

**AIR QUALITY**  
MANAGEMENT DISTRICT**STATEMENT OF BASIS  
FOR  
1st RENEWAL OF TITLE V & TITLE IV FEDERAL OPERATING PERMIT**APPLICATION NO.: TV2012-19-01DATE: January 15, 2013REVIEWING ENGINEER: Venk Reddy**A. FACILITY INFORMATION**

**FACILITY NAME:** Cosumnes Power Plant  
Sacramento Municipal Utility District Financing Authority  
(SFA)

**LOCATION:** 14295 Clay East Road  
Herald, CA 95638

**MAILING ADDRESS:** P.O. Box 15830  
Sacramento, CA 95852

**RESPONSIBLE OFFICIAL:** Paul Lau, SFA Representative  
(916) 732-6252

**CONTACT PERSON:** Dave Blevins, Facility Manager  
(209) 748-5179

**B. PURPOSE OF THIS STATEMENT OF BASIS**

The Title V & Title IV Federal Operating Permit is intended to be a document containing only enforceable terms and conditions as well as any additional information, such as the identification of emission units, emission points, emission sources and processes that makes the terms meaningful. 40 CFR Part 70.7(a)(5) requires that each Title V permit have an accompanying "...statement that sets forth the legal and factual basis for the draft permit conditions". The purpose of this Statement of Basis is to satisfy the above requirement by providing pertinent details regarding the permit/application data and permit conditions in a more easily understandable format. This report will also include background narrative and explanations of regulatory decisions made by the reviewer. It should be emphasized that this Statement of Basis, while based on information contained in the permit, is a separate document and is not itself an enforceable term and condition of the permit. The statement of basis and operating permit will cover conditions relative to Title IV acid rain program.

### C. PERMIT HISTORY

This Statement of Basis is for the first renewal of the initial Title V & Title IV Federal Operating Permit originally issued to Cosumnes Power Plant on March 10, 2008. The current Title V & Title IV Federal Operating Permit has a March 10, 2013 expiration date. The following permit actions have occurred since the initial Federal Operating Permit was issued:

<u>Permit Action</u>	<u>Date Issued</u>	<u>Permit No.</u>
Initial Title V and Title IV Federal Operating Permit	03-10-2008	TV2006-19-01
1st Administrative Amendment	09-03-2008	TV2006-19-01A
2nd Administrative Amendment	09-10-2009	TV2006-19-01B
1st Significant Modification	11-04-2011	TV2006-19-02
2nd Significant Modification	01-17-2013	TV2006-19-03

#### **D. FACILITY DESCRIPTION**

SFA Cosumnes Power Plant became operational in October 2005. The facility generates electricity only and does not provide steam for use by others. There are two gas turbine generator units:

- a. baseload gas turbine no. 2 with a non-fired heat recovery steam generator (HRSG).
- b. baseload gas turbine no. 3 with a non-fired heat recovery steam generator (HRSG).

The major components of the facility are the combined cycle gas turbines, HRSGs, steam turbine, emission control systems, exhaust stacks, water treatment systems, fuel delivery systems and electrical transmission and interconnection systems.

Each gas turbine combusts natural gas or a mixture of natural gas and digester gas, and is not permitted to combust any type of emergency backup fuel. Each gas turbine operating at or near maximum load, produces up to 170 megawatts of electrical power, 24 hours per day and 365 days per year. The steam produced by the two HRSGs drives a single steam turbine, which produces up to 190 megawatts of electrical power. The total electrical power produced by the facility is approximately 530 MW.

Each gas turbine is equipped with a selective catalytic reduction (SCR) air pollution control system to reduce emissions of nitrogen oxides (NO<sub>x</sub>). The SCR system reduces emissions to a level that was determined to be the best available control technology (BACT) at the time the facility was approved for construction in 2002. Carbon monoxide (CO) and volatile organic compound (VOC) emissions are reduced by controlling the combustion process in the gas turbines. Particulate matter (PM<sub>10</sub> & PM<sub>2.5</sub>) and sulfur oxides (SO<sub>x</sub>) emissions are reduced by combusting natural gas and digester gas rather than a liquid or solid fuel.

The facility has an eight cell cooling tower with a drift eliminator to reduce PM<sub>10</sub> & PM<sub>2.5</sub> emissions and a dust collector connected to a perlite storage silo. Perlite is used for water filtration at the facility.

To be consistent with other permitting actions, local SMAQMD and federal regulation applicability, PM<sub>2.5</sub> and Greenhouse gasses will be added to the permit at this time. These pollutants are added for inventory purposes only and do not represent federally enforceable emission limits.

## **E. SIGNIFICANT EMISSIONS UNIT INFORMATION**

### **GAS TURBINE NO. 2 (SMAQMD P/O No. 22673)**

The gas turbine is a General Electric 7FA that produces approximately 170 MW (gross). This turbine is a combined cycle unit. The heat input rating to the gas turbine is 1865 MMBTU/hr. The fuel is natural gas and digester gas.

### **GAS TURBINE NO. 3 (SMAQMD P/O No. 22674)**

The gas turbine is a General Electric 7FA that produces approximately 170 MW (gross). This turbine is a combined cycle unit. The heat input rating to the gas turbine is 1865 MMBTU/hr. The fuel is natural gas and digester gas.

Each gas turbine and its associated heat recovery steam generator (HRSG) is considered a combined cycle unit, and neither HRSG is equipped with duct burners.

### **AIR POLLUTION CONTROL SELECTIVE CATALYTIC REDUCTION SERVING GAS TURBINE No. 2 (SMAQMD P/O No. 16012(Rev01))**

A selective catalytic reduction (SCR) system is utilized for NO<sub>x</sub> control on the gas turbine. The catalyst is installed in a temperature zone of the HRSG that allows the catalyst to be most effective at all loads. The SCR system is comprised of a reactor chamber, catalyst modules, ammonia storage system, ammonia injection system, monitoring equipment and sensors. The ammonia injection rate is controlled by monitoring the flow rate and NO<sub>x</sub> concentration. The SCR system is designed to control NO<sub>x</sub> to 2 ppmv at 15% O<sub>2</sub>.

### **AIR POLLUTION CONTROL SELECTIVE CATALYTIC REDUCTION SERVING GAS TURBINE No. 3 (SMAQMD P/O No. 16013(Rev01))**

A selective catalytic reduction (SCR) system is utilized for NO<sub>x</sub> control on the gas turbine. The catalyst is installed in a temperature zone of the HRSG that allows the catalyst to be most effective at all loads. The SCR system is comprised of a reactor chamber, catalyst modules, ammonia storage system, ammonia injection system, monitoring equipment and sensors. The ammonia injection rate is controlled by monitoring the flow rate and NO<sub>x</sub> concentration. The SCR system is designed to control NO<sub>x</sub> to 2 ppmv at 15% O<sub>2</sub>.

### **COOLING TOWER (SMAQMD P/O No. 22672)**

The cooling systems for the two gas turbines and the steam turbine are served by an eight cell, counterflow, mechanical-draft cooling tower. The cooling tower can circulate a maximum of 155,000 gallons of cooling water per minute. The cooling tower mist eliminator has a maximum drift rate of 0.0005% and the cooling water has a maximum total dissolved solids content of 1,500 ppmw. The cooling towers are served by a continuous parameter monitoring system that monitors the total dissolved solids content of the circulated water.

### **PERLITE STORAGE SILO DUST COLLECTOR (SMAQMD P/O No. 22702)**

The dust collector is connected to the perlite storage silo. It is used primary for control of dust during the loading of perlite. It is sized to 405 sq. ft. filter area and 585 Max acfm and 6" water pressure.

**F. INSIGNIFICANT EMISSIONS UNIT INFORMATION**

The following systems are considered insignificant emissions units and are not subject to equipment specific requirements. However, these units are required to comply with all applicable general requirements.

Equipment or Process	Basis for Designation as Insignificant
Vehicles Manlifts/Tool carrier/fork lifts	SMAQMD Rule 201 Section 111.1 Vehicles used to transport passengers or freight.
Portable pressure washer – 5 hp Portable generator – 5 hp Push blower – 6 hp Backpack blower – 2 hp Steam cleaner – 11 hp String trimmer – 2 hp Portable welder - 22 hp Portable generator for detention pond filtration system - 45 hp	SMAQMD Rule 201 Section 112.1 Internal combustion engines with a manufacturer's maximum continuous rating of 50 hp or less.
Air conditioners	SMAQMD Rule 201 Section 115 Air conditioning systems not designed to remove air contaminants.
Hydrogen storage tanks CO2 storage tanks	SMAQMD Rule 201 Section 117.1 Tanks used for the storage of liquefied or compressed gases.
Lube oil storage tanks Waste lube oil storage tanks Water/waste oil separator	SMAQMD Rule 201 Section 117.2 Tanks used for the storage of unheated organic materials with a vapor pressure $\leq$ 5 mm Hg (0.1 psia) or initial boiling point $\geq$ 150 °C (302 °F).
Maintenance shop painting	SMAQMD Rule 201 Section 118 Surface coating operations using a combined total of one gallon per day or less of coating material or solvent.

**F. INSIGNIFICANT EMISSIONS UNIT INFORMATION**

Equipment or Process	Basis for Designation as Insignificant
Water treatment chemical storage tanks (calcium chloride, sulfuric acid, sodium sulfate, sodium hypochlorite corrosion inhibitor, biocide, etc.)	SMAQMD Rule 201 Section 122 Other equipment which would emit any pollutant, without the benefit of air pollution control devices, at a rate less than 2 pounds in any 24 hour period.
Water storage tanks	
Degreaser - water based cleaner	
Water washing skid - water based cleaner	
Abrasive blasting cabinet	
Welding equipment	
Various natural gas valves and flanges	
Aqueous ammonia storage tank	
Zero liquid discharge system	

**G. ALTERNATE OPERATING SCENARIOS**

None requested by the permittee.

## H. RECENT PERMIT ACTIONS

The following is a breakdown of changes done from the initial permit issuance.

<u>Permit Action</u>	<u>Date Issued</u>	<u>Permit No.</u>
Initial Title V and Title IV Federal Operating Permit	03-10-2008	TV2006-19-01
1st Administrative Amendment	09-03-2008	TV2006-19-01A
2nd Administrative Amendment	09-10-2009	TV2006-19-01B
1st Significant Modification	11-04-2011	TV2006-19-02
2nd Significant Modification	01-17-2013	TV2006-19-03

TV2006-19-01A – An administrative amendment to change the facility manager & Permit language change per EPA comments.

TV-2006-19-01B – An administrative amendment to change the facility manager.

TV-2006-19-02 – A significant modification that gave the applicant the ability to use digester gas, changed the TDS level of the cooling towers and PM emission rates, and added the baghouse, connected to the perlite storage silo.

TV-2006-19-03 - A significant modification that updated/revised the permit language interpretation of the shutdown provisions from SMAQMD Rule 413, Section 113, update of CAM conditions, change of responsible official, change of permit language from ROC to VOC and additional clarification to the source testing of the turbines, silo dust collector and cooling towers.

**I. FACILITY EMISSIONS**

Equipment	Potential Annual Emissions (tons per year)						
	VOC	NOx	SOx	PM10	CO	Single HAP	Total HAPs
Gas Turbine No. 2 Gas Turbine No. 3 Cooling Tower, & Perlite Storage Silo	30 (A)	126 (A)	13 (A)	81 (A)	298 (A)	4 (B)	12 (B)

(A) The emission value is based on permitted levels.

(B) The HAP values are based on proposed HAP emission levels submitted with the SMAQMD Rule 201 permit application. They are not federally enforceable emission limits. The federally enforceable emission limits would be 9.9 tons/year for a single HAP and 24.9 tons/year for a combination of HAPs.

Equipment	Potential Annual Emissions (tons per year)			
	PM2.5 (A)	GHG, CO2e (B)	GHG, CO2e (C) (Methane and N2O)	GHG, CO2e (D)
Gas Turbine No. 2 Gas Turbine No. 3 Cooling Tower, & Perlite Storage Silo	79	1,893,496	1,873	73,822

(A) A conversion factor of 0.998 was used to convert PM10 from the turbines to PM2.5 as referenced in SMAQMD document "COMMUNITY BANK AND PRIORITY RESERVE BANK PM2.5 EMISSION REDUCTION CREDIT EVALUATION" 8-9-2012, The factor of PM2.5 for the cooling tower is based on submitted data from the applicant as part of permit 22672. PM2.5 is assumed to be equal to PM10 for the perlite storage silo.

(B) GHG emission factor is based on 40 CFR part 75, Appx G, Eq G-4, assuming all fuel is natural gas.

(C) GHG emission factors for Methane and N2O are based on 40 CFR part 98.33 Table C-2, Global warming potential from 40 CFR Part 98, Table A-1

(D) GHG emission factors are based on 40 CFR part 75, Appx G, Eq G-4 & 40 CFR part 98.33, Eq C-5. Calculation is based on fuel flow of 2,500 scfm of digester gas

GHG and PM2.5 are being added to the Title V and Title IV permit at this time to show consistency with the local district permit. Detailed calculations of GHG are located at the end of the Statement of Basis, in Attachment B

**J. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Facility-wide Requirements**

**SMAQMD Rule 201 - General Permit Requirements**

SIP approved: 07-13-1987 (52 FR 26148)  
11-20-1984 rule version SIP approved  
08-24-2006 rule version is the current version and is not SIP approved

Rule Description: This rule provides an orderly procedure for the review of new sources of air pollution and of the modification and operation of existing sources through the issuance of permits.

Compliance Status: The permittee has active permits for all sources that require permits.

**SMAQMD Rule 202 - New Source Review**

SIP approved: SIP approval of 11-20-1984 rule version was withdrawn on 8-19-2011  
08-23-2012 rule version is the current version and is not SIP approved.  
This rule is not Federally enforceable

Rule Description: This rule sets the procedures for review of new and modified stationary sources and provides the mechanisms for evaluating the applicability of BACT and/or offset requirements.

Compliance Status: New and modified stationary sources at the permittee's facility have been reviewed pursuant to this rule. BACT and/or emission offsets have been provided as required by the rule.

**SMAQMD Rule 203 – Prevention of Significant Deterioration**

SIP approved: 01-27-2011

Rule Description: This rule sets the procedures for review of the Prevention of Significant Deterioration (PSD) program is construction permitting program for new major facilities and major modifications to existing major facilities.

Compliance Status: This renewal is not subject to the PSD program since there is no change in emissions.

**SMAQMD Rule 207 - Title V Federal Operating Permits**

SIP approved: 11-21-2003 (68 FR 65637) (part of Title V program approval)  
04-26-2001 rule version is SIP approved

Rule Description: This rule sets forth the procedures for review, issuance and renewal of Title V operating permits.

**J. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Facility-wide Requirements**

Compliance Status: The permittee has submitted a timely and complete Title V & IV application for permit renewal in this current permitting action and is currently operating under an active Title V & IV permit. The applicant has requested a permit shield from SMAQMD Rule 413 and 40 CFR 60 Part GG. SMAQMD shall grant a permit shield where ambiguity or conflict occurs between rule requirements that requires an alternative interpretation to the literal language of the rule. Compliance with a rule condition or the rule entirety is not considered sufficient reason to grant a permit shield.

SMAQMD has reviewed the submitted information from the applicant and does not find any ambiguity or conflicts in rule conditions. SMAQMD does see an operational limitation in compliance with the 9.0 PPM standard for NOx that is provided in SMAQMD Rule 413 and the method of testing required to show compliance with the rule. To provide a more streamlined method of determining compliance between the two standards, compliance with the 2.0 PPM NOx standard, (2.0 ppmvd of NOx at 15% O2, averaged over any 1 hour period, monitored by the CEM) shall be considered equivalent to the 9.0 PPM NOx standard (9.0 ppmvd of NOx at 15% O2, measured by the average of three runs for 15 minutes, determined by using EPA Method 20).

SMAQMD interpreted the conditions of SMAQWMD Rule 413 to provide clarity on the specific configuration of the source. (i.e. two gas turbines and two HRSGs ducted to a single steam turbine.). EPA has previously concurred with the interpretation by SMAQMD in a letter dated 1-16-2013. A permit shield will be placed on the permit that will codify SMAQMD's interpretation as it applies to the applicant.

**SMAQMD Rule 214 - Federal New Source Review**

SIP approved: 07-20-2011 (76 FR 43183)

Rule Description: This rule sets the procedures for review of emissions units at new and modified major stationary sources and provides the mechanisms for evaluating the applicability of BACT and/or offset requirements.

Compliance Status: This is a recently adopted and SIP approved rule. The facility's equipment will be reviewed pursuant to this rule for all future permitting actions.

**SMAQMD Rule 301 – Permit Fees – Stationary Source**

SIP approved: Rule adopted 10-27-2005

**J. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Facility-wide Requirements**

Latest rule revision 08-01-08

The rule is not SIP approved but the portions of the rule related to Title V permit fees are applicable because they are part of the SMAQMD Title V Federal Operating Permit program approved by U.S. EPA on 11-21-2003 (68 FR 65637).

Rule Description: This rule requires the facility to pay fees associated with the issuance and renewal of Title V permits.

Compliance Status: The permittee has paid permit fees as required and is in compliance.

**SMAQMD Rule 401 - Ringelmann Chart**

SIP approved: 02-01-1984 (49 FR 3987)  
*04-19-1983 rule version is SIP approved*

Rule Description: This rule limits the discharge of air contaminants into the atmosphere by limiting visible emissions.

Compliance Status: All equipment at the permittee's facility is expected to comply with the visible emissions requirement.

**SMAQMD Rule 403 - Fugitive Dust**

SIP approved: 12-05-1984 (49 FR 47490);  
*08-03-1977 rule version is SIP approved*

Rule Description: This rule regulates operations which may cause fugitive dust emissions into the atmosphere.

Compliance Status: The permittee's facility complies with this rule by taking the necessary precautions to ensure that fugitive dust is not airborne beyond the property line.

**SMAQMD Rule 442 - Architectural Coatings**

SIP approved: 11-09-1998 (63 FR 14)  
*09-05-1996 rule version is SIP approved*  
*05-24-2001 rule version is the current version and is not SIP approved*

Rule Description: This rule limits the quantity of volatile organic compounds in architectural coatings supplied, sold, offered for sale, applied, solicited for application or

**J. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Facility-wide Requirements**

manufactured for use within the SMAQMD.

Compliance Status: The affected coatings used by the permittee are received and stored in containers that display the required manufacturer's labels and demonstrate compliance with the rule's requirements.

**SMAQMD Rule 466 - Solvent Cleaning**

SIP approved: 05-05-2010 (75 FR 24406)  
*10-28-2010 rule version is SIP approved*

Rule Description: This rule reduces the emissions of volatile organic compounds from solvent cleaning operations and activities, and from the storage and disposal of new and spent cleaning solvents.

Compliance Status: The affected architectural coating application equipment solvent cleaning materials used by the facility are received and stored in containers that display the required manufacturer's labels and demonstrate compliance with the rule's requirements.

**SMAQMD Rule 701 - Emergency Episode Plan**

SIP approved: 09-05-2000 (65 FR 53602):

Rule Description: This rule requires a plan be prepared for specific actions to be taken when health related levels of ozone, carbon monoxide or PM10 are exceeded.

Compliance Status: The permittee has prepared the required Emergency Episode Plan and will take the actions required in the plan when notified by the Air Pollution Control Officer of elevated pollutant levels.

**40 CFR 68 (begin at 68.1) - Chemical Accident Prevention Provisions**

Promulgated: 01-31-1994 (59 FR 4493)  
[04-09-2004 (69 FR 18831) most recent amendment]

Rule Description: This regulation specifies requirements for owners or operators of stationary sources concerning the prevention of accidental chemical releases.

An owner or operator of a stationary source that has more than a threshold quantity of a regulated substance in a

**J. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Facility-wide Requirements**

process, as determined under 40 CFR 68.115, must comply with the requirements of 40 CFR Part 68.

40 CFR 68.215 requires that the air permitting authority include in the Title V permit for a facility specified statements regarding the regulation. Those statements are included in the Federally Enforceable Requirements - General section of the permit.

Compliance Status:

The permittee does not store regulated substances in quantities exceeding the thresholds specified in 40 CFR 68 and is in compliance with the requirements of the regulation.

**K. APPLICABLE NON FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Facility-wide Requirements**

The requirements specified under this section are enforceable by the SMAQMD only. They are not federally enforceable and are not SIP approved.

**SMAQMD Rule 306 - Air Toxic Fees**

SIP approved: Not SIP approved.

Rule Description: This rule requires the facility to pay fees associated with toxic emissions regulated through the California "Toxic Hotspot" Program.

Compliance Status: The permittee has paid toxic fees as required and is in compliance.

**SMAQMD Rule 602 - Breakdown Conditions: Emergency Variance**

SIP approved: Not SIP approved.

Rule Description: This rule requires the facility to notify the SMAQMD of any equipment breakdowns that cause an emission violation and to follow specific procedures.

Compliance Status: The permittee has complied with the requirements of the rule when equipment breakdowns have caused emission violations.

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

**SMAQMD Rule 406 - Specific Contaminants**

SIP approved: 12-05-84 (49 FR 47490)  
12-06-1978 rule version is SIP approved

Rule Description: This rule regulates emissions of sulfur compounds and combustion contaminants by limiting emission concentrations. The rule limits the emission of sulfur compounds, calculated as SO<sub>2</sub> to 0.2% by volume. The rule limits particulate matter to 0.1 grains/dscf at 12% CO<sub>2</sub>.

Compliance Status:In the following discussion all particulate emissions from the gas turbines are assumed to be PM<sub>10</sub>. If the PM<sub>10</sub> concentration complies with the rule limits then the PM concentration would also comply with the rule limits.

Gas Turbine No. 2

Based on 2007 source test results, the PM<sub>10</sub> emission concentration from Gas Turbine No. 2 is 0.0019 grains/dscf at 12% CO<sub>2</sub>. The rule limit for particulate matter is 0.1 grains/dscf at 12% CO<sub>2</sub>. Per the applicant the use of digester gas is not expected to change these results.

Based on source test results, the sulfur compounds emission (SO<sub>x</sub>) from Gas Turbine No. 2 is in compliance with the rule limits for sulfur compounds emission (SO<sub>2</sub>) to not exceed 0.2% by volume.

Gas Turbine No. 3

Based on 2007 source test results, the PM<sub>10</sub> emission concentration from Gas Turbine No. 3 is 0.0015 grains/dscf at 12% CO<sub>2</sub>. The rule limit for particulate matter is 0.1 grains/dscf at 12% CO<sub>2</sub>.

Based on source test results, the sulfur compounds emission (SO<sub>x</sub>) from Gas Turbine No. 3 is in compliance with the rule limits for sulfur compounds emission (SO<sub>2</sub>) to not exceed 0.2% by volume.

**SMAQMD Rule 413 – Stationary Gas Turbines**

SIP approved: 01-10-2008 (73 FR 1819)

Rule Description: This rule limits the quantity of nitrogen oxides (NO<sub>x</sub>) to the atmosphere from the operation of stationary gas turbines.

Compliance Status: NO<sub>x</sub> emission limitation –

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

For the purposes of this discussion NOx emission limits are quoted as follows and restated from the operating permit.

NOx	A. 2.0 ppmvd at 15% O <sub>2</sub> , averaged over any 1 hour period
	B. 9.0 ppmvd at 15% O <sub>2</sub> (C), the average of three runs for 15 minutes, determined by using EPA Method 20.
	C. 30 ppmvd at 15% O <sub>2</sub> , averaged over any 1 hour period

The gas turbines are required to meet a NOx emission limitation of 2 ppmvd by SMAQMD Permit to Operate Nos. 22673 and 22674 as a result of a BACT determination made when the initial SMAQMD Authority to Construct was issued in October 2002. The BACT NOx emission limitation is much stricter than the SMAQMD Rule 413 9 ppmvd NOx emission limitation. (See streamlining of multiple applicable requirements discussion at the end of this section titled "Equipment Specific Requirements - Combustion Sources - Gas Turbine Nos. 2 and 3.)

Startup operation -

SMAQMD Permit to Operate Nos. 22673 and 22674 also require that the gas turbines meet the 2 ppmvd NOx emission limit within three hours of a startup operation. The SMAQMD has determined that this is stricter than the SMAQMD Rule 413 requirement of meeting the 9 ppmvd NOx emission limit within the allowed startup time (which depends on the amount of time that the turbine was shutdown). (See streamlining of multiple applicable requirements discussion at the end of this section titled "Equipment Specific Requirements - Combustion Sources - Gas Turbine Nos. 2 and 3.)

For the purposes of complying with this rule, condition V-A.B.9 of the Title V operating permit was added as part of TV2006-19-03. This condition associated the shutdown the gas turbine or HRSG and associated steam piping for equivalent language in the rule for a combined cycle process where there is one steam turbine for two gas turbines as in this case

Short Term Excursion -

SMAQMD Rule 413 allows short-term excursions as they are defined in the rule. SMAQMD Permit to Operate Nos. 22673 and 22674 contain conditions for short-term excursions that are similar to those in SMAQMD Rule 413. The SMAQMD has determined that the permit conditions regulating short-term excursions are stricter than SMAQMD Rule 413. (See streamlining of multiple applicable requirements

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

discussion at the end of this section titled "Equipment Specific Requirements - Combustion Sources - Gas Turbine Nos. 2 and 3.)

**SMAQMD Rule 420 - Sulfur Content of Fuels**

SIP approved: 12-05-1984 (49 FR 47490);  
*08-13-1981 rule version is SIP approved*

Rule Description: This rule regulates emissions of sulfur compounds from combustion of fuels. This rule limits the sulfur content of gaseous fuels to less than 50 grains per 100 cubic feet and the sulfur content of liquid fuels to less than 0.5 percent by weight.

Compliance Status: The commercial natural gas combusted by the gas turbines has a typical sulfur content of 0.5 grains or less per 100 cubic feet. The digester gas is required to have a sulfur content of less than 50 grains per 100 cubic feet. This rule limits the sulfur content of gaseous fuels to less than 50 grains per 100 cubic feet.

**Permit Conditions - SMAQMD Rule 201 Permit to Operate Nos. 22673, 22674, 16012(Rev01) and 16013(Rev01)**

Condition Description: SMAQMD Permit to Operate No. 22673 for Gas Turbine No. 2 with associated SCR, limits emission concentrations, limits mass emissions, requires BACT, requires emission offsets be provided and requires recordkeeping and reporting.

SMAQMD Permit to Operate No. 22674 for Gas Turbine No. 3 with associated SCR, limits emission concentrations, limits mass emissions, requires BACT, requires emission offsets be provided and requires recordkeeping and reporting.

Compliance Status: Each of the gas turbines complies with the requirements of the permit conditions.

**40 CFR Parts 72 through 78 Acid Rain Program:**

Rule Description: This federal regulation limits the emission of NO<sub>x</sub> and SO<sub>x</sub> from electric utility associated combustion equipment such as boilers and gas turbines in order to reduce the formation of acid rain.

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**

**2. Equipment Specific Requirements**

**a. Combustion Sources Only**

**Gas Turbine Nos. 2 and 3 with Associated SCRs**

Compliance Status: SFA Cosumnes Power Plant submitted an Acid Rain permit application to the U.S. EPA dated 12/17/2002. Quarterly reports have been submitted to the U.S. EPA in accordance with the applicable requirements of 40 CFR Part 75. The resulting Title IV (Acid Rain Program) operating permit is contained within the Title V permit

**40 CFR 60 Subpart GG (begin at 60.330) - NSPS for Stationary Gas Turbines:**

Promulgated: 09-10-1979 (44 FR 52798)  
02-24-2006 (71 FR 9457) Most recent amendment

Rule Description: This regulation affects all stationary gas turbines with a heat input greater than 10 MMBTU/hour. The gas turbine emissions are required to not exceed 75 ppmvd of NO<sub>x</sub> at 15% O<sub>2</sub> and 0.015 percent by volume of SO<sub>2</sub> at 15% O<sub>2</sub> on a dry basis .

Compliance Status: The gas turbines are limited by SMAQMD Permit to Operate Nos. 23673 and 23674 to 2 ppmvd NO<sub>x</sub> at 15% O<sub>2</sub>.

The fuel combusted in the turbines is natural gas or a mixture of natural gas and digester gas. The sulfur content of natural gas is less than 0.5 grains per 100 cubic feet and the digester gas is less than 50 grains per 100 cubic feet.

Each gas turbine complies with this federal NSPS, by being less than 150 ppmvd of SO<sub>x</sub> at 15% O<sub>2</sub>.

(See streamlining of multiple applicable requirements discussion at the end of this section titled "Equipment Specific Requirements - Combustion Sources Only - Gas Turbine Nos. 2 and 3.)

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

**40 CFR 60 Subpart D (begin at 60.40) - NSPS for Electric Utility Steam Generating Units for Which Construction Is Commenced After August 17, 1971:**

Promulgated: 06-14-1974 (39 FR 20791)

Rule Description: This federal regulation applies to any fossil fuel fired steam generating unit with a heat input greater than 250 MMBTU. It limits PM emissions to 0.1 lb/MMBTU, NO<sub>x</sub> to 0.20 lb/MMBTU and opacity to 20% except for

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

one six minute period per hour of not more than 27% opacity.

Compliance Status: Each gas turbine is not subject to this rule because it is not a fossil fuel fired steam generating unit as defined in 40 CFR 60.41(a).

"Fossil-fuel fired steam generating unit means a furnace or boiler used in the process of burning fossil fuel for the purpose of producing steam by heat transfer."

Each gas turbine is not a "furnace or boiler" and is therefore not subject to the rule.

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

40 CFR 60 Subpart Da (begin at 60.40a) - NSPS for Electric Utility Steam Generating Units for Which Construction Is Commenced After September 18, 1978:

Promulgated: 06-11-1979 (44 FR 33613)

Rule Description: This federal regulation applies to any steam electric generating unit capable of combusting 250 MMBTU/hour of fossil fuel and supplying more than 1/3 of its potential output capacity and more than 25 MW electrical output to any utility power distribution system for sale. It limits PM emissions to 0.03 lb/MMBTU, NOx to 0.20 lb/MMBTU and opacity to 20% (6-minute average) except for one six minute period per hour of not more than 27% opacity.

Compliance Status: Each gas turbine is not subject to this rule because it is not a steam generating unit as defined in 40 CFR 60.41Da.

"Steam generating unit means any furnace, boiler, or other device used for combusting fuel for the purpose of producing steam (including fossil-fuel-fired steam generators associated with combined cycle gas turbines; nuclear steam generators are not included)".

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

40 CFR 60 Subpart Db (begin at 60.40b) - NSPS for Industrial - Commercial - Institutional Steam Generating Units:

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

Promulgated: 11-26-1986 (51 FR 42768)

Rule Description: This federal regulation applies to any steam generating unit capable of combusting 100 MMBTU/hour of fuels. The regulation limits PM, NOx, SOx and opacity emissions.

Compliance Status: Each gas turbine is not subject to this rule because it is not a steam generating unit as defined in 40 CFR 60.41b.

"Steam generating unit means a device that combusts any fuel or byproduct/waste to produce steam or to heat water or any other heat transfer medium. This term includes any municipal-type solid waste incinerator with a heat recovery steam generating unit or any steam generating unit that combusts fuel and is part of a cogeneration system or a combined cycle system. This term does not include process heaters as they are defined in this subpart".

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

40 CFR 60 Subpart Dc (begin at 60.40c) - NSPS for Small Industrial - Commercial - Institutional Steam Generating Units:

Promulgated: 09-12-1990 (55 FR 37683)

Rule Description: This federal regulation applies to any steam generating unit capable of combusting between 10 and 100 MMBTU/hour of fuels. The regulation limits PM, SOx and opacity emissions.

Compliance Status: Each gas turbine is not subject to this rule because it is rated at 1865 MMBTU/hour, which is greater than the applicability threshold of 10 - 100 MMBTU/hour.

Each gas turbine is not subject to this rule because it is not a "steam generating unit" as defined in 40 CFR 60.41c.

"Steam generating unit means a device that combusts any fuel and produces steam or heats water or any other heat transfer medium. This term includes any duct burner that combusts fuel and is part of a combined cycle system. This term does not include process heaters as defined in this subpart."

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

40 CFR 60 Subpart KKKK (begin at 60.4300) - NSPS for Stationary Combustion Turbines:

Promulgated: 07-06-2006 (71 FR 38497)

Rule Description: This subpart establishes emission standards and compliance schedules for the control of emissions from stationary combustion turbines that commenced construction, modification or reconstruction after February 18, 2005

Compliance Status: The gas turbines commenced construction prior to February 18, 2005 and the gas turbines have not been modified or reconstructed, as defined in the rule since that time, therefore they not subject to the NSPS.

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

40 CFR 63 Subpart YYYY - National Emission Standards for Hazardous Air Pollutants for Stationary Gas Turbines:

Promulgated: 03-05-2004 (69 FR 10511)

Rule Description: This federal regulation limits the emission of HAP from stationary gas turbines located at major sources of HAP.

Rule Compliance: The gas turbines are not subject to the federal NESHAP for Stationary Gas Turbines because they are not located at a facility that is a major source for HAP.

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

40 CFR 64 Compliance Assurance Monitoring:

Promulgated: 10-22-1997 (52 FR 54940)

Rule Description: This federal regulation specifies monitoring requirements for Title V sources that will assure compliance with emission limitations or standards.

Rule Compliance: The federal regulation exempts sources that are subject to the Title IV

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

Acid Rain monitoring requirements and NSPS monitoring requirements [40 CFR 64.2(b)(1)(i) and 40 CFR 64.2(b)(1)(iii)]. Since the gas turbines are subject to these other requirements they are exempt from Part 64 Compliance Assurance Monitoring.

**Streamlining Multiple Applicable Requirements:**

Each of the gas turbines is subject to the following overlapping Applicable Federally Enforceable Requirements:

**A. NOx Emission Concentration**

Applicable Requirement	Emission Limits	
	NOx	SO2
40 CFR 60 Subpart GG NSPS for Gas Turbines	75 ppmvd at 15% O2	150 ppmvd at 15% O2
SMAQMD Rule 413 Stationary Gas Turbines	9.0 ppmvd at 15% O2	-
BACT requirement from SMAQMD Rule 202 New Source Review	2.0 ppmvd at 15% O2	1.31 lb/hr (~0.15 ppmvd at 15% O2)

Pursuant to U.S. EPA White Paper Number 2, the above applicable requirements will be streamlined and only the BACT related NSR requirements, which are the most stringent requirements, will be incorporated into the Title V & IV permit.

The NOx limit of 40 CFR Part 60 – Subpart GG is being subsumed by the more stringent NOx emission limits of SMAQMD Rule 413 (9.0 ppmvd @ 15% O2) and BACT (2.0 ppmvd @ 15% O2)

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

B. Startup Exemption

Applicable Requirement	Startup Exemption
SMAQMD Rule 413 Stationary Gas Turbines Start-up of the gas turbine and associated steam turbine.	9 ppmvd NOx at 15% O2 within 1 hour of startup if shutdown < 8 hours within 3 hours of startup if shutdown 8-72 hours within 4 hours of startup if shutdown >= 72 hours
SMAQMD Title V Requirement Condition No. V-A.B.9. Start-up of the gas turbine and associated HRSG or steam turbine (A)	9 ppmvd NOx at 15% O2 within 1 hour of startup if shutdown < 8 hours within 3 hours of startup if shutdown 8-72 hours within 4 hours of startup if shutdown >= 72 hours
SMAQMD Permit to Operate No. 22673 and 22674	2 ppmvd NOx at 15% O2 within three hours of startup

(A) The language equivalency was approved by EPA in a letter dated 1-16-2013 to SMAQMD as part of the comments received during the review of Significant Modification TV2006-19-03

Pursuant to U.S. EPA White Paper Number 2, the above applicable requirements will be streamlined and only the requirements of SMAQMD Permit to Operate Nos. 22673 and 22674 Condition No. 16 will be incorporated into the Title V permit. The SMAQMD has determined that the Permit to Operate requirement is stricter because it is based on a NOx limit of 2.0 ppmvd and SMAQMD Rule 413 is based on a NOx limit of 9 ppmvd.

C. Short-term Excursions

Applicable Requirement	Short-term Excursion Exemption
SMAQMD Rule 413 Stationary Gas Turbines	must comply with 9 ppmvd NOx (using a 6 hour averaging time) for periods that contain short-term excursions and no more than 4 consecutive 15 minute periods no more than 40 15 minute periods/year
SMAQMD Permit to Operate No. 22673 & 22674	must comply with 30 ppmv NOx (using a 1 hour averaging time) for periods that contain short-term excursions and no more than 4 consecutive 15 minute periods no more than 40 15 minute periods/year

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**2. Equipment Specific Requirements**  
**a. Combustion Sources Only**  
**Gas Turbine Nos. 2 and 3 with Associated SCRs**

Pursuant to U.S. EPA White Paper Number 2, the above applicable requirements will be streamlined and only the requirements of SMAQMD Permit to Operate Nos. 22673 and 22674 will be incorporated into the Title V & IV permit. The SMAQMD has determined that the Permit to Operate requirement is stricter because it is based on a NOx limit of 30 ppmvd for 1 hour and SMAQMD Rule 413 is based on a NOx limit of 9 ppmvd for 6 hours.

For comparable 6 hours periods with the short-term excursion exemption, the allowable amount of NOx emissions is compared below. The allowed NOx emissions are less for the Permit to Operate conditions.

<u>Permit to Operate Conditions</u>		<u>SMAQMD Rule 413 Requirements</u>
(30 ppmv x 1 hour) + (2 ppmv x 5 hours)	<	(9 ppmv x 6 hours)
40 ppmv-hours	<	54 ppmv-hours

<p><b>L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS</b> <b>2. Equipment Specific Requirements</b> <b>b. Cooling Tower</b></p>
--

**Permit Conditions - SMAQMD Rule 201 Permit to Operate No. 22672**

Condition Description: SMAQMD Permit to Operate No. 22672 for the Cooling Tower limits mass emissions, requires emission offsets be provided and requires recordkeeping and reporting.

Compliance Status: The cooling tower complies with the requirements of the permit conditions.

**The following federal regulation is not an applicable federal requirement but is discussed here to document the non-applicability determination:**

**40 CFR 63 Subpart Q - National Emission Standards for Hazardous Air Pollutants for Industrial Process Cooling Towers:**

Promulgated: 09-08-1994 (59 FR 46339)

Rule Description: This federal regulation prohibits the use of chromium in cooling tower water, at major sources of HAP, beginning September 08, 1994.

Rule Compliance: The cooling tower is not subject to the federal NESHAP for Industrial Process Cooling Towers because it is not located at a facility that is a major source for HAP.

<p><b>L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS</b> <b>2. Equipment Specific Requirements</b> <b>b. Cooling Tower</b></p>
--

**SMAQMD Rule 301 - Permit Fees - Stationary Source**

SIP approved: Not SIP approved.

Rule Description: This discussion applies to the sections of the rule that require fees for SMAQMD Rule 201 permits, not to the sections that require fees for Title V permits.

This rule requires the facility to pay fees associated with the issuance and renewal of SMAQMD Rule 201 permits.

Compliance Status: The permittee has paid permit fees as required and is in compliance.

**SMAQMD Rule 466 - Solvent Cleaning**

SIP approved: 9-29-2011.

Rule Description: This rule requires the facility to reduce the emission of VOC from solvent cleaning operations.

Compliance Status: The permittee has used cleaning solvents and work practices as required by the rule and is in compliance.

**L. APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Equipment Specific Requirements:**  
**c. Perlite Storage Silo Dust Collector**

**SMAQMD Rule 301 - Permit Fees - Stationary Source**

SIP approved: Not SIP approved.

Rule Description: This discussion applies to the sections of the rule that require fees for SMAQMD Rule 201 permits, not to the sections that require fees for Title V permits.

This rule requires the facility to pay fees associated with the issuance and renewal of SMAQMD Rule 201 permits.

Compliance Status: The permittee has paid permit fees as required and is in compliance.

**SMAQMD Rule 306 - Air Toxic Fees**

SIP approved: Not SIP approved.

Rule Description: This rule requires the facility to pay fees associated with toxic emissions regulated through the California "Toxic Hotspot" Program.

Compliance Status: The permittee has paid toxic fees as required and is in compliance.

**SMAQMD Rule 466 - Solvent Cleaning**

SIP approved: 09-29-2011

Rule Description: This rule requires the facility to reduce the emission of VOC from solvent cleaning operations.

Compliance Status: The permittee has used cleaning solvents and work practices as required by the rule and is in compliance.

**M. APPLICABLE NON- FEDERALLY ENFORCEABLE REQUIREMENTS**  
**1. Equipment Specific Requirements:**  
**a. Cooling Towers**

**California Code of Regulations, Title 17, Division 3, Chapter 1, Subchapter 7.5, Section 93103, Air Toxic Control Measure (ATCM) - Regulation for Chromate Treated Cooling Towers**

- SIP approved: Not SIP approved  
03-09-1989 - adopted by California Air Resources Board
- Rule Description: The California Air Resources Board's Air Toxic Control Measure (ATCM) - Regulation for Chromate Treated Cooling Towers prohibited the use of chromium in cooling tower water beginning September 05, 1989.
- Rule Compliance: The cooling tower, which began operation in 2005, has never used chromium to treat the cooling tower water and is in compliance with the ATCM.

**N. PERMIT SHIELD**

**PERMIT SHIELD**

SMAQMD has reviewed the submitted information from the applicant and does not find any ambiguity or conflicts in rule conditions that would make the administration of the permit not possible. SMAQMD does see an operational limitation in compliance with the 9.0 PPM standard for NOx that is provided in Rule 413 and the method of testing required to show compliance with the rule. To provide a more streamlined method of determining compliance between the two standards, compliance with the 2.0 PPM NOx standard, (2.0 ppmvd of NOx at 15% O2, averaged over any 1 hour period, monitored by the CEM) shall be considered equivalent to the 9.0 PPM NOx standard (9.0 ppmvd of NOx at 15% O2, measured by the average of three runs for 15 minutes), determined by using EPA Method 20.

SMAQMD interpreted the conditions of SMAQWMD Rule 413 to provide clarity on the specific configuration of the source. (i.e. two gas turbines and two HRSGs ducted to a single steam turbine.). EPA has previously concurred with the interpretation by SMAQMD in a letter dated 1-16-2013. A permit shield will be placed on the permit that will codify SMAQMD's interpretation as it applies to the applicant.

**O. TITLE V & IV PERMIT RENEWAL AND PERMIT CONDITIONS**

**TITLE V & IV PERMIT CONDITIONS:**

It is recommended that the Cosumnes Power Plant Title V & IV Federal Operating Permit be renewed.

See proposed Title V Federal Operating Permit No. TV2012-19-01 for permit conditions.

Approved by:



Date:

10/22/13

**ATTACHMENT A**

**SMAQMD RULES THAT ARE**

**"APPLICABLE FEDERALLY**

**ENFORCEABLE REQUIREMENTS"**

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●	●	101	General Provisions and Definitions 09/03/1998 adoption	Yes - no related conditions are included in the permit because of general nature of the rule.
●	●	102	Circumvention 11/29/1983 adoption	Yes - no related conditions are included in the permit because of general nature of the rule.
●	●	103	Exceptions 11/29/1983 adoption	No - source does not operate the type of equipment described in this rule.
●	●	104	General Conformity 11/03/1994 adoption	No - the rule's purpose is to have the SMAQMD review federal conformity findings.
●	●	105	Emission Statement 04/20/1993 adoption	Yes - related conditions are included in the permit..
●	●	107	Alternative Compliance	No - it is not a SIP approved rule.
●	●	108	Minor Violations	No - it is not a SIP approved rule.
●	●	201	General Permit Requirements 11/20/1984 adoption	Yes - no related conditions are included in the permit because of the general nature of the rule.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●		202	New Source Review	Yes- related conditions are included in the ATC permit.
●		203	Prevention of Significant Deterioration 01-27-2011 Adoption	Yes - rule became effective 08-19-2011. Projects processed after the effective date shall be evaluated under this rule.
		204	Emission Reduction Credits	No - it is not a SIP approved rule.
		205	Community Bank and Priority Reserve Bank	No - it is not a SIP approved rule.
		206	Mobile and Transportation Source Emission Reduction Credits	No - it is not a SIP approved rule.
●	*	207	Title V Federal Operating Permit Program	Yes - related conditions are included in the permit. (*Although this is not a SIP approved rule it is applicable because it is part of the approved Title V Permit Program.)
		208	Acid Rain	No - it is not a SIP approved rule.

**"APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
		209	Limiting Potential to Emit	No - it is not a SIP approved rule.
		210	Synthetic Minor Source Status	No - it is not a SIP approved rule.
●		211	MACT at Major Sources of Hazardous Air Pollutants	Yes - it is not a SIP approved rule, but is part of the Title V program.
●		213	Federal Major Modifications	No - it is not a SIP approved rule.
●	●	214	Federal New Source Review	Yes - rule became effective 08-19-2011. Projects processed after the applicable date shall be evaluated under this rule.
		215	Agricultural Permit Requirements and New Agricultural Permit Review	No - it is not a SIP approved rule.
		217	Federal New Source Review	No - it is not a SIP approved rule.
●	*	301	Stationary Source Permit Fees	Yes - related conditions are included in the permit. (*Although this is not a SIP approved rule it is applicable because it is part of the approved Title V

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●		302	Hearing Board Fees	Permit Program.) No - it is not a SIP approved rule.
		303	Agricultural Burning Permit Fees	No - it is not a SIP approved rule.
●		304	Plan Fees	No - it is not a SIP approved rule.
		305	Environmental Document Preparation and Processing Fees	No - it is not a SIP approved rule.
●		306	Air Toxics Fees	No - it is not a SIP approved rule.
●		307	Clean Air Act Fees 09/26/2002 adoption	Yes - no related conditions are included in the permit because of limited applicability.
		310	Permit Fees - Agricultural Source	No - it is not a SIP approved rule
●		401	Ringelmann Chart 04/05/1983 adoption	Yes - related conditions are included in the permit.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●		402	Nuisance	No - it is not a SIP approved rule.
●	●	403	Fugitive Dust 11/29/1983 adoption	Yes - related conditions are included in the permit.
●	●	404	Particulate Matter 11/20/1984 adoption	Yes - related conditions are included in the permit.
●	●	405	Dust and Condensed Fumes 11/29/1983 adoption	No - the source does not operate such a process.
●	●	406	Specific Contaminants 11/29/1983 adoption	Yes - related conditions are included in the permit.
●	●	407	Open Burning 11/29/1983 adoption	Yes - no related conditions are included in the permit.
●	●	408	Incinerator Burning 11/29/1983 adoption	No - the source does not operate an incinerator.
●	●	409	Orchard Heaters 11/29/1983 adoption	No - the source does not operate orchard heaters.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●	●	410	Reduction of Animal Matter 11/29/1983 adoption	No - the source does not operate equipment for the reduction of animal matter.
●	●	411	Boiler NOx 08/23/2007 adoption	No - the source does not operate a boiler subject to this rule.
●	●	412	Stationary IC Engines at Major Stationary Sources of NOx 06/01/1995 adoption	No - the source does not operate an IC engine and is not a major source.
●	●	413	Stationary Gas Turbines 03/24/2005 version	Yes - related conditions are included in the permit. (see discussion of streamlining applicable requirements)
●	●	414	Natural Gas Fired Water Heaters 08/01/1996 adoption 03/25/2010 rule version is not SIP approved	No - the source does not operate natural gas fired water heaters.
●	●	417	Wood Burning Appliances	No - it is not a SIP approved rule.
●	●	420	Sulfur Content of Fuels	Yes - related conditions are included in the permit.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●	●	441	Organic Solvents 11/29/1983 adoption	Yes - no related conditions are included in the permit because of limited applicability.
●	●	442	Architectural Coatings 09/05/1996 adoption	Yes - related conditions are included in the permit.
●	●	443	Leaks from Synthetic Organic Chemical and Polymer Manufacturing 09/05/1996 adoption	No - the source does not operate synthetic organic chemical or polymer manufacturing equipment.
●	●	444	Petroleum Solvent Dry Cleaning 09/05/1996 adoption	No - the source does not operate petroleum solvent dry cleaning equipment.
●	●	446	Storage of Petroleum Products 11/16/1993 adoption	No - the source does not store petroleum products.
●	●	447	Organic Liquid Loading 04/02/1998 adoption	No - the source does not operate organic liquid loading equipment.
●	●	448	Gasoline Transfer into Stationary Storage	No - the source does not operate such equipment.

**"APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
			Containers 02/02/1995 adoption	
●		449	Transfer of Gasoline into Vehicle Fuel Tanks 09/26/2002 adoption	No - the source does not operate such equipment.
●		450	Graphic Arts Operations 10/23/2008 adoption	No - the source does not operate a graphic arts process as defined in the rule.
●		451	Surface Coating of Miscellaneous Metal Parts and Products 11/29/1983 adoption 10/28/2010 rule version is not SIP approved	Yes - no related conditions are included in the permit because of limited applicability.
●		452	Can Coating 09/25/2008 adoption	No - the source does not operate a can coating process.
●		453	Cutback and Emulsified Asphalt Paving Materials 11/29/1983 adoption	No - the source does not manufacture or apply cutback or emulsified asphalt paving materials.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●		454	Degreasing Operations 09/25/2008 adoption	No - the source does not operate degreasers subject to this rule.
●		455	Pharmaceuticals Manufacturing 11/29/1983 adoption	No - the source does not manufacture pharmaceuticals.
●		456	Aerospace Coating Operations 09/05/1996 adoption	No - the source does not coat aerospace parts.
		457	Methanol Compatible Tanks	No - it is not a SIP approved rule.
●		458	Large Commercial Bread Bakeries 09/05/1996 adoption	No - the source does not produce bread products.
●		459	Automotive, Truck and Heavy Equipment Refinishing Operations 10/02/1997 adoption	No - the source does not refinish vehicles.
●		460	Adhesives and Sealants	No - it is not a SIP approved rule.
●		463	Wood Products Coatings	No - it is not a SIP approved rule.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
			09/25/2008 adoption	
●	●	464	Organic Chemical Manufacturing Operations 07/23/1998 adoption	No - the source does not manufacture organic chemicals.
●	●	465	Polyester Resin Operations 09/25/08 adoption	No - it is not a SIP approved rule.
●	●	466	Solvent Cleaning 10/28/2010 adoption	Yes - related conditions are included in the permit.
		485	Municipal Landfill Gas	No - it is not a SIP approved rule.
		496	Large Confined Animal Facilities	No - it is not a SIP approved rule.
●	●	501	Agricultural Burning 11/29/1983 adoption	No - the source does not conduct agricultural burning.
●	●	601	Procedure before the Hearing Board	No - it is not a SIP approved rule.
●	●	602	Breakdown Conditions: Emergency Variance	No - it is not a SIP approved rule.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
●		701	Emergency Episode Plan 05/27/1999 adoption	Yes - at this time the source emissions are below the rule's applicability level.
		801	New Source Performance Standards	No - it is not a SIP approved rule. Note: there are equivalent federal regulations.
		901	General Requirements	No - it is not a SIP approved rule. Note: there are equivalent federal regulations.
		902	Asbestos	No - it is not a SIP approved rule. Note: there is an equivalent federal regulation.
		903	Mercury	No - it is not a SIP approved rule. Note: there is an equivalent federal regulation.
		904	Airborne Toxic Control Measures	No - it is not a SIP approved rule. Note: there are equivalent federal regulations for some of the listed ATCMs.
		1002	Fleet Inventory	No - it is not a SIP approved rule.
		1003	Reduced-Emission Fleet Vehicles/Alternative	No - it is not a SIP approved rule.

**SMAQMD RULES THAT ARE  
 "APPLICABLE FEDERALLY ENFORCEABLE REQUIREMENTS"  
 FOR THE COSUMNES POWER PLANT**

Rule is Applicable	Rule is SIP Approved	Rule No.	Rule Title	Is the Rule an "Applicable Federally Enforceable Requirement"?
			Fuels	
		1005	Mobile Source Emission Reduction Credits/Banking	No - it is not a SIP approved rule.
		1006	Transportation Conformity	No - it is not a SIP approved rule.

# **ATTACHMENT B**

## **GHG AND HAP CALCULATIONS**

**Table 8.1B-7  
Calculation of Noncriteria Pollutant Emissions for Gas Turbines/HRSGs**

Compound	(each gas turbine)			Emission Rates for Modeling (each gas turbine)	
	Emission Factor, lb/ MMscf (1)	Max Hourly Emissions, lb/hr (2)	Annual Emissions, ton/yr (3)	One-hour Em Rates, g/s	Annual Em Rates, g/s
Ammonia	(4), (6)	25.0088	109.54	3.15E+000	3.15E+000
Propylene(5)	7.71E-001	1.4127	5.89	1.78E-001	1.70E-001
Hazardous Air Pollutants (HAPs)					
Acetaldehyde	4.08E-002	0.0748	0.31	9.42E-003	8.97E-003
Acrolein	3.69E-003	0.0068	0.03	8.52E-004	8.11E-004
Benzene	3.33E-003	0.0061	0.03	7.69E-004	7.32E-004
1,3-Butadiene	4.39E-004	0.0008	0.00	1.01E-004	9.65E-005
Ethylbenzene	3.26E-002	0.0597	0.25	7.53E-003	7.17E-003
Formaldehyde(7)	2.06E-001	0.3767	1.57	4.75E-002	4.52E-002
Hexane(5)	2.59E-001	0.4746	1.98	5.98E-002	5.69E-002
Naphthalene(5)	1.33E-003	0.0024	0.01	3.07E-004	2.92E-004
PAH - Anthracene(5)	3.38E-005	0.0001	0.00	7.80E-006	7.43E-006
PAH - Benzo(a)anthracene(5)	2.26E-005	0.0000	0.00	5.22E-006	4.97E-006
PAH - Benzo(a)pyrene(5)	1.39E-005	0.0000	0.00	3.21E-006	3.06E-006
PAH - Benzo(b)fluoranthrene(5)	1.13E-005	0.0000	0.00	2.61E-006	2.48E-006
PAH - Benzo(k)fluoranthrene(5)	1.10E-005	0.0000	0.00	2.54E-006	2.42E-006
PAH - Chrysene(5)	2.52E-005	0.0000	0.00	5.82E-006	5.54E-006
PAH - Dibenz(a,h)anthracene(5)	2.35E-005	0.0000	0.00	5.43E-006	5.17E-006
PAH - Indeno(1,2,3-cd)pyrene(5)	2.35E-005	0.0000	0.00	5.43E-006	5.17E-006
Propylene oxide	2.96E-002	0.0542	0.23	6.83E-003	6.51E-003
Toluene	1.33E-001	0.2437	1.02	3.07E-002	2.92E-002
Xylene	6.53E-002	0.1196	0.50	1.51E-002	1.44E-002
Total HAPs (four turbines)			23.69		

- Notes: (1) From AP-42 (Table 3.1-3, 4/00) unless noted.  
(2) Based on maximum hourly gas turbine fuel use of: 1.83 MMscf/hr  
(3) Based on maximum annual gas turbine fuel use of: 15,285.86 MMscf/yr  
(4) Maximum lbs/hr NH3 emissions based on 10 ppm @ 15% O2 ammonia slip from SCR system, 100% load, 34 F operating case.  
(5) From CATEF database.  
(6) Maximum annual NH3 emissions based on maximum hourly NH3 emission rate and maximum expected hours per year of gas turbine operation including startup periods.  
(7) Based on 8/21/01 letter from Sims Roy at EPA.

Net Increase in Toxic Air Pollutant Emissions  
 CPP Gas Turbines  
 (Revised 12/03/10)

Digester Gas Flow Rate (scfm)	Toxic Air Pollutant	Emission Factor(1) (lbs/MMBtu)	Emission Factor(2) (lbs/MMscf)	Toxic Air Emissions (lbs/hr)	Toxic Air Emissions (lbs/year)	Toxic Air Emissions (tons/year)
n/a	Ammonia(3)	n/a	n/a	0.25008	2190.70	1.095
2500	1,3-Butadiene	9.80E-06	6.05E-03	9.07E-04	7.95	0.004
2500	1,4-Dichlorobenzene	2.00E-05	1.23E-02	1.85E-03	16.21	0.008
2500	Acetaldehyde	5.30E-05	3.27E-02	4.91E-03	42.97	0.021
2500	Carbon Tetrachloride	2.00E-05	1.23E-02	1.85E-03	16.21	0.008
2500	Chlorobenzene	1.60E-05	9.87E-03	1.48E-03	12.97	0.006
2500	Chloroform	1.70E-05	1.05E-02	1.57E-03	13.78	0.007
2500	Ethylene Dichloride	1.50E-05	9.26E-03	1.39E-03	12.16	0.006
2500	Formaldehyde	1.90E-04	1.17E-01	1.76E-02	154.04	0.077
2500	Methylene Chloride	1.30E-05	8.02E-03	1.20E-03	10.54	0.005
2500	Tetrachloroethylene	2.10E-05	1.30E-02	1.94E-03	17.03	0.009
2500	Trichloroethylene	1.80E-05	1.11E-02	1.67E-03	14.59	0.007
2500	Vinyl Chloride	3.60E-05	2.22E-02	3.33E-03	29.19	0.015
2500	Vinylidene Chloride	1.50E-05	9.26E-03	1.39E-03	12.16	0.006
2500	Arsenic	2.30E-06	1.42E-03	2.13E-04	1.86	0.001
2500	Cadmium	5.80E-07	3.58E-04	5.37E-05	0.47	0.000
2500	Chromium	1.20E-06	7.40E-04	1.11E-04	0.97	0.000
2500	Lead	3.40E-06	2.10E-03	3.15E-04	2.76	0.001
2500	Nickel	2.00E-06	1.23E-03	1.85E-04	1.62	0.001
2500	Selenium	1.10E-05	6.79E-03	1.02E-03	8.92	0.004

Notes:

- (1) From AP42, Section 3.1 - Stationary Gas Turbines, 4/2000, Tables 3.1-7 and 3.1-8 (Digester Gas Fired Gas Turbines).
- (2) Converted from lbs/MMBtu to lbs/MMscf based on digester gas HHV for CPP of 617 Btu/scf.
- (3) Calculated based on the following:
  - i. Maximum increase in gas turbine exhaust flow rate of approximately 0.5% due to F-Factor change associated with use of digester gas (see August 24, 2010 application package submitted to the SMAQMD for CPP PTO modifications).
  - ii. Maximum ammonia emission rate of approximately 25.0088 lbs/hr (at 10 ppmvc NH3) for gas turbine operating at full load burning natural gas (see Attachment 2 - from September 2001 AFC for CPP, Volume 1, Appendix 8.1A, Table 8.1B-7).
  - iii. Increase in ammonia emissions: 0.5% x 25.0088 lbs/hr = 0.125 lbs/hr per gas turbine (0.25008 lbs/hr for two gas turbines).

Table 8.1B-8 (Revised 3/05/07)

Non-Criteria Pollutant Emissions From Cooling Towers

Pollutant	Recirculation Water Concentration (ppmw)	Recirculation Water Drift Rate (lbs/hr)	1 Tower Emission Rate (lbs/hr) (each)	2 Towers Emission Rate (lbs/hr)	1 Tower Annual Emission Rate (ton/yr) (each)	2 Towers Annual Emission Rate (tons/yr)	Hourly Emission Rate Per Cell (g/sec) (each)	Annual Emission Rate Per Cell (g/sec) (each)
Aluminum	0.012	387.35	4.65E-06	9.30E-06	2.04E-05	4.07E-05	7.32E-08	7.32E-08
Ammonia <sup>2,3</sup>	1.000	387.35	3.87E-04	7.75E-04	1.70E-03	3.39E-03	6.10E-06	6.10E-06
Antimony <sup>2</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Arsenic <sup>1,2,3</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Barium	0.160	387.35	6.20E-05	1.24E-04	2.71E-04	5.43E-04	9.76E-07	9.76E-07
Beryllium <sup>1,2</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Boron	0.230	387.35	8.91E-05	1.78E-04	3.90E-04	7.80E-04	1.40E-06	1.40E-06
Cadmium <sup>1,2</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Chloroform <sup>1,2,3,4</sup>	—	387.35	1.71E-01	3.41E-01	7.48E-01	1.50E+00	2.69E-03	2.69E-03
Chromium (hexavalent) <sup>1,2,4</sup>	0.052	387.35	2.01E-05	4.03E-05	8.82E-05	1.76E-04	3.17E-07	3.17E-07
Chromium	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cobalt	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Copper <sup>2,3</sup>	0.190	387.35	7.36E-05	1.47E-04	3.22E-04	6.45E-04	1.16E-06	1.16E-06
Cyanide <sup>2,3</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Fluorides <sup>2,3</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Lead <sup>1</sup>	0.028	387.35	1.08E-05	2.17E-05	4.75E-05	9.50E-05	1.71E-07	1.71E-07
Manganese <sup>2</sup>	0.220	387.35	8.52E-05	1.70E-04	3.73E-04	7.46E-04	1.34E-06	1.34E-06
Mercury <sup>2,3</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nickel <sup>1,2,3</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Selenium <sup>2</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Silver	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Thallium	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Vanadium <sup>3</sup>	0.000	387.35	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Zinc <sup>2</sup>	0.430	387.35	1.67E-04	3.33E-04	7.30E-04	1.46E-03	2.62E-06	2.62E-06

Notes:

1. Carcinogenic compound.
2. Chronic REL.
3. Acute REL.
4. These are new compounds added to this analysis.

Cosumnes Power Plant  
Potential to Emit Greenhouse Gas Emissions

Greenhouse Gas	Cosumnes Power Plant Combined Cycle Combustion Turbines						
	Emission Factor (kg/MMBtu)	Emission Factor (lb/MMBtu)	Fuel Use (MMBtu/yr)	lb/yr	tons/yr	GWP	CO2e tons/yr
Carbon Dioxide (natural gas)	5.391E+01	1.189E+02	31,863,339	3,786,991,785	1,893,496	1	1,893,496
Carbon Dioxide (digester gas)	8.253E+01	1.819E+02	811,461	147,644,815	73,822	1	73,822
					1,967,318		
Methane	1.0E-03	2.205E-03	32,674,800	72,036	36.0	21	756
Nitrous Oxide	1.0E-04	2.205E-04	32,674,800	7,204	3.6	310	1,117
							1,969,191

Carbon Dioxide Emission Factor (Natural Gas): 40 CFR Part 75, App G, Eq G-4  
 Carbon Dioxide Emission Factor (Digester Gas): 40 CFR Part 98.33, Eq C-5  
 Methane Emission Factor: 40 CFR Part 98, Table C-2  
 Nitrous Oxide Emission Factor: 40 CFR Part 98, Table C-2  
 Global Warming Potential (GWP): 40 CFR Part 98, Table A-1  
 Natural Gas Heat Input: 2 gas turbines @ 1865 MMBtu/hr each x 8760 hr/yr, net of digester gas heat input  
 Digester Gas Heat Input: 2,500 scfm x 60 min/hr x 617.55 Btu/scf x 8760 hr/yr

Digester Gas Carbon Dioxide Emission Factor Derivation

Gas Component		Digester Gas Analysis									
Name	Formula	MW	Volume %	Moles C	Moles H	Moles N	Moles O	Moles S	Weight	Weight %	
Oxygen	O2	31.998	0.1268	0	0	0	0.2536	0	0.04	0.15%	
Nitrogen	N2	28.014	0.6076	0	0	1.2152	0	0	0.17	0.64%	
Carbon Dioxide	CO2	44.009	37.7972	37.7972	0	0	75.5944	0	16.63	62.41%	
Carbon Monoxide	CO	26.01	0	0	0	0	0	0	0.00	0.00%	
Hydrogen	H2	2.016	0.0095	0	0.019	0	0	0	0.00	0.00%	
Water	H2O	18.015	0.362	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Total Sulfur	S	32.06	0.0017	0	0	0	0	0.0017	0.00	0.00%	
Methane	CH4	16.043	61.078	61.078	244.312	0	0	0	9.80	36.77%	
Ethane	C2H6	30.07	0.0009	0.0018	0.0054	0	0	0	0.00	0.00%	
Propane	C3H8	44.097	0.0019	0.0057	0.0152	0	0	0	0.00	0.00%	
Isobutane	C4H10	58.125	0.002	0.008	0.02	0	0	0	0.00	0.00%	
n-Butane	C4H10	58.125	0.0016	0.0064	0.016	0	0	0	0.00	0.00%	
IsoPentane	C5H12	72.152	0.0005	0.0025	0.006	0	0	0	0.00	0.00%	
n-Pentane	C5H12	72.152	0.0006	0.003	0.0072	0	0	0	0.00	0.00%	
Hexanes +	C6H14	86.179	0.004	0.024	0.056	0	0	0	0.00	0.01%	
	(Dry)	99.6	98.9266	244.4568	1.2152	75.848	0.0017	26.65	100.00%		
			MW	12.011	1.008	14.007	15.999				
			Weight	1188.21	246.41	17.02	1213.49			2665.13	
			Weight %	44.58%	9.25%	0.64%	45.53%			100.00%	

40 CFR 98.33 Eq C-5

$$CO_2 = 44/12 \times \text{Fuel} \times CC \times MW/MVC \times 0.001$$

Where:

CO2 - metric tons

Fuel - scf

CC - fuel carbon content kg C per kg fuel

MW - fuel molecular weight kg per kg-mole

MVC - molar volume conversion factor 849.5 scf per kg-mole

Fuel	CC	MW	MVC	CO2 (MT)	CO2 (kg)	HHV (Btu/scf)	EF (kg CO2/MMBtu)	EF (lb CO2/MMBtu)
1.0	0.4458	26.65	849.5	5.13E-05	0.0513	621.43	82.53	181.95

Digester Gas

Component	Component	Volume Percent	MW	Moles C	Moles H	Moles N	Moles O	Moles S	Weight Percent	Btu/lb (HHV)	Btu/lb (LHV)	Average MW	HHV/LHV
CH4	Methane	61.0780%	16.043	61.08	244.31	0.00	0.00	0.00	0.00	1013	912.93	21,520	1,1096
C2H6	Ethane	0.0009%	30.070	0.00	0.01	0.00	0.00	0.00	0.00	1792	1640.42	20,432	1,0924
C3H8	Propane	0.0019%	44.097	0.01	0.02	0.00	0.00	0.00	0.00	2590	2384.70	19,944	1,0861
N-C4H10	N-Butane	0.0015%	58.125	0.01	0.02	0.00	0.00	0.00	0.00	3370	3112.52	21,308	1,0827
iso-C4H10	iso-Butane	0.0020%	58.125	0.01	0.02	0.00	0.00	0.00	0.00	3363	3105.44	19,629	1,0829
N-C5H12	N-Pentane	0.0005%	72.152	0.00	0.01	0.00	0.00	0.00	0.00	4016	3716.29	21,091	1,0806
iso-C5H12	iso-Pentane	0.0005%	72.152	0.00	0.01	0.00	0.00	0.00	0.00	4008	3708.33	21,052	1,0808
C6H14	Hexane	0.0040%	86.179	0.02	0.06	0.00	0.00	0.00	0.00	4762	4412.47	19,403	1,0792
O2		0.1288%	31.998	0.00	0.00	0.00	0.25	0.00	0.00				0.04
N2		0.6076%	28.014	0.00	0.00	1.22	0.00	0.00	0.00				0.17
CO2		37.7972%	44.009	37.80	0.00	0.00	75.59	0.00	0.623				16.63
H2		0.0095%	2.016	0.00	0.02	0.00	0.00	0.00	0.00				0.00
H2O		0.3620%	18.015	0.00	0.72	0.00	0.36	0.00	0.00				0.07
Total Sulfur (as S)		0.00170%	32.060	0.00	0.00	0.00	0.00	0.00	0.00				0.00
Total		100.0%							1.000				
Dry Basis		88.6%		98.93	245.18	1.22	76.21	0.00	421.53468	621.43	560.05	7,927	1,1096
Total										8,796			
		Mol Wt		12.011	1.008	14.007	15.999	32.064					
		gms/100 moles		1188.22	247.14	17.02	1219.28	0.05	2671.7245				
		WT %		44.47%	9.25%	0.64%	45.64%	0.00%					
		Standard Molar Volume		379.89 ft <sup>3</sup> /mole	(at 60 deg. F)								

Dry F-Factor (dscf/MMBtu) =

9187.249

Molecular Weights

C	12.01
H	1.01
N	14.01
O	16.00
S	32.06
CH4	16.04
H2O	18.02
NO2	46.01
SO2	64.06
O2	32.00
CO2	44.01
NH3	17.03
CO	28.01
N2	28.01

Dry F-Factor (dscf/MMBtu) =

9187.249

1. Black & Veatch Corporation, Digester Gas Use for the Cosumnes Power Plant, January 2009, Appendix A, Gas Sampling Test Reports