

CALIFORNIA ENERGY COMMISSION

1516 NINTH STREET
SACRAMENTO, CA 95814-5112

DOCKET
01-AFC-19C

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DATE: August 8, 2011**TO:** Interested Parties**FROM:** Christine Stora, Compliance Project Manager**SUBJECT:** Cosumnes Power Plant Project (01-AFC-19C)
Revised Staff Analysis of Proposed Modifications for
Fuel Supply Modification

On December 29, 2010, the Sacramento Municipal Utility District Financing Authority (SFA) (project owner) filed a petition with the California Energy Commission to amend the Energy Commission Decision for the Cosumnes Power Plant project. Staff prepared an analysis of this proposed change, and a copy is enclosed for your information and review.

The Cosumnes Power Plant project is located adjacent to the former Rancho Seco Nuclear Plant in southern Sacramento County. The 500-megawatt project was certified by the Energy Commission in September 2003. The initial operation of Phase 1 (two gas turbines, two heat recovery steam generators, one condensing steam turbine, one cooling tower) began operation in October 2005. The current project (consisting of four general electric (GE) gas turbines exhausting into four unfired heat recovery steam generator units) has been in operation since February 2006.

The proposed modifications will allow the SFA to:

1. Inject digester gas from the Sacramento Regional Wastewater Treatment Plant into the natural gas supply line serving the Cosumnes Power Plant;
2. Refine the allowable levels of total dissolved solids in the cooling tower recirculation water to match the actual performance of the newly installed OnePass water filtration system; and,
3. Remove the peak flow condition in **WATER RES-1** to allow the SFA to maximize generation on high-temperature days while maintaining compliance with the annual water use limit.

Energy Commission staff reviewed the petition and assessed the impacts of this proposal on environmental quality, public health and safety, and proposes revisions to existing conditions of certification for Air Quality (**AQ-17, AQ-18, AQ-19, AQ-24, AQ-32, AQ-33, AQ-36**, and incorporate **AQ-44** through **AQ-55**) and Water Resources (**WATER RES-1**). It is staff's opinion that, with the implementation of revised conditions, the project will remain in compliance with applicable laws, ordinances, regulations, and standards and that the proposed modifications will not result in a significant adverse direct or cumulative impact to the environment (Title 20, California Code of Regulations, Section 1769).

The amendment petition and staff's analysis has been posted on the Energy Commission's webpage at <http://www.energy.ca.gov/sitingcases/smud/compliance/index.html> . The Energy

Commission's Order (if approved) will also be posted on the webpage. Energy Commission staff intends to recommend approval of the petition at the **October 5, 2011**, Business Meeting of the Energy Commission. If you have comments on this proposed modification, please submit them to me at the address below prior to **September 7, 2011**.

Christine Stora, Compliance Project Manager
California Energy Commission
1516 9th Street, MS-2000
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Comments may be submitted by fax to (916) 654-3882, or by e-mail to cstora@energy.state.ca.us. If you have any questions, please contact me at (916) 654-4745.

For further information on how to participate in this proceeding, please contact the Energy Commission Public Adviser's Office, at (916) 654-4489, or toll free in California at (800) 822-6228, or by e-mail at publicadviser@energy.state.ca.us. News media inquiries should be directed to the Energy Commission Media Office at (916) 654-4989, or by e-mail at mediaoffice@energy.state.ca.us.

Enclosure

COSUMNES POWER PLANT PROJECT (01-AFC-19C)

Petition to Amend Fuel Supply & Cooling Tower TDS Modification

Joseph Hughes

August 4, 2011

INTRODUCTION

Red text shows edits made in the Revised Staff Analysis.

Cosumnes Power Plant Project (CPP) was licensed by the California Energy Commission (CEC) in September of 2003 and is owned by Sacramento Municipal Utility District Financing Authority (SFA). CPP currently operates two General Electric (GE) Model 7241FA gas turbines (CTG) exhausting into two unfired heat recovery steam generators (HRSG), one condensing steam turbine and one cooling tower.

SFA's petition to amend (SFA2010) proposes to inject digester gas from the Sacramento Regional Wastewater Treatment Plant (SRWTP) into the natural gas supply line serving CPP, resulting in a more efficient use of the renewable energy created by the wastewater treatment gas, and increasing Sacramento Municipal Utility District's (SMUD) renewable energy portfolio. The petition to amend also requests to increase the permitted total dissolved solids (TDS) in the cooling tower recirculation water due to an increase of TDS from the incoming water supply, and also incorporates the perlite storage dust collector into the Final Decision.

The Petition to Amend proposes to modify the CEC Conditions of Certification (CoC) **AQ-17**, **AQ-18**, and **AQ-19** which limit emissions; **AQ-24** which controls TDS levels; **AQ-32**, **AQ-33**, and **AQ-36** which address monitoring systems, record keeping, and compliance testing requirements, respectively; and incorporate CoC **AQ-44** to **AQ-53** which pertain to the incorporation of digester fuel into the fuel supply and the addition of the perlite Storage Silo and attached APC Dust Collector.

LAWS, ORDINANCES, REGULATION, AND STANDARDS (LORS) - COMPLIANCE

The Sacramento Metropolitan Air Quality Management District (SMAQMD) has issued a **Draft** Authority to Construct (ATC) permit for each of the requested modifications determining that the project would comply with all laws, ordinances, regulations and standards (LORS). **The SMAQMD would issue a Final ATC if the Energy Commission approves the requested modifications.** The environmental impacts assessment presented herein, shows there will be no significant environmental impacts associated with the requested modifications in the petition to amend, and the project as modified would comply with all applicable LORS.

Air Quality Table 1 summarizes the applicable LORS for the facility.

**Air Quality Table 1
Laws, Ordinances, Regulations, and Standards**

Applicable LORS	Description
Federal	
42 U.S.C. §7401 et eq.	Federal Clean Air Act: New Source Review
40 CFR 60 Subpart GG	Standards of Performance for Stationary Gas Turbines.
40 CFR 72-78	Acid Rain Program
State	
Health and Safety Code §41700	"... no person shall discharge from any source whatsoever such quantities of air contaminants or other material which cause injury, detriment, nuisance, or annoyance to any considerable number of persons or to the public, or which endanger the comfort, repose, health, or safety of any such persons or the public, or which cause, or have a natural tendency to cause, injury or damage to business or property."
Local	
Rule 201	General Permit Requirements
Rule 202	New and Modified Stationary Source Review
Rule 203	Prevention of Significant Deterioration
Rule 401	Ringelmann Chart/Opacity
Rule 402	Nuisance
Rule 403	Fugitive Dust
Rule 404	Particulate Matter
Rule 405	Dust and Condensed Fumes
Rule 413	Stationary Gas Turbines
Rule 420	Sulfur Content Fuels

SETTING

The project area is currently attainment for sulfur dioxide (SO₂) and non-attainment for particulate matter (PM₁₀) and fine particulate matter (PM_{2.5}) which would be the pollutants affected by this petition to amend. Since the original Energy Commission decision, the ambient background levels have decreased for the 24-hour SO_x and PM_{2.5} concentrations and increased for 24-hour and annual PM₁₀ concentrations. A comparison of the background levels are provided in **Air Quality Table 2**.

**Air Quality Table 2
Ambient Background Levels for the CPP Project Area**

Pollutant	Averaging Time	Previous Background Levels ($\mu\text{g}/\text{m}^3$)	Current Background Levels ($\mu\text{g}/\text{m}^3$)	Percent Change (%)
SO ₂	1-hour	78.6	78.6	0
	24-hour	47.2	10.5	-78
	Annual	--	2.6	NA
PM10	24-hour	88	89	1
	Annual	21.3	32	50
PM2.5	24-hour	108	54.9	-49
	Annual	--	18.9	NA

Source: California Air Resource Board (ARB) 2010

Maximum Values shown for 2007-2009 for North Highlands – Blackfoot Way and Sacramento – Del Paso Manor monitoring stations.

ANALYSIS

The proposed modifications to the CPP would result in a slight increase in the permitted emission limits for SO_x, PM10, PM2.5, and may result in increase for the potential to emit greenhouse gas (GHG) emissions. This section evaluates the potential air quality impacts associated with the proposed modifications.

INJECTING DIGESTER GAS INTO THE FUEL SUPPLY

Background

The Carson Energy Ice-Gen Facility also known as the Central Valley Financing Authority (CVFA) supplements its natural gas supply by burning digester gas received from the SRWTP. A feasibility study performed by SMUD determined that because of the differential heat rates between the Carson Ice-Gen and CPP facilities, SMUD could enhance its renewably energy production from the digester gas by consuming it at CPP. The CPP facility operates at an average heat rate of 6,900 Btu/kWh (HHV) and the Carson Ice-Gen operates at an average heat rate of 9,500 Btu/kWh (HHV). The additional power generation attributed to the differential heat rates would be a maximum of about 2,140 kW per hour using the same quantity of digester gas. SFA proposes to inject a portion of the digester gas from the SRWTP that is currently being burned at the Carson Ice-Gen, into the natural gas supply line serving CPP. The natural gas supply line is a 26 mile pipeline that runs from the Carson Ice-Gen to CPP. The pipeline is already intact and no further construction would be needed. However, SFA would install new digester gas treatment equipment at the Carson Ice-Gen facility to ensure the digester gas would meet the pipeline and turbine manufacturer requirements allowing the consumption of blended digester gas at CPP.

The proposed CPP modifications include the combustion of up to a maximum of 2,500 standard cubic feet per minute (scfm) of SRWTP digester gas in the CPP gas turbines. The maximum blend of digester gas into the gas supply pipeline would not exceed four percent of the natural gas volume when CPP is operating both turbines at full load. The digester gas will have a maximum sulfur content of 1 grain (gr)/100 standard cubic foot (scf) (17 parts per million by volume) and displace an equal amount of natural gas on a

heat input basis. For the emission calculations provided in SFA2010, the CPP gas turbine full load operating case was evaluated and the SOx emission change associated with the combustion of 2,500 scfm of digester gas was compared to an equal amount of natural gas on a heat input basis. The SOx emissions for the combustion of natural gas were based on natural gas total sulfur content of 0.25 gr/100 scf, which is the basis for the existing emission limits for the CEC's approval of CPP.

SOx

The net increase in SOx emissions associated with the combustion of digester gas would be 0.36 lb/hr; the calculations are provided in SMAQMD2011. **Air Quality Table 3** shows the change in hourly, daily, quarterly, and annual SOx emissions.

**Air Quality Table 3
CPP Gas Turbine SOx Emission Summary**

	Existing COCs	Proposed Levels	Net Emission Increase
Gas Turbine hourly SOx emission limit (lb/hr)	1.31	1.67	0.36
Gas Turbine daily SOx emission limit (lb/day)	31.4	40.1	8.7
Facility-wide daily SOx emission limit (lb/day)	62.9	71.6	8.7
Facility-wide quarterly SOx emission limit (lb/quarter)	5,405 (1Q)	6,190 (1Q)	785(1Q)
	5,465 (2Q)	6,259 (2Q)	794(2Q)
	5,525 (3Q)	6,328 (3Q)	803 (3Q)
	5,525 (4Q)	6,328 (4Q)	803 (4Q)
Facility-wide annual SOx emission limit (lb/year)	21,922	25,107	3,185

Source: Calculations provided in SFA 2010 and SMAQMD2011.

Although there would be a slight increase in SOx emissions at CPP due to the combustion of the digester gas, the Carson Ice-Gen facility would be decreasing its SOx emissions equal to the increase proposed at the CPP by displacing the digester gas with natural gas (SFA2011).

The incorporation of digester gas would not commence until approval of the Acid Rain Program has been given by the EPA.

NOx, CO, and VOC

Because the digester gas would be replacing the natural gas on a heat input basis and it has a lower heat content, a volumetric increase in gas flow (about 985 scfm for every 2,500 scfm of digester gas used to displace the natural gas) at CPP would be required to maintain the rated turbine output. This increased gas flow could potentially increase emissions of NOx, CO, and VOC. However, CPP determined that the relatively small increase in the blended gas F-Factors (ratios of combustion gas volumes to heat inputs, dscf/mmBtu) compared to the current emission compliance margins would result in negligible increases of NOx, CO, and VOC emissions and therefore would not require any modifications to the COC. The permitted emissions for the facility would continue to be demonstrated through the use of CEMS for NOx and CO and on-going annual source testing at the facility for all other criteria pollutants.

PM10

Regarding PM10 emissions, SFA has concluded that there will be no significant measurable increase in PM10 emissions associated with the proposed combustion of blended gas in the CPP gas turbines.

Greenhouse Gases

The combustion of digester gas will increase the CO₂ emissions for these units due to the pass-through of the CO₂ in the digester gas. The following calculation of this increase in GHG emissions is based on a digester gas CO₂ content of 40 percent by volume and was provided in SFA2011 as follows.

$$(2,500 \text{ scfm}) \times 0.4 \times (\text{lb-mol}/385 \text{ scf}) \times (44 \text{ lb CO}_2/\text{lb-mol}) \times (60 \text{ min/hr}) \times (8760 \text{ hr/yr}) \times (\text{ton}/2,000 \text{ lb}) = 30,034 \text{ tons/yr of CO}_2$$

The GHG emission increase associated with the combustion of digester gas by the CPP gas turbines is below the PSD trigger of 75,000 tons/yr for project modifications. Furthermore, just like the SO_x emissions that will result from the use of incorporated digester gas, there will be a net decrease in GHG emissions at the Carson Ice-Gen facility from displacing the digester gas with natural gas that is equal to the increase at the CPP facility.

INCREASED TDS IN THE COOLING TOWER SUPPLY WATER

Background

The CEC approved a Petition to Amend for CPP in June 2008 that allowed an increase in TDS from 470 parts per million by weight (ppmw) to 800 ppmw based on cooling tower design modifications. This current Petition to Amend is requesting to further increase the TDS from 800 ppmw to 1,500 ppmw based on an expected increase in TDS from the incoming water supply.

CPP receives its cooling tower make-up water from the Folsom South Canal (FSC). In 2008, the Freeport Regional Water Authority began construction of an outtake structure and piping system that would convey Sacramento River water to the FSC. Because Sacramento River Water contains higher TDS than the American River, introduction of the Sacramento River water into FSC will significantly alter the constituents of the plant's raw water supply. In preparation for the change in water quality, CEC approved a second Petition to Amend in April 2009 that allowed the installation of a new above ground single-pass water filtration system (OnePass). The OnePass was installed and modifications to the existing zero-liquid discharge (ZLD) system were made.

Based on the recent operating data compiled by the plant operating engineers, SFA is requesting to increase the maximum allowable TDS level in the cooling tower recirculation water from 800 ppmw to 1,500 ppmw to match the actual performance of the newly installed OnePass water filtration system and to provide a margin of compliance for the increased TDS levels expected with the introduction of the Sacramento River water.

PM10

Due to the expected increase in TDS from the incoming water supply there would be an increase in the hourly, daily, and quarterly net emissions for PM10 from the cooling tower at CPP. The daily PM10 emission limit from the cooling tower is enforced by compliance with the TDS content of the circulating cooling water as provided in **AQ-24**. Quantifying PM10 emissions from the cooling tower is demonstrated by the following equation:

PM10 lb/day = circulating water recirculation rate * total dissolved solids concentration in the blowdown water * design drift rate.

This equation assumes that 100% of the emissions are PM10. This was the basis for the Final Commission Decision for CPP in 2003 and then again for the amendment in 2008. In the current Petition to Amend however, SFA is proposing to use an adjustment factor that would assume only a portion of the emissions (67.7%) would be PM10. The suggested adjustment factor is based on calculating solid mass in each drift droplet, based on a representative drift droplet size distribution and total TDS in the water. The methodology is described in detail in Appendix C of SFA2010.

The methodology uses several assumptions that may not accurately quantify PM10 emissions from the cooling tower. First, the equation assumes that each water droplet evaporates shortly after being emitted into ambient air, into a single, solid, spherical particle. This would mean, the higher the TDS, the more solids each drift droplet would contain and therefore, upon evaporation, would result in larger solid particles, often times larger than PM10 which would not be quantified in the emissions of PM10. However, there is no supporting evidence that shows a single larger solid particle will form, when a drift droplet evaporates containing multiple smaller particles, making the entire basis unjustified. If this assumption does not hold true, the calculation methodology would be inaccurate. Second, the equation assumes all TDS would have the same density as sodium chloride. However, there are many other constituents (e.g., phosphate, calcium, etc.) that also make up the TDS in the water supply that have lower densities than sodium chloride and would therefore form smaller particles than those estimated in the assumption.

Staff analyzes estimated worst case project impacts to provide appropriate mitigation under the California Environmental Quality Act (CEQA). Due to the uncertainties in calculating emissions from cooling towers, staff assumes that 100% of the emissions are PM10. SFA's proposal to use an adjustment factor that assumes some fraction less (which would mean that the remaining portion has a diameter greater than PM10) would not appropriately quantify PM10 emissions. Because of this, Staff requested SFA to identify source testing methods that would confirm that approximately 68% of the emissions are PM10 and commit to a CoC that would require this as verification to ensure that all project emission are appropriately mitigated (CEC2011). SFA's response to the data request is summarized below. The entire response was provided in SFA2011.

“SFA has reviewed U.S. Environmental Protection Agency (EPA)-approved particulate compliance test methods and is unable to identify a method that will account for the two step process that forms the basis for the cooling tower PM10 emissions calculated in the CPP Petition to Amend.”

“SFA also contacted three well-known stack testing firms—Airkinetics, Avogadro Group, and Broadbent and Associates—and learned that while these firms could take EPA-approved stack testing equipment/procedures and adapt them to sample the exhaust from wet cooling towers, this type of particulate testing has a number of significant issues that will affect the accuracy of the PM10 emission test results. These issues include sampling problems resulting from cyclonic flow of exhaust from the wet cooling tower fan vents and problems with using particulate size cut methods (e.g., cyclones) in the front part of the sampling probe so that only PM10 particles are captured by the sampling equipment.”

“Because the SFA is concerned that the existing wet cooling tower test methods cannot replicate the two-step process in the PM10 calculation methodology and because of the above issues that affect the accuracy of PM10 emission testing methods adapted to sample wet cooling towers, the SFA does not believe a condition of cooling tower testing program for the proposed CPP amendment is appropriate.”

Due to the unjustified assumptions used in the calculation methodology for estimating PM10 emissions from the cooling tower and the inability to accurately measure or source test PM emissions from the cooling tower, Staff has the obligation to assume that 100% of the emissions are PM10 to analyze potential worst case project impacts and ensure appropriate mitigation for compliance with CEQA. Furthermore, this response brings into question the accuracy and precision of the method used to determine the 67.7% adjustment factor prepared by SFA. **Air Quality Table 4** presents SFA proposed emission limits assuming 67.7% of PM emissions are PM10 and Staff suggested emission limits assuming 100% are PM10.

**Air Quality Table 4
CPP Cooling Tower PM10 Emission Summary**

	Existing COCs	SFA Proposed Levels Based on 67.7% PM10 ²	Staff Suggested Levels Based on 100% PM10 ³	SFA Proposed Net Emission Increase	Staff Suggested Net Emission Increase
Cooling Tower hourly PM10 emission limit (lb/hr)	0.31	0.39	0.58	0.08	0.27
Cooling Tower daily PM10 emission limit (lb/day)	7.43	9.36	13.92	1.93	6.49
Facility-wide quarterly PM10 emission limit (lb/quarter) ¹	39,550 (1Q)	39,726 (1Q)	40,137 (1Q)	176 (1Q)	587 (1Q)
	39,989 (2Q)	40,167 (2Q)	40,582 (2Q)	178 (2Q)	593 (2Q)
	40,428 (3Q)	40,608 (3Q)	41,028 (3Q)	180 (3Q)	600 (3Q)
	40,428 (4q)	40,608 (4Q)	41,028 (4Q)	180 (4Q)	600 (4Q)
Facility-wide annual PM10 emission limit (lb/year) ¹	160,395	161,109	162,775	714	2,380

Source: SFA2010, SMAQMD2011 and modified by Staff.

Notes: 1. The facility-wide total and net increases include the additional 2.6 lb/qtr of PM₁₀ quantified from the perlite storage dust collector shown below in **Air Quality Table 5**.

2. PM10 (lb/hr) = 155,000 (gal/min) * 1500 (ppmw) * 0.0005 (%) * 60 (min/hr) * 8.34 (gal/min) * 67.7 (%)

3. PM10 (lb/hr) = 155,000 (gal/min) * 1500 (ppmw) * 0.0005 (%) * 60 (min/hr) * 8.34 (gal/min)

The SMAQMD agreed to use the 67.7% adjustment factor when quantifying PM10 emissions. **Air Quality Table 4** above shows that Staff assumed 100% PM10, and therefore assumed a higher level of emissions than SMAQMD. The mitigation requirements for these emissions are discussed below in **Air Quality Table 7** below.

ADDITION OF THE PERLITE STORAGE DUST COLLECTOR

Background

As previously discussed, the 2009 Petition to Amend addressed the ZLD system modifications as well as the installation of a membrane (OnePass) water filtration system. Perlite is used in the membrane water filtration system to aid filtration of solids from the incoming raw water supply. A dust collector is used to control particulate emissions during the periodic loading of the perlite storage silo. Based on operational data collected since July 2010, it was determined that the small dust collector associated with the membrane water filtration system required an Authority to Construct (ATC) and a Permit to Operate (PTO) from SMAQMD.

PM10

The SMAQMD has issued a **Draft** ATC and evaluation for the perlite silo storage and the emissions are summarized in **Air Quality Table 5** below. The necessary CoC for compliance with all LORS are included in this Petition to Amend as **AQ-46** to **AQ-53**.

**Air Quality Table 5
CPP Perlite Storage Dust Collector Emission Summary**

	Quarter 1 Lb/qtr	Quarter 2 Lb/qtr	Quarter 3 Lb/qtr	Quarter 4 Lb/qtr	Annual Lb/year
Proposed Emissions	2.6	2.6	2.6	2.6	10.4

Source: SMAQMD2011

AMBIENT AIR QUALITY IMPACT ANALYSIS

An ambient air quality impact analysis was performed to ensure that the proposed CPP modifications would not interfere with the attainment or maintenance of an applicable ambient air quality standard. **Air Quality Table 6** summarizes the maximum ambient SO₂ impacts from the CPP gas turbines and the maximum ambient PM10 impacts from the CPP cooling tower. The results show SO₂ impacts well below all applicable standards, including the new National 1-hour SO₂ standard. The results for the 24-hour and annual PM10 impacts show exceedances of the ambient air quality standards; however, this is due to the already high background levels. The cooling tower impacts alone are well below the PSD significant levels for PM10 of 5.0 µg/m³ and 1.0 µg/m³ for 24-hour average and annual average respectively. Furthermore, the project would be offsetting the PM10 and SO₂ impacts for compliance with CEQA because these are non-attainment and precursor criteria pollutants for the project area.

**Air Quality Table 6
Ambient Air Quality Impact Analysis**

	Previous Modeling Analysis	Revised Impact	Background Levels ^d	Total Impact	Ambient Air Quality Standards
Gas Turbine SO₂ Impacts					
1-hour Impact - State Standard (µg/m ³)	0.58 ^a	0.74 ¹	78.6	79.3	655
1-hour Impact - National Standard (µg/m ³)	0.58 ^a	0.74 ¹	14.7	15.4	195
24-hour Impact (µg/m ³)	0.22 ^a	0.28 ¹	10.5	10.8	105
Annual Impact (µg/m ³)	0.02 ^b	0.03 ¹	2.6	2.6	80
Cooling Tower PM10 Impacts					
24-hour Impact (µg/m ³)	0.177 ^c	0.33 ²	89	89.33	50
Annual Impact (µg/m ³)	0.02 ^c	0.04 ²	32	32.04	20

Source:

- a. CEC Staff Assessment, CPP (01-AFC-19), February 2003, Air Quality Table 5 (Phase 1 ambient impacts).
- b. Supplement A to AFC for CPP (01-AFC-19), March 15, 2002, Table 8.1-28R (calculated based on one-half of combined impacts for four gas turbines to account for impacts for only two gas turbines).
- c. Permit application package for modification to PTO for CPP cooling tower, March 22, 2007, Table 5 and Petition to Amend CEC Approval of CPP, November 2007, Table 2.
- d. California Air Resource Board (ARB) 2010. Maximum Values shown for 2007-2009 for North Highlands – Blackfoot Way and Sacramento – Del Paso Manor monitoring stations.

Notes:

1. Based on ratio between proposed gas turbine SO_x emissions of 1.32 lb/hr and proposed 1.69 lb/hr.
2. Based on ratio between staff proposed cooling tower PM10 emissions of 13.92 lb/day and the permitted level of 7.43 lb/day.

MITIGATION MEASURES

The proposed Petition to Amend would have the potential to increase SO_x emissions by **3,185** lb/year and increase PM10 emissions by **2,380** lb/year. The project area is currently attainment for SO_x and non-attainment for PM10. The CPP facility-wide quarterly potential to emit for PM10 would exceed the SMAQMD threshold and would therefore be required to provide offsets per District Rule 201, Section 302. However, due to the differences in methodologies used in quantifying PM10 emissions from the cooling tower, the SMAQMD would be requiring fewer offsets than the Staff recommended mitigation for CEQA. The SO_x emissions would be below the SMAQMD threshold, therefore SFA would not be required to offset per District rules, however, because the area is currently non-attainment for PM10, all PM10 emissions and precursor emissions (SO_x) are required to be offset per CEQA. **Air Quality Table 7** outlines CPP's offset requirements and demonstrates compliance with all LORS and CEQA mitigation measures.

**Air Quality Table 7
CPP Mitigation Requirements (lb/year)**

Source	NOx	VOC	PM10/PM2.5	CO	SOx
Total Two CTG's Potential Increase	---	---	---	---	3,185
Cooling Tower Potential Increase ¹	---	---	2,370	---	---
Perlite Storage Dust Collector	---	---	10.4	---	---
CPP Potential to Emit	---	---	2,380	---	3,185
Offset Requirements					
SMAQMD Offset Requirements ²	---	---	1,069	---	---
CPP Offset Holdings Certificate, Site of Reduction					
ERC #1030	---	---	1,069	---	---
Surplus from ATC 22673 and 22674 ³	---	---	1,311	---	3,185
CPP Mitigation Total	---	---	2,380	---	3,185
Staff Recommended Mitigation for CEQA Only	0	0	2,380	0	3,185
Fully Offset?	Yes	Yes	Yes	---	Yes

Notes:

1. Staff assumed 100% of PM is PM10 when calculating PM10 emissions from the cooling tower.
2. SMAQMD assumed an adjustment factor of 67.7% when calculating PM10 emissions from the cooling tower. Calculations for SMAQMD offset requirements are provided in SMAQMD2011. SMAQMD PM10 offset requirements are based on a 1.5 to 1.0 distance ratio.
3. SMAQMD Authority to Construct 22673 and 22674 required multiple ERCs. The surplus from these credits would offset the CEQA required project emissions at a 1 to 1 ratio.

CONCLUSIONS AND RECOMMENDATIONS

Staff recommends approval of the requested changes for CPP. With the recommended mitigation measures, all requested project modifications would continue to comply with all applicable LORS.

PROPOSED MODIFICATIONS TO CONDITIONS OF CERTIFICATION

The following conditions of certification would be amended in the Final Commission Decision for the SMUD Cosumnes Power Plant to ensure compliance with all LORS. ~~Strikethrough~~ is used to indicate deleted language and underline for new language. **Red text shows edits made in the Revised Staff Analysis.**

AQ-17 Emissions from the following equipment shall not exceed the following limits, not including periods containing start-ups and short-term excursions as defined in condition AQ-26.

Pollutant	Maximum Allowable Emissions	
	CTG #1 (lbs./hr)	CTG #2 (lbs./hr)
NO _x	13.51 (a)	13.51 (a)
CO	16.46 (b)	16.46 (b)
ROC	3.30 (c)	3.30 (c)
SO _x	4.34 1.67 (d)	4.34 1.67 (d)
PM10	9.00 (e)	9.00 (e)

- (a) Based on data submitted in the application and is monitored by the turbine's NO_x CEM system (1 hour average).
- (b) Based on data submitted in the application and is monitored by the turbine's CO CEM system (3 hour average)
- (c) Based on a turbine ROC emission factor of 0.00177 lb/mmbtu and firing at full capacity.
- (d) Based on a turbine ~~SO_x emission factor of 0.00071 lb/mmbtu and firing at full capacity~~ **aggregate usage of 2,500 scfm (92.63 mmbtu/hr) digester gas (4.626577E-3 SO_x/mmbtu) and 1,772.37 mmbtu/hr natural gas (7.00967E-4 SO_x/mmbtu).**
- (e) Based on a turbine PM10 emission factor of 0.00483 lb/mmBTU and firing at full capacity.

Verification: As part of the quarterly and annual compliance reports, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-18 Emissions of NO_x, CO, ROC, SO_x, and PM10 from Phase 1 of the CPP facility including start-ups and shut-downs shall not exceed the following limits.

Pollutant	Maximum Allowable Emissions (lbs./day)			
	CTG #1	CTG #2	Cooling Tower	Total
NO _x	523.7	523.7	NA	1,047.4
CO	3,051.7	3,051.7	NA	6,103.3
ROC	117.3	117.3	NA	234.6
SO _x	31.44 40.1(a)	31.44 40.1(a)	NA	62.88 80.2(a)
PM10	216.0	216.0	7.41 3.9(b)	439.44 445.9(b)

(a) Facility SO_x equates to the total usage of the proposed natural gas/digester gas mixture.

Individual turbines equate to the total usage of the digester gas and balance natural gas.

(b) Values of PM10 reflect changes to cooling tower TDS change.

Verification: As part of the quarterly and annual compliance reports, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-19 Emissions of NO_x, CO, ROC, SO_x, and PM10 from Phase 1 of the CPP facility including start-ups and shut-downs shall not exceed the following limits.

Pollutant	Maximum Allowable Emissions				
	Qtr 1 (lbs./quarter)	Qtr 2 (lbs./quarter)	Qtr 3 (lbs./quarter)	Qtr 4 (lbs./quarter)	Total (lbs./year)
NOx	62,021	62,643	63,265	63,265	251,194
CO	147,929	148,687	149,444	149,444	595,505
ROC	14,807	14,958	15,110	15,110	59,986
SOx	5,405 5 6,190	5,465 5 6,259	5,525 5 6,328	5,525 5 6,328	21,922 22 25,105
PM10(a)	39,550 50 40,137	39,989 89 40,582	40,428 28 41,028	40,428 28 41,028	160,395 95 162,775

(a) Values reflect changes to cooling tower TDS change and perlite storage silo addition.

Verification: As part of the quarterly and annual compliance reports, the project owner shall include information on the date, time, and duration of any violation of this permit condition.

AQ-24 The total dissolved solids content of the circulating cooling water shall not exceed ~~800~~**1,500** ppmw, averaged over any consecutive three-hour period.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-32 The CPP shall operate a continuous monitoring system that has been approved by the Air Pollution Control Officer that either measures or calculates and records the following:

Parameter to be monitored	Units
Fuel consumption of each combined cycle turbine.	Mmbtu/hr of natural gas/ digester gas combination
Exhaust gas flow rate of turbine and duct burner.	Kscfh or lb/hr
Total dissolved solids content of the circulating water in the cooling towers.	PPMW

Verification: At least sixty (60) days prior to purchase of the continuous monitoring system, the project owner shall submit to the District, for approval, and to the CPM, for review, a copy of the manufacturer specifications for the continuous monitoring system, which demonstrates compliance with the District's monitoring requirements.

AQ-33 The following record shall be continuously maintained on site for the most recent five-year period and shall be made available to the Air Pollution Control Officer upon request. Quarterly and yearly records shall be made available for inspection within 30 days of the end of the previous quarter or year respectively.

Frequency	Information to be recorded
General	<ul style="list-style-type: none"> A. Record of the occurrence and duration of any start-up, short-term excursion, or shut-down. B. Malfunction in operation of each turbine. C. Measurements from the continuous monitoring system. D. Monitoring device and performance testing measurements. E. All continuous monitoring system performance evaluations. F. All continuous monitoring system or monitoring device calibration checks. G. All continuous monitoring system adjustments and maintenance.
Hourly	<ul style="list-style-type: none"> A. Each combined cycle turbine's natural gas <u>and digester gas combination</u> fuel consumption (mmbtu/hr). B. Indicate when each combined cycle turbine start-up/shut-down occurred. C. Each combined cycle turbine's NO_x, CO, ROC, SO_x, and PM₁₀ hourly mass emissions. For those pollutants directly monitored (NO_x and CO), the hourly mass emissions shall be calculated based on concentration measurements from the CEM system required pursuant to condition AQ-31. For those pollutants that are not directly monitored (ROC, SO_x, and PM₁₀), the hourly mass emissions shall be calculated based on District approved emission factors contained in footnotes to condition AQ-17. D. Each combined cycle turbine's NO_x and CO concentration measured in ppmvd at 15% O₂. E. Total dissolved solids content of the circulating water in the cooling towers in ppmw. F. Cooling tower hourly PM₁₀ mass emission rate. The hourly emissions shall be calculated based on the cooling water circulation rate multiplied by the cooling tower drift rate, density of water, and the measured TDS level.
Daily	Total facility NO _x , CO, ROC, SO _x , and PM ₁₀ daily mass emissions.
Quarterly	Total facility NO _x , CO, ROC, SO _x , and PM ₁₀ quarterly mass emissions.

Verification: All quarterly and annual reports shall be maintained on site for a minimum of five (5) years and shall be provided to the CPM or District personnel upon request.

AQ-36 A NO_x, ROC, CO, SO_x, PM₁₀, ammonia, and CEM accuracy source test of each combined cycle turbine shall be performed once each calendar year. The Air Pollution Control Officer may waive the annual PM₁₀ and/or ROC source test requirement if, in the Air Pollution Control Officer's sole judgment, prior test results indicate an adequate compliance margin has been maintained.

- A. The project owner shall submit a test plan to the Air Pollution Control Officer for approval at least 30 days before the source test is to be performed.
- B. The Air Pollution Control Officer shall be notified at least 7 days prior to the emission testing date.
- C. During the test(s), each turbine is to be operated at its maximum firing capacity defined as $\geq 90\%$ of rated heat input capacity and taking into account ambient conditions.
- D. The source test results shall be submitted to the Air Pollution Control Officer within 60 days from the completion of the source test(s).
- E. Source testing shall occur with a representative flow of digester gas into the pipeline feeding the fuel supply to the turbine being tested so that the turbine being tested is using the digester gas.

Verification: The project owner shall notify the District and the CPM within 7 working days prior to the planned source testing date. The source test results shall be submitted to the District and the CPM within 60 days from the completion of the source test.

AQ-44 and AQ-45 pertain to the incorporation of digester fuel into the fuel supply:

AQ-44 The use of digester gas used at the Cosumnes Power Plant is restricted to 2,500 scfm and shall not commence until approval of the Acid Rain Program Petition.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-45 The digester gas used at this facility shall not exceed 50 ppm of H₂S, measured prior to the commingling with the natural gas.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-46 to AQ-53 pertains to the installation of the perlite Storage Silo and attached APC Dust Collector Cyclonaire. AQ-53 also reflects the increase in PM₁₀ emissions from the cooling tower:

AQ-46 The process shall not discharge into the atmosphere any visible air contaminants for a period or periods aggregating more than three minutes in any one hour, which are as dark or darker than ringelmann no. 1 or equivalent to or greater than 20% opacity.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-47 The emissions from the dust collector shall not exceed the following limit:

<u>Pollutant</u>	<u>Maximum Allowable Emissions (A)</u>
	<u>Quarterly (lb/quarter)</u>
<u>PM10</u>	<u>2.6</u>

(A)Based on maximum capacity 26 hours/qtr, and particulate emissions of 0.02 gr/dscf at 585 cfm.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

PROCESS OPERATION

AQ-48 The dust collector shall be equipped with a pressure differential gauge to indicate the pressure drop across the bags. The average pressure drop shall not exceed the manufacturer's recommendation.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-49 The dust collector cleaning frequency and duration shall follow the manufacturer's recommendations.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-50 Total perlite delivered to the silo per quarter cannot exceed 101.4 tons.

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

RECORD KEEPING

AQ-51 The following record shall be continuously maintained on site for the most recent five-year period and shall be made available to the air pollution control officer upon request. Quarterly and yearly records shall be made available for inspection within 30 days of the end of the previous quarter or year respectively.

<u>Frequency:</u>	<u>Information to be recorded:</u>
<u>Quarterly</u>	<u>Total perlite delivered to the silo (tons/qtr)</u>

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports. The owner shall make the records available to the CPM upon request.

EMISSION OFFSETS

AQ-52 The following table depicts the PM10 emission increase that will require to be offset.

<u>Pollutant</u>	<u>Qtr1 lb/qtr</u>	<u>Qtr2 lb/qtr</u>	<u>Qtr3 lb/qtr</u>	<u>Qtr4 lb/qtr</u>
PM10	2.6	2.6	2.6	2.6

Verification: The project owner shall include information on the date, time, and duration of any violation of this permit condition in the quarterly and annual reports.

AQ-53ERC 07-01030 is expected to be surrendered in accordance with SMAQMD Authority to Construct 22702 and 22672.

<u>From erc 1030</u>	<u>Face value of certificates surrendered</u>				<u>Offset ratio</u>	<u>Value applied to the emission liability</u>			
	<u>Qtr1</u>	<u>Qtr2</u>	<u>Qtr3</u>	<u>Qtr4</u>		<u>Qtr1</u>	<u>Qtr2</u>	<u>Qtr3</u>	<u>Qtr4</u>
<u>Erc's surrendered</u>	<u>262</u>	<u>267</u>	<u>270</u>	<u>270</u>	<u>1.5</u>	<u>174.6</u>	<u>177.6</u>	<u>179.6</u>	<u>179.6</u>

Notes: The quantities of ERCs include the increase in PM10 emissions from the cooling tower as required by SMAQMD. For CEQA purposes, a surplus of ERC's provided in ATCs 22673 and 22674 would be used to offset Staff recommended mitigation as discussed in Air Quality Table 7.

Verification: Prior to operation of the equipment, the project owner shall provide valid emission reduction credits specified in AQ-53 to the District for approval and to the CPM for review.

REFERENCES

CEC – California Energy Commission, Final Decision (01-AFC-19), September 10, 2003.

CEC2011 – California Energy Commission, Data Request, March 2011.

SFA2010 – Sacramento Financing Authority for SMUD Cosumnes Power Plant, Petition to Amend (01-AFC-19C), December 29, 2010.

SFA2011 – Sacramento Financing Authority for SMUD Cosumnes Power Plant, Data Responses, April 2011.

SMAQMD2011 – Sacramento Metropolitan Air Quality Management District, Proposed Authority to Construct, May 2011.

COSUMNES POWER PLANT (01-AFC-19C)

**Petition for Modification
Soil and Water Resources Analysis
Prepared by: Mike Conway
March 2011**

INTRODUCTION

On December 29, 2010, the Sacramento Municipal Utility District Financing Authority (SFA) (project owner) filed a petition with the California Energy Commission (Energy Commission) to amend to remove the peak flow intake limitation from Condition of Certification (COC) **WATER RES-1** for its Cosumnes Power Plant (CPP). The owner is requesting to remove the limitation for instantaneous peak flow set at 2,500 gallon per minute (gpm). The limitation requires the owner to curtail load during peak generation demand on high temperature days.

This analysis was prepared because the requested modification has the potential to effect soil and water resources and was evaluated in accordance with the California Environmental Quality Act (CEQA) and current laws, ordinances, regulations, and standards (LORS).

LAWS, ORDINANCES, REGULATIONS, AND STANDARDS COMPLIANCE

Staff has reviewed the LORS identified in the Energy Commission's Final Staff Assessment for the CPP (CEC 2003). The Petition to Amend does not require the analysis of any new or previously non-applicable LORS.

PROJECT DESCRIPTION AND BACKGROUND

In its original Application for Certification, SMUD proposed to use approximately 8,000 acre-feet per year (AFY) of water from the Folsom-South Canal for both Phase 1 and 2 of the project, largely for cooling purposes. SMUD has water rights through an existing contract and an additional assignment with the U.S. Bureau of Reclamation, dating back to 1970, for the delivery of a maximum of 75,000 AFY, most of which was originally intended for the Rancho Seco Nuclear Power Plant, now decommissioned. The Folsom-South Canal originates at Lake Natoma on the American River east of Sacramento and carries water south to Rancho Seco where approximately 15,000 AFY is currently used at the decommissioned power plant and then discharged into Clay Creek. Folsom-South Canal water is also stored in Rancho Seco Reservoir, presently used for recreational purposes.

SMUD constructed a half-mile 12-inch pipeline to the project from the existing 66-inch pipeline for Rancho Seco. An on-site water treatment plant treats the incoming water for use in the cooling towers, potable domestic water system, plant service water, HRSG makeup water, and turbine inlet air cooling. Originally, SMUD proposed to treat and discharge project cooling tower blowdown (water withdrawn after several cycles through

the cooling towers) to Clay Creek. After intensive review by the Energy Commission staff related to concerns over the use of potable water for cooling and the environmental effects of discharging to area surface waters, SMUD revised the project to utilize a Zero Liquid Discharge system, which completely avoids water discharge to Clay Creek and reduces water consumption as well, from 4,000 AFY to approximately 2,663 AFY. Rancho Seco Reservoir contains 2,850 acre-feet of water and currently provides storage for Rancho Seco use. SMUD uses Rancho Seco Reservoir as a backup water supply for Phase 1.

Current condition language limits annual average consumption to 2,663 AFY and also limits peak flow to a rate of 2,500 gpm.

PROPOSED AMENDMENTS

As contained in the December 29, 2010 amendment petition, the project owner proposes to eliminate the peak flow limitation as written in Condition of Certification **WATER RES-1**. The maximum volume of water used on an annual basis would not change.

The owner determined that the CPP cannot maintain adequate cooling tower water levels during high temperature days. The peak flow limitation written into the Condition requires the CPP to curtail peak generation during peak demand. The petition requests to remove the peak flow restriction. The proposed change will not cause an increase in annual water usage.

ANALYSIS

Staff reviewed the project owner's December 29, 2010 petition to identify potential environmental impacts to soil and water resources and for consistency with applicable LORS. This analysis is based on information provided in the Final Staff Assessment for the CPP (CEC 2003) and in the owner's petition.

Based on this review, staff presents the following assessment of the project owner's proposed changes to Conditions of Certification **WATER RES-1**. The scope of this analysis is to evaluate:

1. The CEQA impacts related to the project owner's proposal to remove the peak flow limitation from Condition of Certification **WATER RES-1**.
2. LORS compliance required as a result of the project owner's proposal to remove the peak flow limitation from Condition of Certification **WATER RES-1**.

To analyze the CEQA impacts related to the applicant's proposed change to the condition, staff evaluated whether project operation water use at the maximum flow rate would affect other users supplied by the same conveyance system. Staff understands the conveyance system was designed to ensure all users could receive their allotments when needed. Staff was informed that there is only one downstream user of FSC water. In addition, the plants current conveyance system including pumps and piping, limits the projects maximum delivery flow rate to about 3,000 gpm, which is much lower than the

original conveyance system was capable of providing. Therefore staff believes that if the project flow rate limitation were removed there would be no impact to other users.

Staff believes there would be no impact to water quality by removal of the flow rate limitation. Staff recently amended the project to address changes in water quality that were a result of change in operation by the United States Bureau of Reclamation (USBR) and Sacramento regional water purveyors. This change is due to mixing of Sacramento and American River water supplies and will result in an anticipated degradation of water quality that is beyond the project owner's control. Staff anticipates water quality will vary throughout the year, and an increase in flow rate to meet the project needs would likely have an insignificant effect on water quality.

To analyze whether there would be any effects on the environment and whether there were any limitations on flow rates to the project that would affect the reliability of the supply project operation, staff also reviewed the water rights and supply agreements for the project. Staff noted that in the FSA (2003) the terms of an agreement for supply would be expiring and require renegotiation. Staff found that SMUD is entitled to renewal of their contracts by federal law. SMUD has already executed a Binding Agreement to Renew its contract with USBR and negotiations are expected to be completed in a timely manner.

CONSTRUCTION IMPACTS

No additional construction is required for the proposed amendment.

LORS ANALYSIS

As described above, no new LORS apply to the proposed amendment. The proposed changes would comply with all applicable LORS.

PROPOSED MODIFICATIONS TO CONDITIONS OF CERTIFICATION

Staff agrees with the proposed modification to the condition language as proposed by the owner.

WATER RES-1: Total water use by the project owner for the operation of the project and all landscape irrigation of the CPP site shall not exceed an annual average of 2,663 AFY over any three successive calendar years, ~~nor exceed a peak flow of 2,500 gpm.~~

Verification: The owner shall maintain daily records of water use from each source (FSC, Rancho Seco Reservoir and/or reclaimed if used) and as part of its annual compliance report shall submit a water use summary to the CPM on an annual basis for the life of the project. ~~The owner shall track its water use (from any source) on a daily basis and shall notify the CPM immediately upon exceeding, or upon forecast to exceed, the peak flow of 2,500 gpm.~~ The annual average 2,663 AFY shall be calculated based upon any consecutive three-year period starting with the first full calendar year of

operation and shall not exceed the average annual consumption for any three consecutive years for the life of the project.

CONCLUSIONS

Staff believes the project should be modified to eliminate the peak flow requirement from COC **WATER RES-1**. The modification is consistent with Energy Commission water policy and California Water Code section 13550 which are intended to protect freshwater supplies for other beneficial uses. This change in water use would not result in any impacts and would be consistent with previous project analysis if the proposed changes to the existing conditions of certification are adopted and implemented.

REFERENCES

CEC 2003. Cosumnes Power Plant. Final Staff Assessment, Parts 1 and 2. February 2003.