organic compounds, PM_{10}, and sulfur dioxide that are emitted by the Gas Turbines (S-1, S-2, S-3, and S-4) during the commissioning period shall accrue towards the consecutive twelve-month emission limitations specified in Part 20. (Basis: Regulation 2, Rule 2, Section 409)

9. The owner/ operator shall not operate the Gas Turbines (S-1, S-2, S-3, and S-4) in a manner such that the combined pollutant emissions from the gas turbines will exceed the following limits during the commissioning period. These emission limits shall include emissions resulting from the start-up and shutdown of the Gas Turbines (S-1, S-2, S-3, S-4). In addition, commissioning activities will be conducted on no more than one turbine/day. (Basis: BACT, Regulation 2, Rule 2, Section 409)

   NO_x (as NO_2): 16.3 tons per year

CO:	8.7 tons per year
POC (as CH_4):	1.0 ton per year
PM_{10}:	1.0 ton per year
SO_2:	0.54 ton per year

9a. The owner/ operator shall not operate the Gas Turbines (S-1, S-2, S-3, and S-4) in a manner such that the pollutant emissions from each gas turbine will exceed the following limits during the commissioning period. These emission limits shall include emissions resulting from the start-up and shutdown of the Gas Turbines (S-1, S-2, S-3, S-4). In addition, commissioning activities will be conducted on no more than one turbine/day. (Basis: BACT, Regulation 2, Rule 2, Section 409)

NO_x (as NO_2):	408 pounds per calendar day
	51 pounds per hour
CO:	360 pounds per calendar day
	45 pounds per hour
POC (as CH_4):	36 pounds per calendar day
PM_{10}:	20 pounds per calendar day
SO_2:	10.8 pounds per calendar day

10. Within 90 days after start-up of each turbine, the owner/operator shall conduct District and CEC approved source tests on that turbine to determine compliance with the emission limitations specified in Part 17 on that turbine. The source tests 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 working days before the execution of the source tests, the owner/operator shall submit to the District and the CEC Compliance Program Manager (CPM) a detailed source test plan designed to satisfy the requirements of this Part. The District and the CEC CPM will notify the owner/operator 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 and CEC CPM comments into the test plan. The owner/operator shall notify the District and the CEC CPM within seven (7) working days prior to the planned source testing date. The owner/operator shall submit the source test results for each turbine to the District and the CEC CPM within 60 days of the source testing date of that turbine. (Basis: Regulation 2, Rule 2, Section 419)

Conditions for the GE LM 6000 PC Sprint Simple-Cycle Gas Turbines (S-1, S-2, S-3, and S-4)

11. The owner/operator shall fire the Gas Turbines (S-1, S-2, S-3, and S-4) exclusively on PUC-regulated natural gas with a maximum sulfur content of 1 grain per 100 standard cubic feet. To demonstrate compliance with this limit, the operator of S-1, S-2, S-3 and S-4 shall sample and analyze the gas from each supply source at least monthly to determine the sulfur content of the gas. PG&E monthly sulfur data may be used provided

that such data can be demonstrated to be representative of the gas delivered to the MEP. (Basis: BACT for SO2 and PM10)

12. The owner/operator shall not operate the units such that the heat input rate to each Gas Turbine (S-1, S-2, S-3, and S-4) exceeds 481 MMbtu (HHV) per hour. (Basis: 2-2-409)

13. The owner/operator shall not operate the units such that the heat input rate to each Gas Turbine (S-1, S-2, S-3, and S-4) exceeds 11,544 MMbtu (HHV) per day. (Basis: 2-2-409, Cumulative Increase for PM_{10})

14. The owner/operator shall not operate the units such that the combined cumulative heat input rate for the Gas Turbines (S-1, S-2, S-3, and S-4) exceeds 8,128,900 MMbtu (HHV) per year. (Basis: 2-2-409, Offsets)

15a. The owner operator shall not operate any turbine S-1, S-2, S-3, or S-4 such that the hours of operation for any of the four units exceeds 5,200 hours per year. (Basis: 2-2-409)

15b. The owner operator shall not operate the turbines S-1, S-2, S-3, or S-4 such that the hours of operation for the four units combined exceeds 16,900 hours per year. (Basis: Offsets, Cumulative Increase)

16. The owner/operator shall ensure that each Gas Turbine (S-1, S-2, S-3, S-4) is abated by the properly operated and properly maintained Selective Catalytic Reduction (SCR) System A-2, A-4, A-6 or A-8 and Oxidation Catalyst System A-1, A-3, A-5, or A-7 whenever fuel is combusted at those sources and the corresponding SCR catalyst bed (A-2, A-4, A-6 or A-8) has reached minimum operating temperature. (Basis: BACT for NO_x, POC and CO)

17. The owner/operator shall ensure that the Gas Turbines (S-1, S-2, S-3, S-4) comply with requirements (a) through (i). Requirements (a) through (f) do not apply during a gas turbine start-up, and shutdown. (Basis: BACT and Regulation 2, Rule 5)
    a) Nitrogen oxide mass emissions (calculated as NO_2) at each exhaust point P-1, P-2, P-3, and P-4 (exhaust point for S-1, S-2, S-3 and S-4 Gas Turbine after abatement by A-2, A-4, A-6 and A-8 SCR System) shall not exceed 4.4 pounds per hour. (Basis: BACT for NO_x).
    b) The nitrogen oxide emission concentration at each exhaust point P-1, P-2, P-3 and P-4 shall not exceed 2.5 ppmv, on a dry basis, corrected to 15% O_2, averaged over any 1-hour period. (Basis: BACT for NO_x)
    c) Carbon monoxide mass emissions at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 2.14 pounds per hour. (Basis: BACT for CO)
    d) The carbon monoxide emission concentration at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 2.0 ppmv, on a dry basis, corrected to 15% O_2 averaged over any rolling 3-hour period. (Basis: BACT for CO)
    e) Ammonia (NH_3) emission concentrations at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 5 ppmv, on a dry basis, corrected to 15% O_2, averaged over

any rolling 3-hour period. This ammonia emission concentration shall be verified by the continuous recording of the ammonia injection rate to each SCR System A-2, A-4, A-6, and A-8. The correlation between the gas turbine heat input rates, A-2, A-4, A-6, and A-8 SCR System ammonia injection rates, and corresponding ammonia emission concentration at emission points P-1, P-2, P-3 and P-4 shall be determined in accordance with Part 25 or a District approved alternative method. (Basis: Regulation 2, Rule 5)

f) Precursor organic compound (POC) mass emissions (as CH_4) at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 0.61 pounds per hour. (Basis: BACT for POC)

g) Sulfur dioxide (SO_2) mass emissions at each exhaust point P-1, P-2, P-3, and P-4 shall not exceed 1.35 pounds per hour. (Basis: BACT for SO_2)

(Basis: Regulation 2, Rule 2, Section 419)

18. The owner/operator shall ensure that the regulated air pollutant mass emission rates from each of the Gas Turbines (S-1, S-2, S-3, and S-4) during a start-up or shutdown does not exceed the limits established below. Startups shall not exceed 30 minutes. Shutdowns shall not exceed 15 minutes. (Basis: BACT Limit for startup and shutdown operation)

TABLE 39. STARTUP AND SHUTDOWN

Pollutant	**Maximum Emissions Per Startup (lb/startup)**	**Maximum Emissions During Hour with Startup and/or Shutdown(lb/hr)**	**Maximum Emissions Per Shutdown (lb/shutdown)**
NO_x (as NO_2)	14.2	18.5	3.2
CO	14.1	17.3	2.7
POC (as CH_4)	1.1	1.4	0.12

19. The owner/operator shall not allow total combined emissions from the Gas Turbines (S-1, S-2, S-3, and S-4), including emissions generated during gas turbine start-ups, and shutdowns to exceed the following limits during any calendar day:
    (a) 1100 pounds of NO_x (as NO_2) per day (Basis: Cumulative Increase)
    (b) 934 pounds of CO per day (Basis: Cumulative Increase)
    (c) 95 pounds of POC (as CH_4) per day (Basis: Cumulative Increase)
    (d) 130 pounds of SO_2 per day (Basis: Cumulative Increase)

20. The owner/operator shall not allow cumulative combined emissions from the Gas Turbines (S-1, S-2, S-3, and S-4), including emissions generated during gas turbine start-ups, shutdowns, and malfunctions to exceed the following limits during any consecutive twelve-month period:
    (a) 45.6 tons of NO_x (as NO_2) per year (Basis: Offsets)
    (b) 27.2 tons of CO per year (Basis: Cumulative Increase)

(c) 5.6 tons of POC (as CH_4) per year (Basis: Cumulative Increase)
(d) 18.6 tons of PM_{10} per year (Basis: Cumulative Increase)
(e) 2.9 tons of SO_2 per year (Basis: Cumulative Increase)

Emissions of PM_{10} from each gas turbine shall be calculated by multiplying turbine fuel usage times an emission factor determined by source testing of the turbine conducted in accordance with Part 26. The emission factor for each turbine shall be based on the average of the emissions rates observed during the 4 most recent source tests on that turbine (or, prior to the completion of 4 source tests on a turbine, on the average of the emission rates observed during all source tests on the turbine).

21. The owner/operator shall not allow the maximum projected annual toxic air contaminant emissions (per Part 26) from the Gas Turbines (S-1, S-2, S-3, S-4) combined to exceed the following limits:

formaldehyde	3725.26 pounds per year
benzene	107.94 pounds per year
Specified polycyclic aromatic hydrocarbons (PAHs)	1.063 pounds per year

unless the following requirement is satisfied:

The owner/operator shall perform a health risk assessment to determine the total facility risk using the emission rates determined by source testing and the most current Bay Area Air Quality Management District approved procedures and unit risk factors in effect at the time of the analysis. The owner/operator shall submit the risk analysis to the District and the CEC CPM within 60 days of the source test date. The owner/operator may request that the District and the CEC CPM revise the carcinogenic compound emission limits specified above. If the owner/operator demonstrates to the satisfaction of the APCO that these revised emission limits will not result in a significant cancer risk, the District and the CEC CPM may, at their discretion, adjust the carcinogenic compound emission limits listed above. (Basis: Regulation 2, Rule 5)

22. The owner/operator shall demonstrate compliance with Parts 12 through 15, 17(a) through 17(e), 18 (NO_x and CO limits), 19(a), 19(b), 20(a) and 20(b) by using properly operated and maintained continuous monitors (during all hours of operation including gas turbine start-up, and shutdown periods). The owner/operator shall monitor for all of the following parameters:
(a) Firing Hours and Fuel Flow Rates for each of the following sources: S-1, S-2, S-3, and S-4
(b) Oxygen (O_2) concentration, Nitrogen Oxides (NO_x) concentration, and carbon monoxide (CO) concentration at exhaust points P-1, P-2, P-3 and P-4.
(c) Ammonia injection rate at A-2, A-4, A-6 and A-8 SCR Systems

The owner/operator shall record all of the above parameters at least every 15 minutes (excluding normal calibration periods) and shall summarize all of the above parameters for each clock hour. For each calendar day, the owner/operator shall calculate and record

the total firing hours, the average hourly fuel flow rates, and pollutant emission concentrations.
The owner/operator shall use the parameters measured above and District-approved calculation methods to calculate the following parameters:
(d) Heat Input Rate for each of the following sources: S-1, S-2, S-3, and S-4
(e) Corrected NO_x concentration, NO_x mass emission rate (as NO_2), corrected CO concentration, and CO mass emission rate at each of the following exhaust points: P-1, P-2, P-3 and P-4.

For each source and exhaust point, the owner/operator shall record the parameters specified in Parts 22(d) and 22(e) at least once every 15 minutes (excluding normal calibration periods). As specified below, the owner/operator shall calculate and record the following data:
(f) total heat input rate for every clock hour and the average hourly heat input rate for every rolling 3-hour period.
(g) on an hourly basis, the cumulative total heat input rate for each calendar day for the following: each Gas Turbine and for S-1, S-2, S-3 and S-4 combined.
(h) the average NO_x mass emission rate (as NO_2), CO mass emission rate, and corrected NO_x and CO emission concentrations for every clock hour.
(i) on an hourly basis, the cumulative total NO_x mass emissions (as NO_2) and the cumulative total CO mass emissions, for each calendar day for the following: each Gas Turbine and for S-1, S-2, S-3 and S-4 combined.
(j) For each calendar day, the average hourly heat input rates, corrected NO_x emission concentration, NO_x mass emission rate (as NO_2), corrected CO emission concentration, and CO mass emission rate for each gas turbine.
(k) on a monthly basis, the cumulative total NO_x mass emissions (as NO_2) and cumulative total CO mass emissions, for the previous consecutive twelve-month period for sources S-1, S-2, S-3, and S-4 combined. (Basis: 1-520.1, 9-9-501, BACT, Offsets, NSPS, Cumulative Increase)

23. To demonstrate compliance with Parts 17(f), 17(g), , 19(c), 19(d), 20(c), 20(d), 20(e), the owner/operator shall calculate and record on a daily basis, the precursor organic compound (POC) mass emissions, fine particulate matter (PM_{10}) mass emissions (including condensable particulate matter), and sulfur dioxide (SO_2) mass emissions from each power train. The owner/operator shall use the actual heat input rates measured pursuant to Part 22, actual gas turbine start-up times, actual gas turbine shutdown times, and CEC and District-approved emission factors developed pursuant to source testing under Part 26 to calculate these emissions. The owner/operator shall present the calculated emissions in the following format:
(a) For each calendar day, POC, PM_{10}, and SO_2 emissions, summarized for each power train (gas turbine) and S-1, S-2, S-3, and S-4 combined
(b) on a monthly basis, the cumulative total POC, PM_{10}, and SO_2 mass emissions, for each year for S-1, S-2, S-3, and S-4 combined.
(Basis: Offsets, Cumulative Increase)

24. To demonstrate compliance with Part 21, the owner/operator shall calculate and record on an annual basis the maximum projected annual emissions of: formaldehyde, benzene, and specified PAH's. The owner/operator shall calculate the maximum projected annual emissions using the maximum annual heat input rate of 8,128,900 MMbtu/year for S-1, S-2, S-3, and S-4 combined and the highest emission factor (pounds of pollutant per MMbtu of heat input) determined by the most recent of any source test of the S-1, S-2, S-3, or S-4 Gas Turbines. If the highest emission factor for a given pollutant occurs during minimum-load turbine operation, a reduced annual heat input rate may be utilized to calculate the maximum projected annual emissions to reflect the reduced heat input rates during gas turbine start-up and minimum-load operation. The reduced annual heat input rate shall be subject to District review and approval. (Basis: Regulation 2, Rule 5)

25. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint units, the owner/operator shall conduct a District-approved source test on exhaust point P-1, P-2, P-3, or P-4 to determine the corrected ammonia (NH_3) emission concentration to determine compliance with Part 17(e). The source test shall determine the correlation between the heat input rates of the gas turbine, A-2, A-4, A-6, or A-8 SCR System ammonia injection rate, and the corresponding NH_3 emission concentration at emission point P-1, P-2, P-3, or P-4. The source test shall be conducted over the expected operating range of the turbine (including, but not limited to, minimum and full load modes) to establish the range of ammonia injection rates necessary to achieve NO_x emission reductions while maintaining ammonia slip levels. The owner/operator shall repeat the source testing on an annual basis thereafter. Ongoing compliance with Part 17(e) shall be demonstrated through calculations of corrected ammonia concentrations based upon the source test correlation and continuous records of ammonia injection rate. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: Regulation 2, Rule 5)

26. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint units and on an annual basis thereafter, the owner/operator shall conduct a District-approved source test on exhaust points P-1, P-2, P-3 and P-4 while each Gas Turbine is operating at maximum load to determine compliance with Parts 17(a), 17(b), 17(c), 17(d), 17(f), 17(g), and to determine a total particulate matter including condensable particulate matter emission factor, and while each Gas Turbine is operating at minimum load to determine compliance with Parts 17(c), and 17(d) and to verify the accuracy of the continuous emission monitors required in Part 22. The owner/operator shall test for (as a minimum): water content, stack gas flow rate, oxygen concentration, precursor organic compound concentration and mass emissions, nitrogen oxide concentration and mass emissions (as NO_2), carbon monoxide concentration and mass emissions, sulfur dioxide concentration and mass emissions, methane, ethane, and total particulate matter emissions including condensable particulate matter. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. The owner/operator may conduct up to four tests per year for total particulate matter including condensable particulate matter. (Basis: BACT, Offsets)

27. The owner/operator shall obtain approval for all source test procedures from the District's Source Test Section and the CEC CPM prior to conducting any tests. The

owner/operator shall comply with all applicable testing requirements for continuous emission monitors as specified in Volume V of the District's Manual of Procedures. The owner/operator shall notify the District's Source Test Section and the CEC CPM in writing of the source test protocols and projected test dates at least 7 days prior to the testing date(s). As indicated above, the owner/operator shall measure the contribution of condensable PM (back half) to any measurement of the total particulate matter or PM_{10} emissions. However, the owner/operator may propose alternative measuring techniques to measure condensable PM such as the use of a dilution tunnel or other appropriate method used to capture semi-volatile organic compounds. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: BACT, Regulation 2, Rule 2, Section 419)

28. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint gas turbines and on a biennial basis (once every two years) thereafter, the owner/operator shall conduct a District-approved source test on one of the following exhaust points P-1, P-2, P-3 or P-4 while the Gas Turbine is operating at maximum allowable operating rates to demonstrate compliance with Part 21. The owner/operator shall also test the gas turbine while it is operating at minimum load. If three consecutive biennial source tests demonstrate that the annual emission rates calculated pursuant to Part 24 for any of the compounds listed below are less than the BAAQMD trigger levels, pursuant to Regulation 2, Rule 5, shown, then the owner/operator may discontinue future testing for that pollutant:

Benzene	≤	3.8 pounds/year and 2.9 pounds/hour
Formaldehyde	<	18 pounds/year and 0.12 pounds/hour
Specified PAHs	≤	0.0069 pounds/year

(Basis: Regulation 2, Rule 5)

29. The owner/operator shall calculate the sulfuric acid mist (SAM) emission rate using the total heat input for the sources and the highest results of any source testing conducted pursuant to Part 30. If this SAM mass emission limit of Part 31 is exceeded, the owner/operator must utilize air dispersion modeling to determine the impact (in micrograms/cubic meter) of the sulfuric acid mist emissions pursuant to Regulation 2, Rule 2, Section 306. (Basis: Regulation 2, Rule 2, Section 306)

30. Within 90 days of start-up of each of the MEP GE LM-6000 PC Sprint gas turbines and on an annual basis thereafter, the owner/operator shall conduct a District-approved source test on two of the four exhaust points P-1, P-2, P-3 and P-4 while each gas turbine is operating at maximum heat input rates to demonstrate compliance with the SAM emission rates specified in Part 31. The owner/operator shall test for (as a minimum) SO_2, SO_3, and H_2SO_4. The owner/operator shall submit the source test results to the District and the CEC CPM within 60 days of conducting the tests. (Basis: Regulation 2, Rule 2, Section 306, and Regulation 2, Rule 2, Section 419)

31. The owner/operator shall not allow sulfuric acid emissions (SAM) from stacks P-1, P-2, P-3, P-4 combined to exceed 7 tons in any consecutive 12 month period. (Basis: Regulation 2, Rule 2, Section 306, and Regulation 2, Rule 2, Section 419)

32. The owner/operator shall ensure that the stack heights of emission points P-1, P-2, P-3 and P-4 are each at least 79.5 feet above grade level at the stack base. (Basis: Regulation 2, Rule 5)

33. The owner/operator of the MEP shall submit all reports to the District (including, but not limited to monthly CEM reports, monitor breakdown reports, emission excess reports, equipment breakdown reports, etc.) as required by District Rules or Regulations and in accordance with all procedures and time limits specified in the Rule, Regulation, Manual of Procedures, or Enforcement Division Policies & Procedures Manual. (Basis: Regulation 2, Rule 1, Section 403)

34. The owner/operator of the MEP shall maintain all records and reports on site for a minimum of 5 years. These records shall include but are not limited to: continuous monitoring records (firing hours, fuel flows, emission rates, monitor excesses, breakdowns, etc.), source test and analytical records, natural gas sulfur content analysis results, emission calculation records, records of plant upsets and related incidents. The owner/operator shall make all records and reports available to District and the CEC CPM staff upon request. (Basis: Regulation 2, Rule 1, Section 403, Regulation 2, Rule 6, Section 501)

35. The owner/operator of the MEP shall notify the District and the CEC CPM of any violations of these permit conditions. Notification shall be submitted in a timely manner, in accordance with all applicable District Rules, Regulations, and the Manual of Procedures. Notwithstanding the notification and reporting requirements given in any District Rule, Regulation, or the Manual of Procedures, the owner/operator shall submit written notification (facsimile is acceptable) to the Enforcement Division within 96 hours of the violation of any permit condition. (Basis: Regulation 2, Rule 1, Section 403)

36. The owner/operator of MEP shall provide adequate stack sampling ports and platforms to enable the performance of source testing. The location and configuration of the stack sampling ports shall comply with the District Manual of Procedures, Volume IV, Source Test Policy and Procedures, and shall be subject to BAAQMD review and approval, except that the facility shall provide four sampling ports that are at least 6 inches in diameter in the same plane of each gas turbine stack (P-1, P-2, P-3, P-4). (Basis: Regulation 1, Section 501)

37. Within 180 days of the issuance of the Authority to Construct for the MEP, the owner/operator shall contact the BAAQMD Technical Services Division regarding requirements for the continuous emission monitors, sampling ports, platforms, and source tests required by Parts 10, 25, 26, 28 and 30. The owner/operator shall conduct all source testing and monitoring in accordance with the District approved procedures. (Basis: Regulation 1, Section 501)

38. The owner/operator shall ensure that the MEP complies with the requirement to hold SO2 allowances in 40 CFR 72.9(c)(1) and the continuous emission monitoring requirements of 40 CFR Part 75. (Basis: Regulation 2, Rule 7)

Condition 22850
For S-5, Diesel Fire Pump

1. The owner/operator shall not exceed 50 hours per year per engine for reliability-related testing. [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]

2. The owner/operator shall operate each emergency standby engine only for the following purposes: to mitigate emergency conditions, for emission testing to demonstrate compliance with a District, State or Federal emission limit, or for reliability-related activities (maintenance and other testing, but excluding emission testing). Operating while mitigating emergency conditions or while emission testing to show compliance with District, State or Federal emission limits is not limited.
[Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(3) or (e)(2)(B)(3)]

3. The owner/operator shall operate each emergency standby engine only when a non-resettable totalizing meter (with a minimum display capability of 9,999 hours) that measures the hours of operation for the engine is installed, operated and properly maintained. [Basis: "Stationary Diesel Engine ATCM" section 93115,title 17, CA Code of Regulations, subsection (e)(4)(G)(1)]

4. Records: The owner/operator shall maintain the following monthly records in a District-approved log for at least 36 months from the date of entry (60 months if the facility has been issued a Title V Major Facility Review Permit or a Synthetic Minor Operating Permit). Log entries shall be retained on-site, either at a central location or at the engine's location, and made immediately available to the District staff upon request.
   a. Hours of operation for reliability-related activities (maintenance and testing).
   b. Hours of operation for emission testing to show compliance with emission limits.
   c. Hours of operation (emergency).
   d. For each emergency, the nature of the emergency condition.
   e. Fuel usage for each engine(s).

   [Basis: "Stationary Diesel Engine ATCM" section 93115, title 17, CA Code of Regulations, subsection (e)(4)(I), (or, Regulation 2-6-501)]

5. At School and Near-School Operation:
   If the emergency standby engine is located on school grounds or within 500 feet of any school grounds, the following requirements shall apply:
   The owner/operator shall not operate each stationary emergency standby diesel-fueled engine for non-emergency use, including maintenance and testing, during the following periods:
   a. Whenever there is a school-sponsored activity (if the engine is located on school grounds)
   b. Between 7:30 a.m. and 3:30 p.m. on days when school is in session.

“School” or “School Grounds” means any public or private school used for the purposes of the education of more than 12 children in kindergarten or any of grades 1 to 12, inclusive, but does not include any private school in which education is primarily conducted in a private home(s). “School” or “School Grounds” includes any building or structure, athletic field, or other areas of school property but does not include unimproved school property.
[Basis: “Stationary Diesel Engine ATCM” section 93115, title 17, CA Code of Regulations, subsection (e)(2)(A)(1)] or (e)(2)(B)(2)]

10 Final Determination

The APCO has made a final determination that the proposed Mariposa Energy Project, which is composed of the sources listed below, complies with all applicable District, state and federal air quality rules and regulations. The following sources will be subject to the permit conditions and BACT and offset requirements discussed previously.

S-1 Combustion Turbine Generator (CTG) #1, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-1 Oxidation Catalyst and A-2 Selective Catalytic Reduction System (SCR).

S-2 Combustion Turbine Generator (CTG) #2, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-3 Oxidation Catalyst and A-4 Selective Catalytic Reduction System (SCR).

S-3 Combustion Turbine Generator (CTG) #3, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-5 Oxidation Catalyst and A-6 Selective Catalytic Reduction System (SCR).

S-4 Combustion Turbine Generator (CTG) #4, GE LM 6000 PC-Sprint, Natural Gas Fired, with high efficiency inlet air filtration, 50 MW (nominal), 481 MMbtu/hr maximum rated capacity (HHV); abated by A-7 Oxidation Catalyst and A-8 Selective Catalytic Reduction System (SCR).

S-5 Diesel Fire Pump: Make: Cummins; Model: CFP7E-F40; Model Year: TBD (2009 or later); Rated bhp: 220

11. Glossary of Acronyms

AAQS	Ambient Air Quality Standard
ARB	Air Resource Board
BTU	British Thermal Unit
BAAQMD	Bay Area Air Quality Management District
BACT	Best Available Control Technology
Cal ISO	California Independent System Operator
CAISO	California Independent System Operator
CARB	California Air Resources Board
CEC	California Energy Commission
CEM	Continuous Emission Monitor
CEQA	California Environmental Quality Act
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CPUC	California Public Utilities Commission
CTG	Combustion Turbine Generator
EO/APCO	Executive Officer/Air Pollution Control Officer
EPA	Environmental Protection Agency
ERC	Emission Reduction Credit
FDOC	Final Determination of Compliance
GE	General Electric Company
GHG	Greenhouse Gases
GT	Gas Turbine
MW	Megawatt
NH_3	Ammonia
N_2	Nitrogen
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_x	Nitrogen Oxides
NSR	New Source Review
O_2	Oxygen
LAER	Lowest Achievable Emissions Rate
LLC	Limited Liability Company
MEP	Mariposa Energy Project
MMbtu	Million Btu
NAAQS	National Ambient Air Quality Standard
PAH	Polycyclic Aromatic Hydrocarbon
PDOC	Preliminary Determination of Compliance
PG&E	Pacific Gas & Electric Company
PM_{10}	Particulate Matter less than 10 Microns in Diameter
$PM_{2.5}$	Particulate Matter less than 2.5 Microns in Diameter
POC	Precursor Organic Compounds

ppm	Parts Per Million
ppmv	Parts Per Million by Volume
ppmvd	Parts Per Million by Volume, Dry
PSD	Prevention of Significant Deterioration
PUC	Public Utilities Commission
RACT	Reasonably Available Control Technology
RATA	Relative Accuracy Test Audit
SCAQMD	South Coast Air Quality Management District
SNCR	Selective Non-catalytic Reduction
SCR	Selective Catalytic Reduction
SJVAPCD	San Joaquin Valley Air Pollution Control District
SO_2	Sulfur Dioxide
SO_x	Sulfur Oxides
TAC	Toxic Air Contaminant
TBACT	Toxics Best Available Control Technology
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds

Appendix A
Emission Calculations

Emission Calculation Standards:

The following physical constants and standard conditions were utilized to derive the criteria-pollutant emission factors used to estimate and verify criteria pollutant and toxic air contaminant emissions submitted with the permit application. The criteria emission calculations were prepared by the applicant's consultant and are based on a combustion model. The District has verified these values using the calculations shown below. For the toxic air contaminants the District revised the calculation submitted by the applicant.

standard temperature:	68°F
standard pressure:	14.7 psia
molar volume:	385.54 dscf/lbmol
ambient oxygen concentration:	20.95%
dry flue gas factor[b]:	8710 dscf/MMbtu
natural gas higher heating value:	1020 btu/dscf

[b] F-factor is based upon the assumption of complete stoichiometric combustion of natural gas. In effect, it is assumed that all excess air present before combustion is emitted in the exhaust gas stream. Value shown is the standard value given by EPA in Method 19, Determination of Sulfur Dioxide Removal Efficiency and Particulate Matter, Sulfur Dioxide, and Nitrogen Oxide Emission Rates.

Table A-1 summarizes the regulated air pollutant emission factors that were used to calculate mass emission rates for each source. All units are pounds per million Btu of natural gas fired based upon the high heating value (HHV). All emission factors are after abatement by applicable control equipment.

Table A-1: Mariposa Energy Project Turbine Criteria Pollutant Emission Estimates

Pollutant	lb/MMbtu	One Simple-Cycle Turbine Emission Rate (lbs/hr)
NO_x (as NO_2) [a]	0.00915	4.40
CO[b]	0.004456	2.14
POC (as CH_4)	0.00127	0.612
$PM_{10}/PM_{2.5}$	0.0046 (average)	2.2 (average)
SO_x (as SO_2) Maximum[d]	0.0028	1.35
SOx (as SO_2) Annual Average[c]	0.0007	0.34

[a] Based upon stack concentration of 2.5 ppmvd NOx @ 15% O2 that reflects the use of dry low-NOx combustors at the CTG and abatement by the Selective Catalytic Reduction Systems with ammonia injection.

[b] Based upon the permit condition emission limit of 2 ppmvd CO @ 15% O2 that reflects abatement by oxidation catalysts.
[c] Average SOx emissions based on 0.25 grains sulfur per 100 scf of natural gas and an average annual firing rate of 481 MMbtu/hour.
[d] Maximum SOx emissions based on 1 grain sulfur per 100 scf of natural gas.

REGULATED AIR POLLUTANTS

NITROGEN OXIDE EMISSIONS

The combined NOx emissions from the simple-cycle gas turbines will be 2.5 ppmv, dry @ 15% O2. This concentration is converted to a mass emission factor as follows:

(2.5 ppmv)(20.95 - 0)/(20.95 - 15) = 8.80 ppmv of NO_x, dry @ 0% O_2

(8.80 E-6)(1 lbmol/385.54 dscf)(46 lb of NO_2/lbmol)(8710 dscf/MMbtu)

= 0.00915 lb of NO_2/MMbtu

(0.00915 lb of NO_2/MMbtu) (481 MMbtu/hr) = 4.40 lb of NO_x (as NO_2)/hr

CARBON MONOXIDE EMISSIONS

The CO emissions from the simple-cycle gas turbines will be conditioned to a maximum controlled CO emission limit of 2 ppmv, dry @ 15% O_2 during all operating modes except gas turbine start-up, and shutdown. The emission factor corresponding to this emission concentration is calculated as follows:

(2 ppmv)(20.95 - 0)/(20.95 - 15) = 7.04 ppmv, dry @ 0% O_2

(7.04 E-6)(1 lbmol/385.54 dscf)(28 lb of NO_2/lbmol)(8710 dscf/MMbtu))

= 0.00445 lb of CO/MMbtu

(0.00445 lb of NO_2/MMbtu) (481 MMbtu/hr) = 2.14 lb of CO/hr

PRECURSOR ORGANIC COMPOUND (POC) EMISSIONS

The POC emissions from the simple-cycle gas turbines will be conditioned to a maximum controlled emission limit of 1 ppmv, dry @ 15% O_2 during all operating modes except gas turbine start-up and shutdown. The POC emission factor corresponding to this emission concentration is calculated as follows:

(1 ppmv)(20.95 - 0)/(20.95 - 15) = 3.52 ppmv, dry @ 0% O_2

(3.52 E-6)(lbmol/385.54 dscf)(16 lb CH_4/lbmol)(8710 dscf/MMbtu)

= 0.00127 lb of POC/MMbtu

(0.00127 lb of POC/MMbtu) (481 MMbtu/hr) = 0.612 lb of POC/hr

The amount of fuel that the turbine can burn varies with the ambient temperature. The emissions are conservatively calculated as if the ambient temperature is 46°F, because at that temperature, the turbines can burn the maximum amount of fuel. The daily emissions are based on maximum daily operation of 24 hours/day. The annual emissions are based on maximum annual operation for 4000 hours/year. These are the steady-state controlled emissions. Emissions equivalent to 150 hours in startup mode and 75 hours in shutdown mode will be added to the annual emission limits.

Table A-2
NO_x = 2.5 ppm @ 15% O_2 for 1-hour

Normal Operating Scenario			NOx Emissions (Per Turbine)				For all 4 turbines
Ambient Temp F	Load %	Fuel Input Per Turbine MMbtu/hr (HHV)	lb/hr	lb/day	lb/yr	tons/yr	tons/yr
17	100	465					
46	100	481	4.4	105.6	17,600	8.8	35.2
59	100	465					
59	50	282					
93	100	391					
93	50	270					
112	100	338					

Table A-3
CO = 2.0 ppm @ 15% O_2 for 3-hour rolling

Normal Operating Scenario			CO Emissions (Per Turbine)				For all 4 turbines
Ambient Temp F	Load %	Fuel Input Per Turbine MMbtu/hr (HHV)	lb/hr	lb/day	lb/yr	tons/yr	tons/yr
17	100	465					
46	100	481	2.14	51.36	8,560	4.28	17.12
59	100	465					
59	50	282					
93	100	391					
93	50	270					
112	100	338					

Table A-4 **POC = 1.0 ppm @ 15% O_2 for 1-hour**							
Normal Operating Scenario			POC Emissions (Per Turbine)				For all 4 turbines
Ambient Temp F	Load %	Fuel Input Per T MMbtu/hr (HHV)	lb/hr	lb/day	lb/yr	tons/yr	tons/yr
17	100	465					
46	100	481	0.612	14.688	2,448	1.224	4.896
59	100	465					
59	50	282					
93	100	391					
93	50	270					
112	100	338					

PARTICULATE MATTER (PM_{10}) EMISSIONS

The District has determined that the turbines will emit an average of 2.2 lb PM_{10}/hr. This emission rate is approximately 0.0046 lb per MMbtu on average.

SULFUR DIOXIDE EMISSIONS

The SO_2 emission factor is based upon annual average natural gas sulfur content of 0.25 grains per 100 scf and a higher heating value of 1020 Btu/scf.

The sulfur emission factor is calculated as follows:

Natural Gas: 1 grain of S/100 scf maximum

SO_2 = (1 gr/100 scf)(lb/7000 gr)(1/1020 BTU/scf)(1 x 10E6 Btu/MMbtu)(64 lb SO_2/32 lb S)
= 0.002801 lb/MMbtu

Natural Gas: 0.25 grain of S/100 scf for Annual Average

SO_2 = (0.25 gr/100 scf)(lb/7000 gr)(1/1020 BTU/scf)(1 x 10E6 Btu/MMbtu)(64 lb SO_2/32 lb S)

= 0.0007 lb/MMbtu

Maximum Hourly SO_2

The corresponding SO_2 emission rate for one gas turbine:

0.0028 lb SO_2/MMbtu)(481 MMbtu/hr) = 1.347 lb/hr
= 1.35 lb/hr

Annual Average SO_2

The corresponding SO_2 emission rate for one gas turbine:

(0.0007 lb SO_2/MMbtu)(481 MMbtu/hr) = 0.337 lb/hr
= 0.34 lb/hr

Mariposa Energy Project
Startup and Shutdown Emission Estimates

Mode	Value	Units	Notes
Total Start Up Duration	30	minutes	Based on client data from existing LM6000 plant.
Total Shutdown Duration	15	minutes	Based on client data from existing LM6000 plant.
SCR/Ox Cat Start Up Duration	20	minutes	SCR/Ox Cat warm up period after turbine start of 10 minutes.
SCR/Ox Cat Shutdown Duration	7		Additional SCR/Ox cat shutdown period in addition to the 8 minutes GE shutdown curve.
Starts/Shutdowns/Day	12	each	
Starts/CTG/Year	300	each	
Shutdown/CTG/Year	300	each	

	Emission Rate (pound per period)			
Initial Startup/Shutdown	**NOx**	**CO**	**POC**	**Reference**
Startup Emission Data	3.5	3.0	0.058	Initial 10 minutes - GE LM6000 Start Curve at ISO Conditions
Shutdown Emission Data	2.7	2.4	0.047	Final 8 minutes - GE LM6000 Shutdown Curve at ISO Conditions

Maximum Hourly Emission Rate (Steady State)

Mode	NOx (lb/hr)	CO (lb/hr)	POC (lb/hr)	NOx (lb/min)	CO (lb/min)	POC (lb/min)
without SCR/Ox Cat control	43.950	66.800	6.370	0.733	1.113	0.106
with SCR/Ox Cat control	4.395	2.14	0.61	0.073	0.030	0.010

Table A-5
Startup/Shutdown Emission Estimates Per CTG

Pollutant	Start-up lb/Events	Shutdown lb/Events	Highest hour lb/hour	For 12 Startup Emissions lb/day	For 12 Shutdown Emissions lb/day	For 300 Startup Emissions lb/year	For 300 Shutdown Emissions lb/year
NOx	14.2	3.2	18.5	170.4	38.4	4260	960
CO	14.1	2.7	17.3	169.2	32.4	4,230	810
POC	1.1	0.12	1.4	13.2	1.5	330	36
PM10	1.1 (average)	0.55 (average)	2.2 (average)	13.2 (average)	6.6 (average)	330	165
SO_2[a]	0.17/0.675 [a]	0.085/0.338 [a]	1.35	2.04/8.1 [a]	1.0/4.1 [a]	51.0 [a]	25.5 [a]

[a]Lower SO2 values assume average sulfur content in fuel. Higher SO2 values assume maximum sulfur in fuel. The maximum sulfur content has been used for daily calculations and limits. The average sulfur content has been used for annual calculations and limits.

Table A-6 Startup/Shutdown Emission Estimates for 4 CTG								
Pollutant	Highest hour lb/hour	Startup lb/day	Shutdown lb/day	Startup lb/year	Shutdown lb/year	Startup TPY	Shutdown TPY	Combine Start/Stop TPY
NOx	74	682	153.6	17,040	3,840	8.52	1.92	10.44
CO	72.4 69.2	677	130	16,920	3,240	8.46	1.62	10.1
POC	5.6	52.8	6.0	1,320	144	0.66	0.072	0.73
PM10	8.8 (avg)	53	26	1320	660	0.66	0.33	0.99
SO2	5.4	32.4[a]	16.4[a]	204[a]	102[a]	0.10[a]	0.05[a]	0.15[a]

[a]Lower SO2 values assume average sulfur content in fuel. Higher SO2 values assume maximum sulfur in fuel. The maximum sulfur content has been used for daily calculations and limits. The average sulfur content has been used for annual calculations and limits.

Mariposa Energy Project
Startup and Shutdown Emission Estimates

The startup and shutdown emissions have been estimated using a combination of manufacturer's data and the District's BACT determination, which is presented on an hourly and minute basis below.

Steady state one-hour emissions without SCR/Oxidation catalyst control (Data provided by manufacturer)

NOx 43.950 lb/hr 0.733 lb/min
CO 66.800 lb/hr 1.113 lb/min
POC 6.370 lb/hr 0.106 lb/min

Steady state one-hour emissions with SCR/Oxidation Catalyst control (Based on BACT determination)

NOx 4.395 lb/hr 0.073 lb/min
CO 2.14 lb/hr 0.036 lb/min
POC 0.612 lb/hr 0.010 lb/min

Initial period startup emissions from turbine for first 10 minutes (Data provided by manufacturer)

NOx 3.5 lb/period for first 10 minutes
CO 3.0 lb/period for first 10 minutes
POC 0.058 lb/period for first 10 minutes

Shutdown emissions from turbine for final 8 minutes (Data provided by manufacturer)

NOx 2.7 lb/period for final 8 minutes
CO 2.4 lb/period for final 8 minutes

POC 0.047 lb/period for final 8 minutes

The maximum emissions in lb/event for each pollutant for a startup event lasting 30 minutes have been calculated as shown below. In some cases, the applicant has proposed lower emissions because there is some degree of control during the "uncontrolled" periods. The manufacturer has provided the emissions during the initial 10-minute period. During this period, the turbines ramp up to the maximum firing rate. After the initial 10 minutes, the turbines are considered to be uncontrolled for up to 14 minutes. During this time, the catalyst heats up. The ammonia injection systems are started when the SCR catalyst is at the proper temperature. After the ammonia injection starts, there will be some lag time before the NOx CEM measures reduced NOx emissions. After the 14 minutes of uncontrolled operation, the turbines are considered to be controlled.

lb/event = Emissions in pounds during initial 10-minute period + 14 minutes uncontrolled emissions + 6 minutes controlled emissions

For NOx:
lb/event = 3.5 lbs during initial 10-minute period + 14 min uncontrolled NOx emission rate + 6 min controlled NOx emission rate

lb/event = 3.5 lb/initial 10 minutes + (14 min x 0.733 lb/min uncontrolled) + (6 min x 0.073 lb/min controlled)
lb/event = 14.2 lb/30 min event

For CO:
lb/event = 3.0 lbs during initial 10-minute period + 14 minutes uncontrolled CO emission rate + 6 minutes controlled CO emission rate

lb/event = 3.0 lb/initial 10 minutes + (14 minutes x 1.113 lb/min uncontrolled) + (6 minutes x 0.036 lb/min controlled)
lb/event = 18.79 lb/30 min event
Proposed emissions: 14.1 lb per 30 min event

For POC:
lb/event = 0.058 lbs during initial 10-minute period + 14 minutes uncontrolled CO emission rate + 6 minutes controlled CO emission rate

lb/event = 0.058 lb/initial 10 minutes + (14 minutes x 0.106 lb/min uncontrolled) + (6 minutes x 0.010 lb/min controlled)
lb/event = 1.60 lb/30 min event
Proposed emissions: 1.1 lb per 30 min event

SO2 and PM10 are calculated by assuming that the hourly rate in unchanged from the steady state, so the emissions of SO2 and PM10 during a half-hour startup are assumed to be 0.17 and 1.1 lb/hr, respectively.

The emissions in lb/event for each pollutant for a shutdown event lasting 15 minutes are calculated as follows:
The manufacturer has provided the emissions during the final 8 minutes of shutdown. During the beginning of the 15-minute shutdown period, the turbines are considered to be controlled.

lb/event = 7 minutes controlled emissions + emissions in pounds during final 8 minutes

For NOx:
lb/event = (7 min x 0.073 lb/min controlled) + 2.7 lb during final 8 minutes = 3.21 lb/15 minute event

For CO:
lb/event = (7 min x 0.036 lb/min controlled) + 2.4 lb during final 8 minutes = 2.65 lb/15 minute event
Proposed emissions: 2.7 lb per 15-minute event

For POC:
lb/event = (7 min x 0.010 lb/min controlled) + 0.047 lb during final 8 minutes = 0.117 lb/15 minute event
Proposed emissions: 0.12 lb per 15-minute event

Following is a calculation of the maximum hourly emissions assuming that the hour has one startup and one shutdown.

<u>Hour containing one startup and one shutdown:</u>
It takes 30 minutes to start up the turbine. The emissions for an hour that includes a 30-minute startup, 15 minutes of steady state operation, and a 15-minute shutdown would be:

> NOx: 14.2 lb in 30 minutes + (15 min x 0.073 lb/min) + 3.2 lb in 15 minutes = 18.49 lb NOx/hr
> CO: 14.1 lb in 30 minutes x (15 min + 0.036 lb/min) + 2.7 lb in 15 minutes = 17.3 lb CO/hr
> POC: 1.1 lb in 30 minutes + (15 min x 0.010 lb/min) + 0.2 lb in 15 minutes = 1.5 lb POC/hr

Prior to the publication of the PDOC, the applicant proposed the following maximum hourly emissions:

> NOx: 18.5 lb/hr
> CO: 18.1 lb/hr
> POC: 1.7 lb/hr

In comments after the publication of the PDOC, the applicant has proposed the following maximum hourly emissions:

NOx: 18.5 lb/hr
CO: 17.3 lb/hr
POC: 1.4 lb/hr

It is assumed that the emissions of PM10 and SO2 do not change during startup.

Mariposa Energy Project
Grain Loading calculation

Grain Loading Calculation for GE LM-6000 PC Sprint Simple Cycle Gas Turbines

PM-10/PM2.5 Maximum Emission Rate 2.5 lb/hr

Firing Rate 481 MMbtu/hr

F-factor 8743 dscf/MMbtu

lb = 7000 grains

Corrected O2 Concentration 15% for gas turbine

Ambient Air O2 Concentration 20.9%

At 15% O2

grains/dscf = (2.2 lb/hr x 7000 grains/lb)/(481 MMbtu/hr x (8743 dscf/MMbtu x 20.9/(20.9 - 15))

grains/dscf = 0.0011

Mariposa Energy Project
Commissioning Emissions

Table A-7 Expected Commissioning Phase NOx Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	**Hours/Day Operation**	**Days operation**	**Load Range**	**NOx lbs/hr**	**NOx lbs/day**	**NOx for 4 turbines lbs/year**	**NOx in tons per Turbine**	**NOx in tons for 4 Turbines**
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	51	204	1632	0.204	0.816
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	51	408	14688	1.836	7.344
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	34	272	16320	2.04	8.16
Total Emissions					884	32640	4.08	16.32

Table A-8 Expected Commissioning Phase CO Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	**Hours/Day Operation**	**Days operation**	**Load Range**	**CO lbs/hr**	**CO lbs/day**	**CO for 4 turbines lbs/year**	**CO in tons per Turbine**	**CO in tons for 4 Turbines**
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	45	180	1440	0.18	0.72
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	45	360	12960	1.62	6.48
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	6.2	49.6	2976	0.372	1.48
Total Emissions					589.6	17376	2.172	8.68

Table A-9 Expected Commissioning Phase POC Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	**Hours/Day Operation**	**Days operation**	**Load Range**	**POC lbs/hr**	**POC lbs/day**	**POC for 4 turbines lbs/year**	**POC in tons per Turbine**	**POC in tons for 4 Turbine**
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	4.48	17.92	143.36	0.01792	0.07168
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	4.48	35.84	1290.24	0.1613	0.06452
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	1.2	9.6	576	0.072	0.288
Total Emissions					63.36	2009.6	0.25122	1

Mariposa Energy Project
Commissioning Emissions

Table A-10 Expected Commissioning Phase PM10 Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	**Hours/Day Operation**	**Days operation**	**Load Range**	**PM10 lbs/hr**	**PM10 lbs/day**	**PM10 for 4 turbines lbs/year**	**PM10 in tons per Turbine**	**PM10 in tons for 4-Turbine**
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	2.2	9	72	0.01	0.04
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	2.2	18	648	0.08	0.36
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	2.2	18	1080	0.14	0.6
Total Emissions						1800	0.23	0.9

Table A-11 Expected Commissioning Phase SOx Emissions for a Single GE LM 6000 Turbine								
Phase (Each Turbine)	**Hours/Day Operation**	**Days operation**	**Load Range**	**SOx lbs/hr**	**SOx lbs/day**	**SOx for 4 turbines lbs/year**	**SOx in tons per Turbine**	**SOx in tons for 4-Turbine**
Initial Load Testing and Engine Checkout	<=4	<=2	<=10%	1.35	5.4	43.2	0.006	0.022
Pre-Catalyst Initial Tuning	<=8	<=9	50-100%	1.35	10.8	389	0.049	0.195
Post-Catalyst Initial Tuning	<=8	<=15	50-100%	1.35	10.8	648	.081	0.324
Total Emissions					10.8	1080	0.136	0.541

Mariposa Energy Project
Toxic Air Contaminant Emissions

Table A-12 MAXIMUM FACILITY TOXIC AIR CONTAMINANT (TAC) EMISSIONS							
	EF	**Per Turbine**	**Per Turbine**	**Total for 4 Turbines**	**Total for 4 Turbines**	**Acute Risk Screening Trigger Level**	**Chronic Risk Screening Trigger Level**
Toxic Air Contaminant	**lb/MMbtu**	**lb/hour**	**lb/year**	**lb/hour**	**lb/year**	**(lb/hr)**	**(lb/yr)**
1,3-Butadiene	0.00000012	0.000060	0.258	0.00024	1.0307	None	0.63
Acetaldehyde	0.00013431	0.064645	277.974	0.25858	1111.8974	1	38
Acrolein	0.00001853	0.008918	38.348	0.03567	153.3931	0.0055	14
Ammonia	0.00680000	3.272840	14073.212	13.09136	56292.8480	7.1	7700
Benzene	0.00001304	0.006276	26.986	0.02510	107.9433	2.9	3.8
Benzo(a)anthracene	0.00000002	0.000011	0.046	0.00004	0.1834	None	None
Benzo(a)pyrene	0.00000001	0.000007	0.028	0.00003	0.1128	None	0.0069
Benzo(b)fluoranthene	0.00000001	0.000005	0.023	0.00002	0.0917	None	None
Benzo(k)fluoranthene	0.00000001	0.000005	0.022	0.00002	0.0893	None	None
Chrysene	0.00000002	0.000012	0.051	0.00005	0.2045	None	None
Dibenz(a,h)anthracene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Ethylbenzene	0.00001755	0.008446	36.319	0.03379	145.2771	None	43
Formaldehyde	0.00045000	0.216585	931.316	0.86634	3725.2620	0.21	18
Hexane	0.00025392	0.122212	525.514	0.48885	2102.0542	None	270000
Indeno(1,2,3-cd)pyrene	0.00000002	0.000011	0.048	0.00004	0.1907	None	None
Naphthalene	0.00000163	0.000783	3.368	0.00313	13.4726	None	None
Propylene	0.00075588	0.363806	1564.367	1.45522	6257.4662	None	120000
Propylene Oxide	0.00004686	0.022555	96.987	0.09022	387.9467	6.8	29
Toluene	0.00006961	0.033502	144.060	0.13401	576.2388	82	12000
Xylene (Total)	0.00002559	0.012316	52.957	0.04926	211.8286	49	27000
Sulfuric Acid Mist (H2SO4)	0.00058950	0.283550	1197.997	1.1342	4791.9866	0.26	39
Benzo(a)pyrene equivalents	0.0000000448	0.000022	0.093	0.00009	0.3706	None	0.0069
PAH	0.001132	1.0640	------	-------	-----	-----	-----
One (1)-Diesel Engine (0.127 g/bhp/hr)		(220 bhp)		(50 hrs/yr)	(3.07 lb/yr)	None	0.63

Notes: PAH impacts are evaluated as Benzo(a)pyrene equivalents.

Equivalency Factor	
Benzo(a)anthracene	0.1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	0.1
Benzo(k)fluoranthene	0.1
Chrysene	0.01
Dibenz(a,h)anthracene	1.05
Indeno(1,2,3-cd)pyrene	0.1

Mariposa Energy Project
Ammonia Emissions

Ammonia Emission Factors

The limit for ammonia concentration will be 5 ppm @ 15% O2. This concentration is converted to a mass emission factor as follows:

(5 ppmv)(20.95 - 0)/(20.95 - 15) = 17.6 ppmv of NH_3, dry @ 0% O_2

(17.6 E-6)(1 lbmol/385.54 dscf)(17 lb of NH_3/lbmol)(8710 dscf/MMbtu)

= 0.00675 lb of NH_3/MMbtu

(0.0068 lb of NH_3/MMbtu) (481 MMbtu/hr) = 3.27 lb of NO_x (as NO_2)/hr

Mariposa Energy Project
Toxic Air Contaminant Emissions

Table A-13 CATEF Gas Turbine TAC Emission Factors												
ID	**System Type**	**Material Type**	**SCC**	**APC Device**	**Other Desc**	**CAS**	**Substance**	**Max Emission factor**	**Mean**	**Median**	**Unit**	lb/MMbtu
4543	Turbine	Natural gas	20200203	COC/SCR	None	106-99-0	1,3-Butadiene	1.33E-04	1.27E-04	1.24E-04	lbs/MMcf	1.25E-07
4568	Turbine	Natural gas	20200203	COC/SCR	None	75-07-0	Acetaldehyde	5.11E-01	1.37E-01	5.38E-02	lbs/MMcf	1.34E-04
4573	Turbine	Natural gas	20200203	COC/SCR	None	107-02-8	Acrolein	6.93E-02	1.89E-02	1.09E-02	lbs/MMcf	1.85E-05
4584	Turbine	Natural gas	20200203	COC/SCR	None	71-43-2	Benzene	4.72E-02	1.33E-02	1.01E-02	lbs/MMcf	1.30E-05
4593	Turbine	Natural gas	20200203	COC/SCR	None	56-55-6	Benzo(a)anthracene	1.34E-04	2.26E-05	3.61E-06	lbs/MMcf	2.22E-08
4598	Turbine	Natural gas	20200203	COC/SCR	None	50-32-8	Benzo(a)pyrene	9.16E-05	1.39E-05	2.57E-06	lbs/MMcf	1.36E-08
4603	Turbine	Natural gas	20200203	COC/SCR	None	205-99-2	Benzo(b)fluoranthene	6.72E-05	1.13E-05	2.87E-06	lbs/MMcf	1.11E-08
4618	Turbine	Natural gas	20200203	COC/SCR	None	207-08-9	Benzo(k)fluoranthene	6.72E-05	1.10E-05	2.87E-06	lbs/MMcf	1.08E-08
4623	Turbine	Natural gas	20200203	COC/SCR	None	218-01-9	Chrysene	1.50E-04	2.52E-05	4.99E-06	lbs/MMcf	2.47E-08
4628	Turbine	Natural gas	20200203	COC/SCR	None	53-70-3	Dibenz(a,h)anthracene	1.34E-04	2.35E-05	3.03E-06	lbs/MMcf	2.30E-08
4633	Turbine	Natural gas	20200203	COC/SCR	None	100-41-4	Ethylbenzene	5.70E-02	1.79E-02	9.74E-03	lbs/MMcf	1.75E-05
4648	Turbine	Natural gas	20200203	COC/SCR	None	50-00-0	Formaldehyde	6.87E+00	9.17E-01	1.12E-01	lbs/MMcf	8.99E-04
4653	Turbine	Natural gas	20200203	COC/SCR	None	110-54-3	Hexane	3.82E-01	2.59E-01	2.19E-01	lbs/MMcf	2.54E-04
4658	Turbine	Natural gas	20200203	COC/SCR	None	193-39-5	Indeno(1,2,3-cd)pyrene	1.34E-04	2.35E-05	2.87E-06	lbs/MMcf	2.30E-08
4663	Turbine	Natural gas	20200203	COC/SCR	None	91-20-3	Naphthalene	7.88E-03	1.66E-03	9.26E-04	lbs/MMcf	1.63E-06
4678	Turbine	Natural gas	20200203	COC/SCR	None	115-07-1	Propylene	2.00E+00	7.71E-01	5.71E-01	lbs/MMcf	7.56E-04
4683	Turbine	Natural gas	20200203	COC/SCR	None	75-56-9	Propylene Oxide	5.87E-02	4.78E-02	4.48E-02	lbs/MMcf	4.69E-05
4693	Turbine	Natural gas	20200203	COC/SCR	None	108-88-3	Toluene	1.68E-01	7.10E-02	5.91E-02	lbs/MMcf	6.96E-05
4708	Turbine	Natural gas	20200203	COC/SCR	None	1330-20-7	Xylene (Total)	6.26E-02	2.61E-02	1.93E-02	lbs/MMcf	2.56E-05
Natural Gas 1020 Btu/scf												

Mariposa Energy Project
H2SO4 Estimates

H2SO4 Estimate

Worst Case lb/hr

1 grain Sulfur/100 scf

lb S/MMbtu = 1 grain S/100 scf x lb/7000 grains x scf/1020 Btu x 1E06 Btu/MMbtu = 0.0014 lb S/MMbtu

lb SO2/MMbtu = 0.0014 lb S/MMbtu x 64/32 = 0.0028 lb SO2/MMbtu

Worst Case lb/hour assume 55% SO2 converts to H2SO4

lb H2SO4/MMbtu = 0.0028 lb SO2/MMbtu x 98/64 x 0.55 = 0.002358 lb H2SO4/MMbtu

Simple Cycle Turbine lb/hr H2SO4 = 481 MMbtu/hour x 0.002358 lb H2SO4/MMbtu = 1.134 lb/hour per turbine

Annual Average assume 55% SO2 converts to H2SO4

0.25 grain Sulfur/100 scf

lb S/MMbtu = 0.25 grain S/100 scf x lb/7000 grains x scf/1020 Btu x 1E06 Btu/MMbtu = 0.00035 lb S/MMbtu

lb SO2/MMbtu = 0.00035 lb S/MMbtu x 64/32 = 0.0007 lb SO2/MMbtu

Worst Case Annual Average lb/hour assume 55% SO2 converts to H2SO4

lb H2SO4/MMbtu = 0.0007 lb SO2/MMbtu x 98/64 x 0.55 = 0.0005895 lb H2SO4/MMbtu

Simple Cycle Turbine lb/hr H2SO4 = 481 MMbtu/hour x 0.0005895 lbH2SO4/MMbtu = 0.2835 lb/hour per turbine

Total H2SO4 = 4 x (0.2835 lb/hour x 4300 hour/year) = 4877.05 lb/year, 2.44 ton/year

Appendix B

Health Risk Assessment Results

INTEROFFICE MEMORANDUM
August 11, 2009

TO: **Madhav Patil** **Via:** **Scott Lutz**
Daphne Chong

FROM: **Ted Hull**

SUBJECT: **Results of Health Risk Screening Analysis for Mariposa Energy, LLC (Byron, CA), Plant #19730, Application #020737**

SUMMARY: Per your request, we have completed a health risk screening analysis (HRSA) for the above referenced permit application. The analysis estimates the combined health risks associated with toxic air contaminant (TAC) emissions from a proposed power generation facility consisting of (4) natural gas fired combustion turbines. In addition, the analysis includes emissions from the non-emergency operation of a diesel IC engine used to drive a fire pump.

Results from the HRSA indicate that the maximum cancer risk is 1.3 in a million, the chronic hazard index is 0.015, and the acute hazard index is 0.026. In accordance with Regulation 2-5-301 these are acceptable project risks. It should be noted that nearly all of the worker cancer risk (1.3 in a million) is attributed to the non-emergency operation of the fire pump engine diesel engine. This risk level is considered acceptable, since it has been demonstrated that the engine meets the current TBACT emissions standard for diesel PM.

EMISSIONS: The emission rates for toxic air contaminants used in this evaluation are those provided in your memorandum. TAC emissions were adjusted for toxicity and assumed exposure levels, so that a single risk based emission value was entered for each source component (See Spreadsheet Tables 1 through 5). Model runs were set up to estimate the maximum project risk in the following categories: (1) Cancer Risk and (2) Chronic Hazard Index for Residential and Off-site Worker receptors; and (3) Acute Hazard Index for the maximally exposed receptor.

The California Air Resources Board's Hotspots Analysis and Reporting Program (HARP), version 1.4a was used to determine the Cancer, Chronic Hazard Index (HI) and Acute HI risk factors for each compound. In addition to the inhalation exposure pathway, the polycyclic aromatic hydrocarbon group (PAH) also has cancer risks associated with oral ingestion and dermal exposure.

MODELING: The ISCST3 air dispersion computer model was used to estimate annual average and maximum 1-hour ambient air concentrations. Model runs were made with Screen3 meteorological data because actual data was not available for this area. Elevated terrain was considered using input from the USGS Altamont, Byron Hot Springs, Clifton-Court-Forebay, and Midway digital elevation maps (NAD27 format). Model runs were made with Rural land use dispersion coefficients to best represent the area surrounding the facility. Stack parameters for the analysis were based on information provided by the applicant.

HEALTH RISK: Estimates of residential risk assume exposure to annual average TAC concentrations occur 24 hours per day, 350 days per year, for a 70-year lifetime. Risk estimates for offsite workers assume exposure occurs 8 hours per day, 245 day per year, for 40 years. Risk estimates for students assume a higher breathing rate, and exposure is assumed to occur 10 hours per day, 36 weeks per year, for 9 years. The estimated health risks for this permit application are presented in the table below.

Receptor	Cancer Risk	Non-cancer Hazard Index (HI)	Max. Acute Non-cancer HI
Resident	0.3 in a million	0.015	N/A
Worker	1.3 in a million	0.001	N/A
Any	N/A	N/A	0.026

Risk to Students was not calculated because there are no schools within 1,000 feet of the source.

Health Risk Screening Analysis Summary for Gas Turbines
Facility = Mariposa Energy, LLC (Byron, CA)
- Plant #19370, Application #020737

Table 1: HARP Multipathway Unit Risk Factors - Gas Turbine

TACs	(HARP) Residential Cancer Risk Factors[1]	(HARP) Residential Chronic HI Factors[2]	(HARP) Unadjusted Worker Cancer Risk Factors[3]	(HARP) Unadjusted Worker Chronic HI Factors[3]	(HARP) Acute Hazard Index (HI) Factors[3]
	$(ug/m^3)^{-1}$	$(ug/m^3)^{-1}$	$(ug/m^3)^{-1}$	$(ug/m^3)^{-1}$	$(ug/m^3)^{-1}$
Acetaldehyde	2.90E-06	7.14E-03	5.72E-07	7.14E-03	2.13E-03
Acrolein	0.00E+00	2.86E+00	0.00E+00	2.86E+00	4.00E-01
Ammonia	0.00E+00	5.00E-03	0.00E+00	5.00E-03	3.13E-04
1,3 Butadiene	1.74E-04	5.00E-02	3.43E-05	5.00E-02	0.00E+00
Benzene	2.90E-05	1.67E-02	5.72E-06	1.67E-02	7.69E-04
Ethylbenzene	2.52E-06	5.00E-04	4.97E-07	5.00E-04	0.00E+00
Formaldehyde	6.08E-06	1.11E-01	1.20E-06	1.11E-01	1.82E-02
Hexane	0.00E+00	1.43E-04	0.00E+00	1.43E-04	0.00E+00
Naphthalene	3.48E-05	1.11E-01	6.86E-06	1.11E-01	0.00E+00
PAH, as B(a)P	1.65E-02	0.00E+00	6.00E-03	0.00E+00	0.00E+00
Propylene	0.00E+00	3.33E-04	0.00E+00	3.33E-04	0.00E+00
Propylene Oxide	3.76E-06	3.33E-02	7.43E-07	3.33E-02	3.23E-04
Sulfuric Acid Mist	0.00E+00	1.00E+00	0.00E+00	1.00E+00	8.33E-03
Toluene	0.00E+00	3.33E-03	0.00E+00	3.33E-03	2.70E-05
Xylene	0.00E+00	1.43E-03	0.00E+00	1.43E-03	4.55E-05

Notes:
1. HARP Version 1.4a, Derived Adjusted Method
2. HARP Version 1.4a, Derived OEHHA Method
3. HARP Version 1.4a, Point Estimate Method

Table 2: Exposure Adjustment Factors (EAFs) - Gas Turbine

Receptor	Presence During Source Operation			Potential for Exposure			Annual Exposure	Exposure Correction	Exposure Adjustment Factors	
	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	(%)	Factor	Cancer	Chronic HI
Resident	24	7	50	11	7	50	96.2%	1.04	1.00	0.96
Worker	8	5	49	8	5	49	49.0%	4.47	2.19	0.49
Student	10	5	36	10	5	36	45.0%	4.87	2.19	0.45
Source Operation	11	7	52							

Note:
HARP chronic risk values assume 8,400 hrs/yr of residential exposure, 1,960 hrs/yr of worker exposure, and 1,800 hrs/yr of student exposure from a continuously operating source (8,760 hours/yr).
Risk based emissions from sources that do not operate continuously are scaled to account for exposure outside these parameters.

Health Risk Screening Analysis Summary for Gas Turbines
Facility = Mariposa Energy, LLC (Byron, CA)
- Plant #19370, Application #020737

Table 3: Resident - Cancer, Chronic, and Acute Risk Adjusted Total Emission Rates for Each Turbine

TACs	Annual Emission Rate (lb/yr)	Annual Emission Rate (g/sec)	Hourly Emission Rate (lb/hr)	Hourly Emission Rate (g/sec)	(HARP) Multi-Path Unit Cancer Risk Factor $(ug/m^3)^{-1}$	(HARP) Chronic Hazard Index (HI) per Unit Conc. $(ug/m^3)^{-1}$	(HARP) Acute Hazard Index (HI) per Unit Conc. $(ug/m^3)^{-1}$	Cancer Risk (in a million) Weighted Emissions $(g/s)/(ug/m^3)$	Chronic HI Weighted Emissions $(g/s)/(ug/m^3)$	Acute HI Weighted Emission Rate $(g/s)/(ug/m^3)$
Acetaldehyde	2.78E+02	4.00E-03	6.46E-02	8.14E-03	2.90E-06	7.14E-03	2.13E-03	1.16E-02	2.75E-05	1.73E-05
Acrolein	3.83E+01	5.51E-04	8.92E-03	1.12E-03	0.00E+00	2.86E+00	4.00E-01	0.00E+00	1.51E-03	4.50E-04
Ammonia	1.41E+04	2.03E-01	3.27E+00	4.12E-01	0.00E+00	5.00E-03	3.13E-04	0.00E+00	9.75E-04	1.29E-04
1,3 Butadiene	2.58E-01	3.71E-06	5.99E-05	7.55E-06	1.74E-04	5.00E-02	0.00E+00	6.47E-04	1.78E-07	0.00E+00
Benzene	2.70E+01	3.88E-04	6.28E-03	7.91E-04	2.90E-05	1.67E-02	7.69E-04	1.13E-02	6.24E-06	6.08E-07
Ethylbenzene	3.63E+01	5.22E-04	8.45E-03	1.06E-03	2.52E-06	5.00E-04	0.00E+00	1.32E-03	2.51E-07	0.00E+00
Formaldehyde	9.31E+02	1.34E-02	2.17E-01	2.73E-02	6.08E-06	1.11E-01	1.82E-02	8.16E-02	1.43E-03	4.98E-04
Hexane	5.26E+02	7.57E-03	1.22E-01	1.54E-02	0.00E+00	1.43E-04	0.00E+00	0.00E+00	1.04E-06	0.00E+00
Naphthalene	3.37E+00	4.85E-05	7.83E-04	9.87E-05	3.48E-05	1.11E-01	0.00E+00	1.69E-03	5.17E-06	0.00E+00
PAH, as B(a)P	9.27E-02	1.33E-06	2.15E-05	2.71E-06	1.65E-02	0.00E+00	0.00E+00	2.21E-02	0.00E+00	0.00E+00
Propylene	1.56E+03	2.24E-02	3.64E-01	4.59E-02	0.00E+00	3.33E-04	0.00E+00	0.00E+00	7.18E-06	0.00E+00
Propylene Oxide	9.70E+01	1.40E-03	2.26E-02	2.85E-03	3.76E-06	3.33E-02	3.23E-04	5.26E-03	4.47E-05	9.20E-07
Sulfuric Acid Mist	8.85E+02	1.27E-02	2.06E-01	2.60E-02	0.00E+00	1.00E+00	8.33E-03	0.00E+00	1.22E-02	2.16E-04
Toluene	1.44E+02	2.07E-03	3.35E-02	4.22E-03	0.00E+00	3.33E-03	2.70E-05	0.00E+00	6.63E-06	1.14E-07
Xylene (Total)	5.30E+01	7.62E-04	1.23E-02	1.55E-03	0.00E+00	1.43E-03	4.55E-05	0.00E+00	1.05E-06	7.05E-08
								1.36E-01	1.63E-02	***1.31E-03***
				1-Hour to Annual Ave. Concentration Conversion:			0.1	***1.36E-02***	***1.63E-03***	

Table 4: Worker - Cancer, Chronic, and Acute Risk Adjusted Total Emission Rates for Each Turbine

TACs	Annual Emission Rate (lb/yr)	Annual Emission Rate (g/sec)	Hourly Emission Rate (lb/hr)	Hourly Emission Rate (g/sec)	(HARP) Multi-Path Unit Cancer Risk Factor $(ug/m^3)^{-1}$	(HARP) Chronic Hazard Index (HI) per Unit Conc. $(ug/m^3)^{-1}$	(HARP) Acute Hazard Index (HI) per Unit Conc. $(ug/m^3)^{-1}$	Cancer Risk (in a million) Weighted Emissions $(g/s)/(ug/m^3)$	Chronic HI Weighted Emissions $(g/s)/(ug/m^3)$	Acute HI Weighted Emission Rate $(g/s)/(ug/m^3)$
Acetaldehyde	2.78E+02	4.00E-03	6.46E-02	8.14E-03	5.72E-07	7.14E-03	2.13E-03	5.00E-03	1.40E-05	1.73E-05
Acrolein	3.83E+01	5.51E-04	8.92E-03	1.12E-03	0.00E+00	2.86E+00	4.00E-01	0.00E+00	7.71E-04	4.50E-04
Ammonia	1.41E+04	2.03E-01	3.27E+00	4.12E-01	0.00E+00	5.00E-03	3.13E-04	0.00E+00	4.96E-04	1.29E-04
1,3 Butadiene	2.58E-01	3.71E-06	5.99E-05	7.55E-06	3.43E-05	5.00E-02	0.00E+00	2.78E-04	9.08E-08	0.00E+00
Benzene	2.70E+01	3.88E-04	6.28E-03	7.91E-04	5.72E-06	1.67E-02	7.69E-04	4.86E-03	3.17E-06	6.08E-07
Ethylbenzene	3.63E+01	5.22E-04	8.45E-03	1.06E-03	4.97E-07	5.00E-04	0.00E+00	5.68E-04	1.28E-07	0.00E+00
Formaldehyde	9.31E+02	1.34E-02	2.17E-01	2.73E-02	1.20E-06	1.11E-01	1.82E-02	3.52E-02	7.28E-04	4.98E-04
Hexane	5.26E+02	7.57E-03	1.22E-01	1.54E-02	0.00E+00	1.43E-04	0.00E+00	0.00E+00	5.30E-07	0.00E+00
Naphthalene	3.37E+00	4.85E-05	7.83E-04	9.87E-05	6.86E-06	1.11E-01	0.00E+00	7.27E-04	2.63E-06	0.00E+00
PAH, as B(a)P	9.27E-02	1.33E-06	2.15E-05	2.71E-06	6.00E-03	0.00E+00	0.00E+00	1.75E-02	0.00E+00	0.00E+00
Propylene	1.56E+03	2.24E-02	3.64E-01	4.59E-02	0.00E+00	3.33E-04	0.00E+00	0.00E+00	3.66E-06	0.00E+00
Propylene Oxide	9.70E+01	1.40E-03	2.26E-02	2.85E-03	7.43E-07	3.33E-02	3.23E-04	2.27E-03	2.27E-05	9.20E-07
Sulfuric Acid Mist	8.85E+02	1.27E-02	2.06E-01	2.60E-02	0.00E+00	1.00E+00	8.33E-03	0.00E+00	6.23E-03	2.16E-04
Toluene	1.44E+02	2.07E-03	3.35E-02	4.22E-03	0.00E+00	3.33E-03	2.70E-05	0.00E+00	3.38E-06	1.14E-07
Xylene (Total)	5.30E+01	7.62E-04	1.23E-02	1.55E-03	0.00E+00	1.43E-03	4.55E-05	0.00E+00	5.34E-07	7.05E-08
								6.64E-02	8.28E-03	***1.31E-03***
				1-Hour to Annual Ave. Concentration Conversion:			0.1	***6.64E-03***	***8.28E-04***	

Health Risk Screening Analysis Summary for Diesel Engine
Facility = Mariposa Energy, LLC (Byron, CA)
- Plant #19370, Application #020737

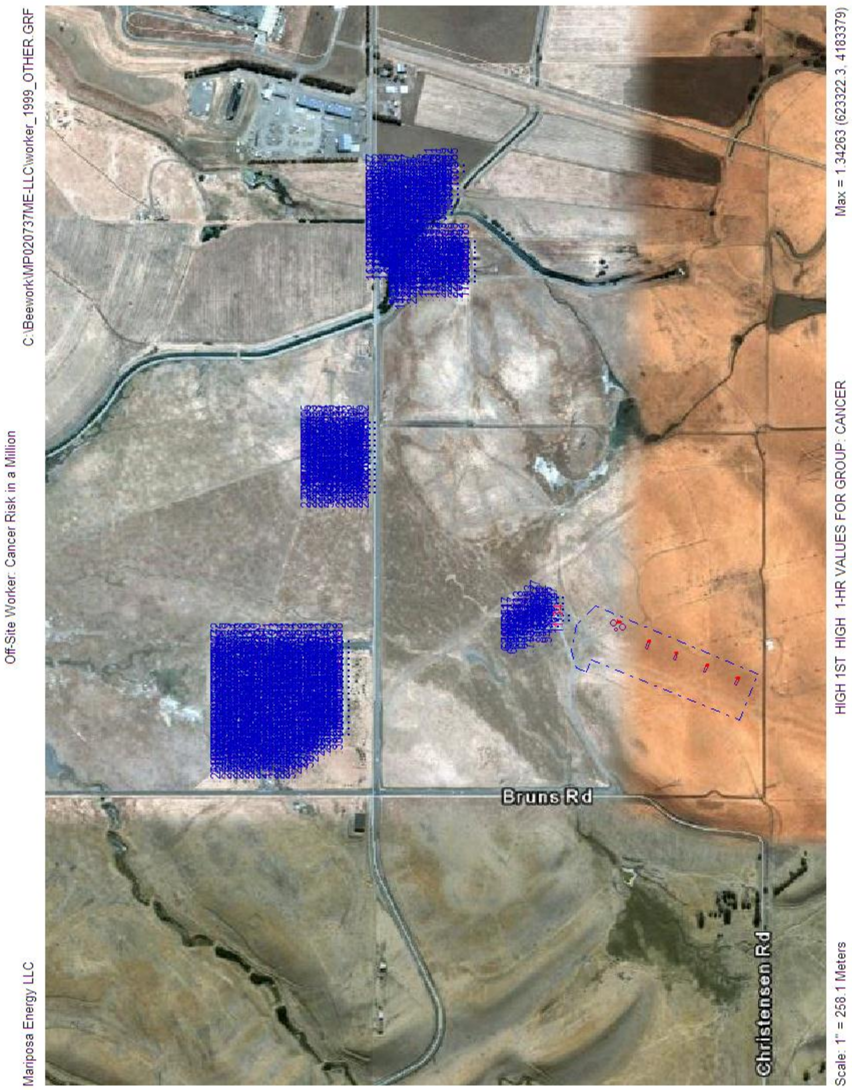
Table 5: Risk Based ISC Emissions Inputs - Diesel Engine

			Resident				Worker			
Source	Annual Emission Rate (lb/yr)	Annual Average Emission Rate (g/sec)	(HARP) Residential Cancer Risk Factors $(ug/m^3)^{-1}$	(HARP) Residential Chronic HI Factors $(ug/m^3)^{-1}$	Exposure Adjusted Cancer Risk Factor $(g/s)/(ug/m^3)$	Exposure Adjusted Chronic HI Factor $(g/s)/(ug/m^3)$	(HARP) Unadjusted Worker Cancer Risk Factors $(ug/m^3)^{-1}$	(HARP) Unadjusted Worker Chronic HI Factors $(ug/m^3)^{-1}$	Cancer Risk (in a million) Weighted Emissions $(g/s)/(ug/m^3)$	Chronic HI Weighted Emissions $(g/s)/(ug/m^3)$
S-5	3.08E+00	4.43E-05	3.19E-04	2.00E-01	**1.47E-02**	**8.86E-06**	6.29E-05	2.00E-01	**1.22E-02**	**8.68E-06**
	1-Hour to Annual Ave. Concentration Conversion:			0.1	***1.47E-03***	***8.86E-07***			***1.22E-03***	***8.68E-07***

Table 6: Exposure Adjustment Factors (EAFs) - Diesel Engine

Receptor	Presence During Source Operation			Potential for Exposure			Annual Exposure (%)	Exposure Correction Factor	Exposure Adjustment Factors	
	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)	Daily (hours/day)	Weekly (days/week)	Annually (weeks/year)			Cancer	Chronic HI
Resident	24	7	50	1	1	50	100.0%	1.04	1.04	1.00
Worker	8	5	49	1	1	49	98.0%	4.47	4.38	0.98
Student	10	5	36	1	1	36	72.0%	4.87	3.50	0.72
Source Operation	**1**	**1**	**50**							

Note:
HARP cancer risk values assume 8,400 hours per year of residential exposure and 1,960 hours per year of worker exposure from a continuously operating source (8,760 hours/yr).
Risk based emissions from sources that do not operate continuously must be scaled to account for exposure outside these parameters.



Mariposa Energy Project
Risk Screening Report

```
NO ECHO

 BEE-Line ISCST3 "BEEST" Version 9.00

 Input File - C:\Beework\MP020737ME-LLC\worker_1999_OTHER.DTA

Output File - C:\Beework\MP020737ME-LLC\worker_1999_OTHER.LST

   Met File - C:\Beework\metdata\screen3.asc


 *** Message Summary For ISC3 Model Setup ***

 --------- Summary of Total Messages --------

A Total of            0 Fatal Error Message(s)
A Total of            1 Warning Message(s)
A Total of            0 Informational Message(s)

   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***

   ********   WARNING MESSAGES   ********
RE W282  1845 CHK_EL:RecElev < SrcBase; See non-DFAULT HE>ZI option in  MCB#9

************************************
*** SETUP Finishes Successfully ***
************************************
```

Mariposa Energy Project
Risk Screening Report

```
 *** ISCST3 - VERSION 02035 ***    *** Mariposa Energy LLC                                                  ***        08/10/09
                                   *** Application #020737                                                  ***        11:23:36
**MODELOPTs:                                                                                                           PAGE   1
CONC                    RURAL ELEV         DFAULT

                                           ***     MODEL SETUP OPTIONS SUMMARY       ***
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

**Intermediate Terrain Processing is Selected
**Model Is Setup For Calculation of Average CONCentration Values.

  --  SCAVENGING/DEPOSITION LOGIC --
**Model Uses NO DRY DEPLETION.  DDPLETE =  F
**Model Uses NO WET DEPLETION.  WDPLETE =  F
**NO WET SCAVENGING Data Provided.
**NO GAS DRY DEPOSITION Data Provided.
**Model Does NOT Use GRIDDED TERRAIN Data for Depletion Calculations
**Model Uses RURAL Dispersion.
**Model Uses Regulatory DEFAULT Options:
           1. Final Plume Rise.
           2. Stack-tip Downwash.
           3. Buoyancy-induced Dispersion.
           4. Use Calms Processing Routine.
           5. Not Use Missing Data Processing Routine.
           6. Default Wind Profile Exponents.
           7. Default Vertical Potential Temperature Gradients.
           8. "Upper Bound" Values for Supersquat Buildings.
           9. No Exponential Decay for RURAL Mode
**Model Accepts Receptors on ELEV Terrain.
**Model Assumes No FLAGPOLE Receptor Heights.
**Model Calculates  1 Short Term Average(s) of:   1-HR
**This Run Includes:    10 Source(s);      2 Source Group(s); and    1671 Receptor(s)
**The Model Assumes A Pollutant Type of:  OTHER
**Model Set To Continue RUNning After the Setup Testing.

**Output Options Selected:
         Model Outputs Tables of Highest Short Term Values by Receptor (RECTABLE Keyword)
         Model Outputs External File(s) of High Values for Plotting (PLOTFILE Keyword)

**NOTE:  The Following Flags May Appear Following CONC Values:  c for Calm Hours
                                                                m for Missing Hours
                                                                b for Both Calm and Missing Hours

**Misc. Inputs:  Anem. Hgt. (m) =    10.00 ;    Decay Coef. =    0.000     ;    Rot. Angle =     0.0
                 Emission Units = GRAMS/SEC                                ;  Emission Rate Unit Factor =   0.10000E+07
                 Output Units   = MICROGRAMS/M**3

**Approximate Storage Requirements of Model =     1.4 MB of RAM.

**Input Runstream File:          worker_1999_OTHER.DTA
**Output Print File:             worker_1999_OTHER.LST
```

```
*** ISCST3 - VERSION 02035 ***     *** Mariposa Energy LLC                                   ***     08/10/09
                                   *** Application #020737                                   ***     11:23:36
**MODELOPTs:                                                                                         PAGE   2
CONC                    RURAL ELEV         DFAULT
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
S1CAN	0	0.66400E-02	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES	
S2CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES	
S3CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES	
S4CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES	
S5CAN	0	0.12200E-02	623306.6	4183270.8	36.6	3.66	740.93	35.26	0.15	YES	
S1CHR	0	0.82800E-03	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES	
S2CHR	0	0.82800E-03	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES	
S3CHR	0	0.82800E-03	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES	
S4CHR	0	0.82800E-03	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES	
S5CHR	0	0.86800E-06	623306.6	4183270.8	36.6	3.66	740.93	35.26	0.15	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
CANCER	S1CAN , S2CAN , S3CAN , S4CAN , S5CAN ,
CHRONIC	S1CHR , S2CHR , S3CHR , S4CHR , S5CHR ,

Mariposa Energy Project
Risk Screening Report

Mariposa Energy Project
Risk Screening Report

```
*** ISCST3 - VERSION 02035 ***    *** Mariposa Energy LLC                                              ***        08/10/09
                                  *** Application #020737                                              ***        11:23:36
**MODELOPTs:                                                                                                      PAGE   3
CONC                   RURAL ELEV          DFAULT

                                        *** DIRECTION SPECIFIC BUILDING DIMENSIONS ***

SOURCE ID: S1CAN
 IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK
   1  10.1,  17.5, 0      2  10.1,  17.2, 0      3  10.1,  17.4, 0      4  10.1,  17.4, 0      5  10.1,  17.0, 0      6  10.1,  15.9, 0
   7  10.1,  14.5, 0      8  10.1,  12.5, 0      9  10.1,  10.2, 0     10  10.1,   7.6, 0     11  10.1,   4.8, 0     12  10.1,   6.5, 0
  13  10.1,   9.2, 0     14  10.1,  11.7, 0     15  10.1,  13.8, 0     16  10.1,  15.5, 0     17  10.1,  16.7, 0     18  10.1,  17.4, 0
  19  10.1,  17.5, 0     20  13.7,  15.2, 0     21  13.7,  16.0, 0     22  10.1,  17.4, 0     23  10.1,  17.0, 0     24  10.1,  15.9, 0
  25  10.1,  14.5, 0     26  10.1,  12.5, 0     27  10.1,  10.2, 0     28  10.1,   7.6, 0     29  10.1,   4.8, 0     30  10.1,   6.5, 0
  31  10.1,   9.2, 0     32  10.1,  11.7, 0     33  10.1,  13.8, 0     34  10.1,  15.5, 0     35  10.1,  16.7, 0     36  10.1,  17.4, 0

SOURCE ID: S2CAN
 IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK
   1  10.1,  17.6, 0      2  10.1,  17.3, 0      3  10.1,  17.4, 0      4  10.1,  17.4, 0      5  10.1,  16.9, 0      6  10.1,  15.9, 0
   7  10.1,  14.4, 0      8  10.1,  12.4, 0      9  10.1,  10.1, 0     10  10.1,   7.5, 0     11  10.1,   4.7, 0     12  10.1,   6.7, 0
  13  10.1,   9.4, 0     14  10.1,  11.8, 0     15  10.1,  13.9, 0     16  10.1,  15.6, 0     17  10.1,  16.8, 0     18  10.1,  17.5, 0
  19  10.1,  17.6, 0     20  10.1,  17.3, 0     21  10.1,  17.4, 0     22  10.1,  17.4, 0     23  10.1,  16.9, 0     24  10.1,  15.9, 0
  25  10.1,  14.4, 0     26  10.1,  12.4, 0     27  10.1,  10.1, 0     28  10.1,   7.5, 0     29  10.1,   4.7, 0     30  10.1,   6.7, 0
  31  10.1,   9.4, 0     32  10.1,  11.8, 0     33  10.1,  13.9, 0     34  10.1,  15.6, 0     35  10.1,  16.8, 0     36  10.1,  17.5, 0

SOURCE ID: S3CAN
 IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK
   1  10.1,  17.6, 0      2  10.1,  17.2, 0      3  10.1,  17.4, 0      4  10.1,  17.5, 0      5  10.1,  16.9, 0      6  10.1,  15.9, 0
   7  10.1,  14.4, 0      8  10.1,  12.4, 0      9  10.1,  10.1, 0     10  10.1,   7.5, 0     11  10.1,   4.6, 0     12  10.1,   6.7, 0
  13  10.1,   9.5, 0     14  10.1,  11.9, 0     15  10.1,  14.0, 0     16  10.1,  15.6, 0     17  10.1,  16.8, 0     18  10.1,  17.5, 0
  19  10.1,  17.6, 0     20  10.1,  17.2, 0     21  10.1,  17.4, 0     22  10.1,  17.5, 0     23  10.1,  16.9, 0     24  10.1,  15.9, 0
  25  10.1,  14.4, 0     26  10.1,  12.4, 0     27  10.1,  10.1, 0     28  10.1,   7.5, 0     29  10.1,   4.6, 0     30  10.1,   6.7, 0
  31  10.1,   9.5, 0     32  10.1,  11.9, 0     33  10.1,  14.0, 0     34  10.1,  15.6, 0     35  10.1,  16.8, 0     36  10.1,  17.5, 0

SOURCE ID: S4CAN
 IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK  IFV   BH      BW  WAK
   1  10.1,  17.5, 0      2  10.1,  17.2, 0      3  10.1,  17.5, 0      4  10.1,  17.5, 0      5  10.1,  17.0, 0      6  10.1,  16.0, 0
   7  10.1,  14.6, 0      8  10.1,  12.6, 0      9  10.1,  10.3, 0     10  10.1,   7.7, 0     11  10.1,   4.9, 0     12  10.1,   6.6, 0
  13  10.1,   9.3, 0     14  10.1,  11.8, 0     15  10.1,  13.8, 0     16  10.1,  15.5, 0     17  10.1,  16.7, 0     18  10.1,  17.4, 0
  19  10.1,  17.5, 0     20  10.1,  17.2, 0     21  10.1,  17.5, 0     22  10.1,  17.5, 0     23  10.1,  17.0, 0     24  10.1,  16.0, 0
  25  10.1,  14.6, 0     26  10.1,  12.6, 0     27  10.1,  10.3, 0     28  10.1,   7.7, 0     29  10.1,   4.9, 0     30  10.1,   6.6, 0
  31  10.1,   9.3, 0     32  10.1,  11.8, 0     33  10.1,  13.8, 0     34  10.1,  15.5, 0     35  10.1,  16.7, 0     36  10.1,  17.4, 0
```

This image cannot currently be displayed.

Mariposa Energy Project
Risk Screening Report

*** ISCST3 - VERSION 02035 *** *** Mariposa Energy LLC *** 08/10/09
*** Application #020737 *** 11:23:36
PAGE 5

**MODELOPTs:
CONC RURAL ELEV DFAULT

*** DIRECTION SPECIFIC BUILDING DIMENSIONS ***

SOURCE ID: S4CHR

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	10.1,	17.5,	0	2	10.1,	17.2,	0	3	10.1,	17.5,	0	4	10.1,	17.5,	0	5	10.1,	17.0,	0	6	10.1,	16.0,	0
7	10.1,	14.6,	0	8	10.1,	12.6,	0	9	10.1,	10.3,	0	10	10.1,	7.7,	0	11	10.1,	4.9,	0	12	10.1,	6.6,	0
13	10.1,	9.3,	0	14	10.1,	11.8,	0	15	10.1,	13.8,	0	16	10.1,	15.5,	0	17	10.1,	16.7,	0	18	10.1,	17.4,	0
19	10.1,	17.5,	0	20	10.1,	17.2,	0	21	10.1,	17.5,	0	22	10.1,	17.5,	0	23	10.1,	17.0,	0	24	10.1,	16.0,	0
25	10.1,	14.6,	0	26	10.1,	12.6,	0	27	10.1,	10.3,	0	28	10.1,	7.7,	0	29	10.1,	4.9,	0	30	10.1,	6.6,	0
31	10.1,	9.3,	0	32	10.1,	11.8,	0	33	10.1,	13.8,	0	34	10.1,	15.5,	0	35	10.1,	16.7,	0	36	10.1,	17.4,	0

SOURCE ID: S5CHR

IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK	IFV	BH	BW	WAK
1	13.7,	18.9,	0	2	13.7,	15.2,	0	3	13.7,	16.0,	0	4	13.7,	19.6,	0	5	13.7,	23.1,	0	6	13.7,	26.4,	0
7	13.7,	29.3,	0	8	13.7,	31.7,	0	9	13.7,	33.5,	0	10	13.7,	34.7,	0	11	13.7,	35.3,	0	12	13.7,	35.2,	0
13	13.7,	34.5,	0	14	13.7,	33.1,	0	15	13.7,	31.2,	0	16	13.7,	28.7,	0	17	13.7,	25.8,	0	18	13.7,	22.5,	0
19	13.7,	18.9,	0	20	13.7,	15.2,	0	21	13.7,	16.0,	0	22	13.7,	19.6,	0	23	13.7,	23.1,	0	24	13.7,	26.4,	0
25	13.7,	29.3,	0	26	13.7,	31.7,	0	27	13.7,	33.5,	0	28	13.7,	34.7,	0	29	13.7,	35.3,	0	30	13.7,	35.2,	0
31	13.7,	34.5,	0	32	13.7,	33.1,	0	33	13.7,	31.2,	0	34	13.7,	28.7,	0	35	13.7,	25.8,	0	36	13.7,	22.5,	0

```
*** ISCST3 - VERSION 02035 ***    *** Mariposa Energy LLC                                          ***       08/10/09
                                  *** Application #020737                                          ***       11:23:36
**MODELOPTs:                                                                                                  PAGE   6
CONC                    RURAL ELEV          DFAULT

                              *** METEOROLOGICAL DAYS SELECTED FOR PROCESSING ***
                                                 (1=YES; 0=NO)

        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1 1 1 1 1
        1 1 1 1 1 1 1 1 1 1  1 1 1 1 1 1

  NOTE:  METEOROLOGICAL DATA ACTUALLY PROCESSED WILL ALSO DEPEND ON WHAT IS INCLUDED IN THE DATA FILE.

                   *** UPPER BOUND OF FIRST THROUGH FIFTH WIND SPEED CATEGORIES ***
                                               (METERS/SEC)

                                   1.54,    3.09,    5.14,    8.23,   10.80,

                                       *** WIND PROFILE EXPONENTS ***
```

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
B	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01	.70000E-01
C	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00	.10000E+00
D	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00	.15000E+00
E	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00	.35000E+00
F	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00	.55000E+00

*** VERTICAL POTENTIAL TEMPERATURE GRADIENTS ***
(DEGREES KELVIN PER METER)

STABILITY CATEGORY	WIND SPEED CATEGORY 1	2	3	4	5	6
A	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
B	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
C	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
D	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00	.00000E+00
E	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01	.20000E-01
F	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01	.35000E-01

```
*** ISCST3 - VERSION 02035 ***     *** Mariposa Energy LLC                                   ***        08/10/09
                                   *** Application #020737                                   ***        11:23:36
**MODELOPTs:                                                                                            PAGE   7
CONC                     RURAL ELEV          DFAULT

                    *** THE FIRST  24 HOURS OF METEOROLOGICAL DATA ***

     FILE:   screen3.asc
     FORMAT: (4I2,2F9.4,F6.1,I2,2F7.1,f9.4,f10.1,f8.4,i4,f7.2)
     SURFACE STATION NO.:  99999                   UPPER AIR STATION NO.:  99999
                    NAME: ,                                         NAME: ,
                    YEAR:   1999                                    YEAR:   1999
```

YR MN DY HR	FLOW VECTOR	SPEED (M/S)	TEMP (K)	STAB CLASS	MIXING HEIGHT (M) RURAL	MIXING HEIGHT (M) URBAN	USTAR (M/S)	M-O LENGTH (M)	Z-0 (M)	IPCODE	PRATE (mm/HR)
99 01 01 01	5.0	1.00	293.0	1	320.0	320.0	0.0000	0.0	0.0000	0	0.00
99 01 01 02	5.0	1.50	293.0	1	480.0	480.0	0.0000	0.0	0.0000	0	0.00
99 01 01 03	5.0	2.00	293.0	1	640.0	640.0	0.0000	0.0	0.0000	0	0.00
99 01 01 04	5.0	2.50	293.0	1	800.0	800.0	0.0000	0.0	0.0000	0	0.00
99 01 01 05	5.0	3.00	293.0	1	960.0	960.0	0.0000	0.0	0.0000	0	0.00
99 01 01 06	5.0	1.00	293.0	2	320.0	320.0	0.0000	0.0	0.0000	0	0.00
99 01 01 07	5.0	1.50	293.0	2	480.0	480.0	0.0000	0.0	0.0000	0	0.00
99 01 01 08	5.0	2.00	293.0	2	640.0	640.0	0.0000	0.0	0.0000	0	0.00
99 01 01 09	5.0	2.50	293.0	2	800.0	800.0	0.0000	0.0	0.0000	0	0.00
99 01 01 10	5.0	3.00	293.0	2	960.0	960.0	0.0000	0.0	0.0000	0	0.00
99 01 01 11	5.0	3.50	293.0	2	1120.0	1120.0	0.0000	0.0	0.0000	0	0.00
99 01 01 12	5.0	4.00	293.0	2	1280.0	1280.0	0.0000	0.0	0.0000	0	0.00
99 01 01 13	5.0	4.50	293.0	2	1440.0	1440.0	0.0000	0.0	0.0000	0	0.00
99 01 01 14	5.0	5.00	293.0	2	1600.0	1600.0	0.0000	0.0	0.0000	0	0.00
99 01 01 15	5.0	1.00	293.0	3	320.0	320.0	0.0000	0.0	0.0000	0	0.00
99 01 01 16	5.0	1.50	293.0	3	480.0	480.0	0.0000	0.0	0.0000	0	0.00
99 01 01 17	5.0	2.00	293.0	3	640.0	640.0	0.0000	0.0	0.0000	0	0.00
99 01 01 18	5.0	2.50	293.0	3	800.0	800.0	0.0000	0.0	0.0000	0	0.00
99 01 01 19	5.0	3.00	293.0	3	960.0	960.0	0.0000	0.0	0.0000	0	0.00
99 01 01 20	5.0	3.50	293.0	3	1120.0	1120.0	0.0000	0.0	0.0000	0	0.00
99 01 01 21	5.0	4.00	293.0	3	1280.0	1280.0	0.0000	0.0	0.0000	0	0.00
99 01 01 22	5.0	4.50	293.0	3	1440.0	1440.0	0.0000	0.0	0.0000	0	0.00
99 01 01 23	5.0	5.00	293.0	3	1600.0	1600.0	0.0000	0.0	0.0000	0	0.00
99 01 01 24	5.0	8.00	293.0	3	2560.0	2560.0	0.0000	0.0	0.0000	0	0.00

```
*** NOTES:  STABILITY CLASS 1=A, 2=B, 3=C, 4=D, 5=E AND 6=F.
            FLOW VECTOR IS DIRECTION TOWARD WHICH WIND IS BLOWING.
```

```
*** ISCST3 - VERSION 02035 ***    *** Mariposa Energy LLC                                                    ***       08/10/09
                                  *** Application #020737                                                    ***       11:23:36
**MODELOPTs:                                                                                                           PAGE   8
CONC                     RURAL ELEV         DFAULT

                                            *** THE SUMMARY OF HIGHEST  1-HR RESULTS ***

                                    ** CONC OF OTHER     IN MICROGRAMS/M**3                           **

                                                       DATE                                                            NETWORK
GROUP ID                          AVERAGE CONC      (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZFLAG)     OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

CANCER   HIGH  1ST HIGH VALUE IS       1.34263  ON 99010408: AT (  623322.31,  4183379.00,     33.50,      0.00)  DC       NA
         HIGH  2ND HIGH VALUE IS       1.28731  ON 99010918: AT (  623347.31,  4183391.50,     33.10,      0.00)  DC       NA

CHRONIC  HIGH  1ST HIGH VALUE IS       0.00127  ON 99012523: AT (  624275.75,  4183743.50,     20.00,      0.00)  DC       NA
         HIGH  2ND HIGH VALUE IS       0.00126  ON 99012317: AT (  624275.75,  4183781.00,     19.00,      0.00)  DC       NA

 *** RECEPTOR TYPES:  GC = GRIDCART
                      GP = GRIDPOLR
                      DC = DISCCART
                      DP = DISCPOLR
                      BD = BOUNDARY

*** Message Summary : ISCST3 Model Execution ***

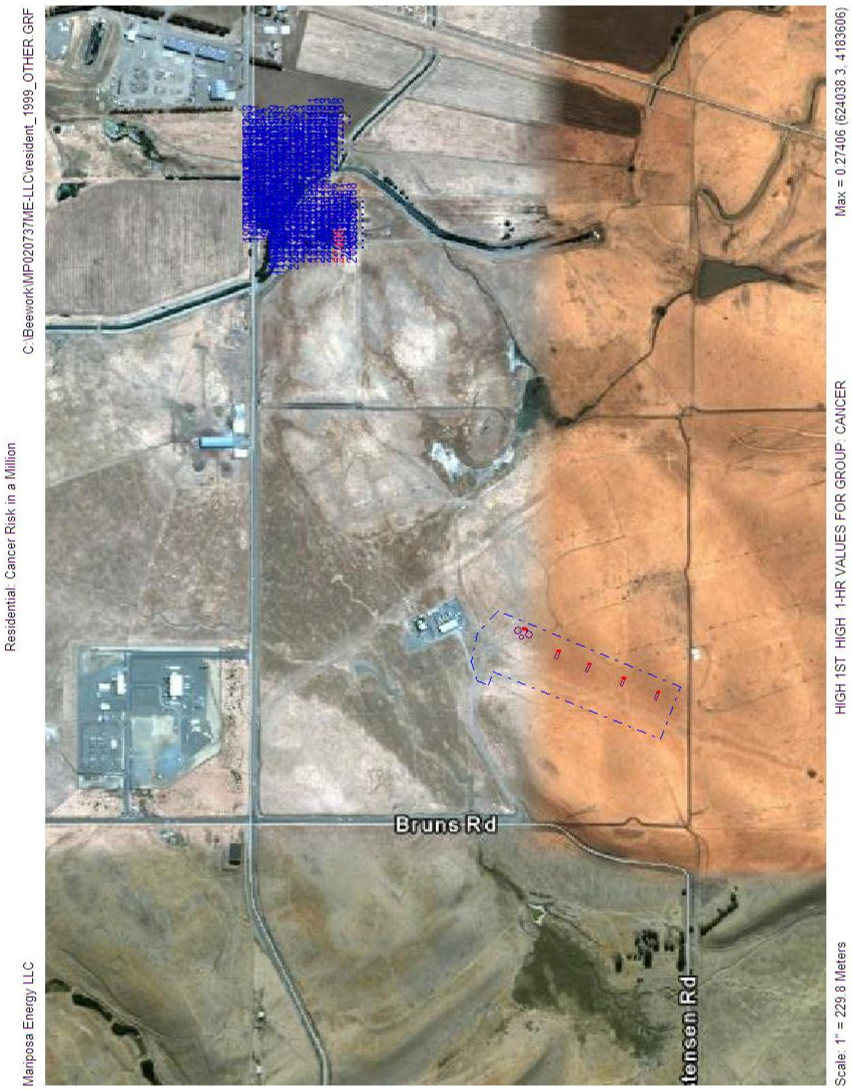
 --------- Summary of Total Messages --------

A Total of          0 Fatal Error Message(s)
A Total of          1 Warning Message(s)
A Total of          0 Informational Message(s)

   ******** FATAL ERROR MESSAGES ********
              ***  NONE  ***

   ********   WARNING MESSAGES   ********
RE W282  1845 CHK_EL:RecElev < SrcBase; See non-DFAULT HE>ZI option in  MCB#9

   ************************************
   *** ISCST3 Finishes Successfully ***
   ************************************
```



Mariposa Energy Project
Risk Screening Report

worker_1999_OTHER

*** ISCST3 - VERSION 02035 ***
*** Mariposa Energy LLC ***
*** Model Executed on 08/10/09 at 16:37:31 ***
Input File - C:\Beework\MP020737ME-LLC\worker_1999_OTHER.DTA

Output File - C:\Beework\MP020737ME-LLC\worker_1999_OTHER.LST

Met File - C:\Beework\metdata\screen3.asc

Number of sources - 10
Number of source groups - 3
Number of receptors - 1671

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
S1CAN	0	0.66400E-02	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES	
S2CAN	0	0.66400E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES	
S3CAN	0	0.66400E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES	
S4CAN	0	0.66400E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES	
S5CAN	0	0.12200E-02	623306.6	4183270.8	36.6	3.66	740.93	35.26	0.15	YES	
S1CHR	0	0.82800E-03	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES	
S2CHR	0	0.82800E-03	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES	
S3CHR	0	0.82800E-03	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES	
S4CHR	0	0.82800E-03	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES	
S5CHR	0	0.86800E-06	623306.6	4183270.8	36.6	3.66	740.93	35.26	0.15	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
CANCER	S1CAN , S2CAN , S3CAN , S4CAN , S5CAN ,
CHRONIC	S1CHR , S2CHR , S3CHR , S4CHR , S5CHR ,
ICECAN	S5CAN ,

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
CANCER	HIGH 1ST HIGH VALUE IS	1.34263	ON 99010408:	AT (623322.31, 4183379.00, 33.50, 0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	1.28731	ON 99010918:	AT (623347.31, 4183391.50, 33.10, 0.00)	DC	NA
CHRONIC	HIGH 1ST HIGH VALUE IS	0.00127	ON 99012523:	AT (624275.75, 4183743.50, 20.00, 0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	0.00126	ON 99012317:	AT (624275.75, 4183781.00, 19.00, 0.00)	DC	NA
ICECAN	HIGH 1ST HIGH VALUE IS	1.34263	ON 99010408:	AT (623322.31, 4183379.00, 33.50, 0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	1.28676	ON 99010918:	AT (623347.31, 4183391.50, 33.10, 0.00)	DC	NA

Page 1

```
                                                      resident_1999_OTHER
*** ISCST3 - VERSION 02035 ***
*** Mariposa Energy LLC                                       ***
*** Model Executed on 08/10/09 at 10:25:07 ***
 Input File - C:\Beework\MP020737ME-LLC\resident_1999_OTHER.DTA

Output File - C:\Beework\MP020737ME-LLC\resident_1999_OTHER.LST

   Met File - C:\Beework\metdata\screen3.asc

      Number of sources -        10
Number of source groups -         2
    Number of receptors -      1154

                                       *** POINT SOURCE DATA ***

             NUMBER EMISSION RATE                      BASE     STACK   STACK    STACK     STACK    BUILDING EMISSION RATE
   SOURCE     PART.  (GRAMS/SEC)      X         Y      ELEV.    HEIGHT  TEMP.  EXIT VEL. DIAMETER   EXISTS   SCALAR VARY
     ID       CATS.                (METERS)  (METERS) (METERS) (METERS) (DEG.K)  (M/SEC)  (METERS)                 BY
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -

   S1CAN        0   0.13600E-01  623264.9 4183205.5    36.9    24.23   726.48    46.37     3.66      YES
   S2CAN        0   0.13600E-01  623239.9 4183147.2    36.9    24.23   726.48    46.37     3.66      YES
   S3CAN        0   0.13600E-01  623213.3 4183081.2    36.9    24.23   726.48    46.37     3.66      YES
   S4CAN        0   0.13600E-01  623186.1 4183015.5    36.9    24.23   726.48    46.37     3.66      YES
   S5CAN        0   0.14700E-02  623306.6 4183270.8    36.6     3.66   740.93    35.26     0.15      YES
   S1CHR        0   0.16300E-02  623264.9 4183205.5    36.9    24.23   726.48    46.37     3.66      YES
   S2CHR        0   0.16300E-02  623239.9 4183147.2    36.9    24.23   726.48    46.37     3.66      YES
   S3CHR        0   0.16300E-02  623213.3 4183081.2    36.9    24.23   726.48    46.37     3.66      YES
   S4CHR        0   0.16300E-02  623186.1 4183015.5    36.9    24.23   726.48    46.37     3.66      YES
   S5CHR        0   0.88600E-06  623306.6 4183270.8    36.6     3.66   740.93    35.26     0.15      YES

                                 *** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID                                             SOURCE IDs

 CANCER    S1CAN    , S2CAN    , S3CAN    , S4CAN    , S5CAN    ,

 CHRONIC   S1CHR    , S2CHR    , S3CHR    , S4CHR    , S5CHR    ,

                                       *** THE SUMMARY OF HIGHEST  1-HR RESULTS ***

                                ** CONC OF OTHER     IN MICROGRAMS/M**3                           **

                                                 DATE                                                                NETWORK
GROUP ID                          AVERAGE CONC    (YYMMDDHH)            RECEPTOR  (XR, YR, ZELEV, ZFLAG)    OF TYPE  GRID-ID
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
CANCER    HIGH  1ST HIGH VALUE IS        0.27406  ON 99012924: AT (  624038.25,  4183606.00,     22.90,      0.00)  DC      NA
          HIGH  2ND HIGH VALUE IS        0.21477  ON 99013001: AT (  624038.25,  4183606.00,     22.90,      0.00)  DC      NA
CHRONIC   HIGH  1ST HIGH VALUE IS        0.01525  ON 99042024: AT (  616424.25,  4180092.50,    254.40,      0.00)  DC      NA
          HIGH  2ND HIGH VALUE IS        0.01525  ON 99041818: AT (  616424.25,  4180092.50,    254.40,      0.00)  DC      NA

                                                          Page 1
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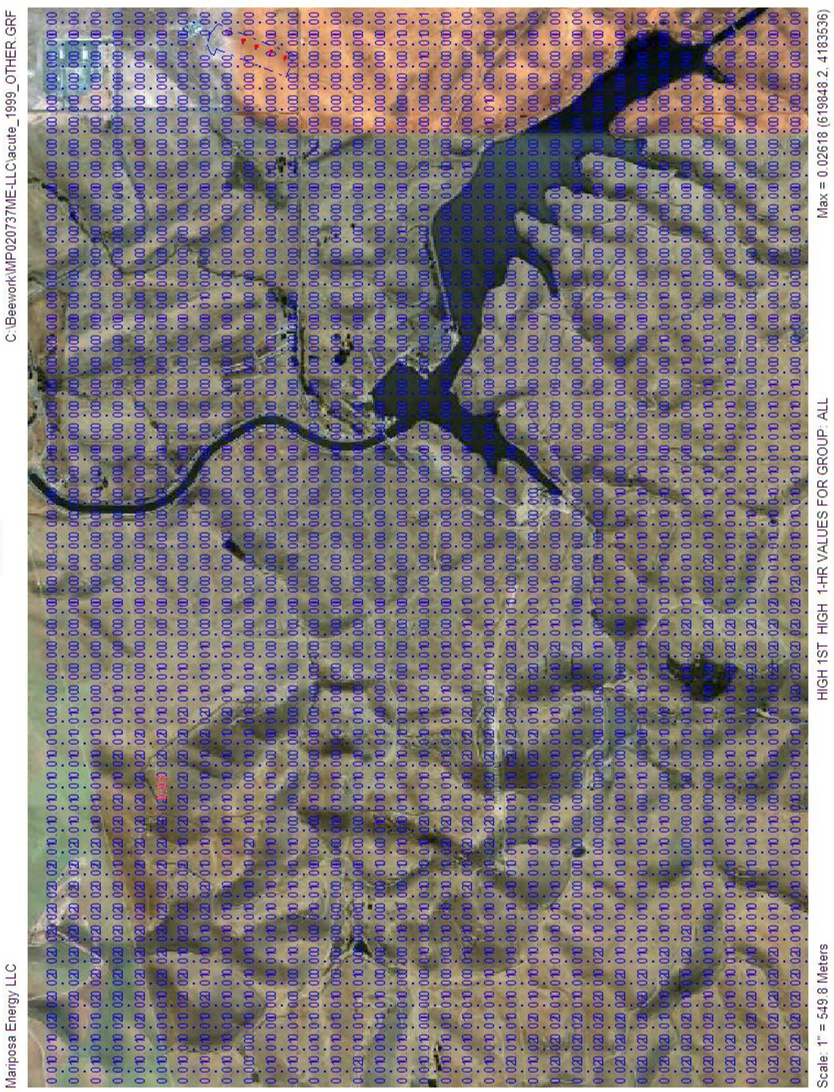

Mariposa Energy Project
Risk Screening Report

```
*** ISCST3 - VERSION 02035 ***
*** Mariposa Energy LLC                                              ***
*** Model Executed on 08/10/09 at 15:19:10 ***
 Input File - C:\Beework\MP020737ME-LLC\acute_1999_OTHER.DTA

Output File - C:\Beework\MP020737ME-LLC\acute_1999_OTHER.LST

   Met File - C:\Beework\metdata\screen3.asc

      Number of sources -          4
Number of source groups -          1
    Number of receptors -       3571
```

*** POINT SOURCE DATA ***

SOURCE ID	NUMBER PART. CATS.	EMISSION RATE (GRAMS/SEC)	X (METERS)	Y (METERS)	BASE ELEV. (METERS)	STACK HEIGHT (METERS)	STACK TEMP. (DEG.K)	STACK EXIT VEL. (M/SEC)	STACK DIAMETER (METERS)	BUILDING EXISTS	EMISSION RATE SCALAR VARY BY
S1	0	0.13100E-02	623264.9	4183205.5	36.9	24.23	726.48	46.37	3.66	YES	
S2	0	0.13100E-02	623239.9	4183147.2	36.9	24.23	726.48	46.37	3.66	YES	
S3	0	0.13100E-02	623213.3	4183081.2	36.9	24.23	726.48	46.37	3.66	YES	
S4	0	0.13100E-02	623186.1	4183015.5	36.9	24.23	726.48	46.37	3.66	YES	

*** SOURCE IDs DEFINING SOURCE GROUPS ***

GROUP ID	SOURCE IDs
ALL	S1 , S2 , S3 , S4 ,

*** THE SUMMARY OF HIGHEST 1-HR RESULTS ***

** CONC OF OTHER IN MICROGRAMS/M**3 **

GROUP ID		AVERAGE CONC	DATE (YYMMDDHH)	RECEPTOR (XR, YR, ZELEV, ZFLAG)	OF TYPE	NETWORK GRID-ID
ALL	HIGH 1ST HIGH VALUE IS	0.02618	ON 99050206: AT (	619848.19, 4183535.50, 231.60, 0.00)	DC	NA
	HIGH 2ND HIGH VALUE IS	0.02618	ON 99050412: AT (	619848.19, 4183535.50, 231.60, 0.00)	DC	NA

Page 1