

**TO: INTERESTED PARTIES**  
**FROM: JERI SCOTT, COMPLIANCE PROJECT MANAGER**  
**DATE: JUNE 23, 1999**  
**SUBJECT: STAFF ANALYSIS**

On April 12, 1999, Energy Commission staff received a petition from the Central Valley Financing Authority to amend the Commission Decision for the Carson Cogeneration Project (92-SPPE-1C). The petition contains a proposal by the project owner to modify the language in Condition of Exemption Air Quality One. The modification will allow the project owner to increase the daily hours of operation of the simple cycle unit without making any physical plant modifications or changes to the plant's rate power output.

The additional daily hours of operation will generate additional electrical power for SMUD during periods of high power demand, and provide additional voltage support to the local power grid. However, the increased hours of operation will cause the daily emission cap of the reactive organic compounds (ROCs) to increase from a 96 lb/day to 125 lb/day.

We have completed our analysis of the petition and determined that, with sufficient mitigation, increasing the emission cap of the ROCs will not cause a significant impact on the environment. Therefore, we plan to recommend approval of the Central Valley Financing Authority's petition at the Commission's July 28, 1999 Business Meeting. We have enclosed a copy of our analysis for your review. Your comments and questions are appreciated and must be received no later than, and preferably prior to the July 23, 1999.

Please call me at (916) 654-4228 if you have questions regarding this memo or the Energy Commission amendment process. Technical questions should be directed to Mr. Matt Layton at (916) 654-3868.

Enclosure

# **AMENDMENT REQUEST TO INCREASE DAILY EMISSIONS LIMIT FOR REACTIVE ORGANIC COMPOUNDS, CARSON ENERGY GROUP COMBINED CYCLE COGENERATION FACILITY, 92-SPPE-1**

## **Amendment Request**

On April 12, 1999, the Carson Energy Group, the Carson Ice-Gen project operator, proposed an amendment to their Combined Cycle Cogeneration Facility, 92-SPPE-1, to increase the allowable daily facility emissions of reactive organic compounds. The amendment proposes that the reactive organic compound emissions increase, an ozone precursor, be mitigated via the inclusion of the Carson Ice-Gen project in the emission reduction credit bubble (an offset bubble) which now includes the Sacramento Municipal Utility District's Proctor & Gamble and the Campbell Soup Projects (CEG 1999).

## **Background**

In October 1992, the Carson Energy Group (CEG) proposed to construct and operate the 99.3 megawatt (MW) Carson-Ice Project. The project was certified in June 1993 (CEC 1993) and ownership was transferred to the Central Valley Financing Authority, a joint powers agency composed of the Sacramento Municipal Utility District (SMUD) Board and one non-voting member of the Sacramento County Sanitation District.

The project, built and operating, consists of one combustion turbine generator (CTG) combined cycle with a duct burner, one combustion turbine generator peaking unit, and one cooling tower. Two existing boilers and six digester gas flares at the adjacent wastewater treatment facility are included in the facility emission caps. The fuels are natural gas, and digester gas from the adjacent wastewater treatment facility.

## **Laws, Ordinances, Regulations, And Standards**

Air Quality Condition of Certification AQ-1 (CEC 1993) sets a single emission limit for criteria air pollutants for the facility. The emission limits are for nitrogen oxides (NO<sub>x</sub>), carbon monoxide (CO), reactive organic compounds (ROC), sulfur oxides (SO<sub>x</sub>), and particulate matter less than 10 microns (PM<sub>10</sub>).

## **Analysis**

The CEG is proposing a change to AQ-1, increasing the allowable facility emissions of ROC from the current limit of 96 pounds/day up to 125 pounds/day. Other air pollutant emission limits in AQ-1 will remain the same. CEG is not proposing any physical changes to the facility, stating that the ROC increase will allow additional hours of operation per day of the existing facility peaking turbine to meet the summer and daily peak electrical demands of the region served by SMUD (CEG 1999). Currently, the CTG peaking unit is limited to roughly 10 hours of operation per day, if the other emission sources are on line and producing emissions that are part of the facility air pollutant mass emission caps in AQ-1 (CEG 1999).

The peak electrical demand generally occurs during the afternoons, and mostly on summer days when the region also experiences high ambient ozone levels. Any emission increase of an ozone precursor, particularly on a hourly or daily basis, needs to be analyzed to determine if the increase will cause, or contribute to an existing, violation of a state or federal 1-hour ozone standards. Additionally, ROCs are precursors to PM10. Operating Carson’s peaking combustion turbines to meet a daily peak demand during the winter PM10 season needs to be analyzed to determine if the emission increase will cause, or contribute to an existing, violation of a state or federal ambient air quality 24-hour PM10 standards.

### Ambient Air Quality Setting

The Sacramento Metropolitan Air Quality Management District (District) encompasses all of Sacramento County. Ambient air quality measurements are fairly constant, despite the continued growth in the number of industries; residents and vehicle miles traveled in the county. Air quality problems occur on a seasonal rather than continuous basis. Sacramento generally experiences violations of the state and federal ozone standards during the summer months and violations of the state PM10 standard during the winter months.

Air Quality Table 1 shows the ambient air quality data from District monitoring stations close to the Carson Ice-Gen facility, and the maximum measurements for the county. The proximity of the monitoring station to the emission source is generally not as important for ozone and PM10 data; these pollutants have regional, or gross, rather than localized effects. Table 1 also shows the number of days per year that the measure levels of air pollutant exceed the standard. These continued violations, particularly of the state standards, suggest the need for continued control measures for PM10, and PM10 and ozone precursor emissions from sources in the air basin. Sacramento County ambient air quality measurements do not violate the federal 24-hr PM10 standard.

**Air Quality Table 1: SMAQMD Summary Air Quality Data**

Pollutant	Year	1309 T Street	Elk Grove – Bruceville	H.D. Stockton	County Maximum	Days above NAAQS (a)	Days above CAAQS (b)
Ozone – ppm	1997	0.09	0.12	---	0.14	3	21
	1996	0.12	0.12	---	0.16	7	49
	1995	0.13	0.12	---	0.16	10	39
	1994	0.11	0.11	---	0.15	6	36
PM <sub>10</sub> - µg/m <sup>3</sup>	1997	108	---	107	108	0	6
	1996	75	---	86	86	0	12
	1995	85	---	74	85	0	17
	1994	99	---	94	104	0	13

- a. The National Ambient Air Quality Standard for 1-hr ozone is 0.12 ppm; for 24-hr PM10 it is 150 µg/m<sup>3</sup>.
- b. The California Ambient Air Quality Standard for 1-hr ozone is 0.09 ppm; for 24-hr PM10 it is 50 µg/m<sup>3</sup>.

Sources: CARB 1994, 1995, 1996, 1997

## Amendment Description

The amendment proposes an increase in the Carson Ice-Gen facility ROC emission limit by 29 pounds per day (see Air Quality Table 2). The increase will allow CEG, or effectively SMUD, through its joint power ownership of Carson Ice-Gen, to provide more peak power to its service area.

**Air Quality Table 2: Carson Ice-Gen Project Air Pollutant Emissions (lb/day)**

Pollutant	Proposed Permit Limits	Current Permit Limits	Potential Emission Increases (a)
ROC	125	96	29
a. The potential emissions increase is the proposed permit level less the current permit limit and less proposed mitigation.			

Source: CEG 1999

At the same time that SMUD is proposing to increase the operation of Carson Ice-Gen peaking unit, SMUD is pursuing peaking power from the Sacramento Power Authority (SPA) at Campbell Soup project and the McClellan peaker turbine project. SMUD is also seeking to delay the construction of the Sacramento Cogeneration Authority (SCA) Procter & Gamble project peaking unit. SMUD has filed an amendment with the CEC and the District for the P&G project requesting an extension of the CEC Decision and District DOC (ATC).

SMUD owns and controls the Campbell Soup and P&G projects through similar joint power agencies, and owns McClellan outright. Table 3 shows that SMUD is planning to increase their peaking capacity by 42 MW, meanwhile, delaying the construction of 42 MW of peaking capacity.

**Air Quality Table 3: SMUD Peaking Units**

Unit	Proposed operations increase (decrease)	Proposed MW increase (decrease)	Proposed mitigation of emission increase (decrease)
Carson Peaking Unit	Increase hours of operation per day	0	Inclusion of Carson into the Campbell/P&G ERC bubble
Campbell CTCC	Increase output	17	ERCs and ERC bubble with P&G
McClellan Peaking Unit	Increase output and operating hours: from 175 to 1000 hrs/qtr	25	ERCs for NOx increase only

<b>TOTAL INCREASE</b>		42	
P&G Peaking Unit	(Delay construction)	(-42)	(Not surrendering ERCs at this time)

Source: CEG 1999, SPA 1999, SCA 1999, SMUD 1999

### Campbell

By 2001 (CEC 1999) SMUD plans to increase the capacity of the Campbell Soup CTG by almost 17 percent (17 MW) through a combination of additional combustion turbine fuel-firing and power augmentation (steam or water injection into the combustion turbine). SMUD desires to take full advantage of the CTG's capability to generate more power at times of high electrical load (*i.e.*, peaking power) (SPA 1999). The Campbell amendment proposes to increase the daily emissions of SO<sub>x</sub>, PM<sub>10</sub>, and CO. While the hourly emission rates of NO<sub>x</sub> and ROC are increasing, daily emissions are not increasing in the current amendment. The SMUD Campbell Soup project's daily emission limits and proposed increases are shown in Table 4.

**Air Quality Table 4: Campbell Soup Project Air Pollutant Emissions (lb/day)**

Pollutant	Proposed Permit Limits	Current Permit Limits	Mitigation	Potential Emission Increases (a)
NO <sub>x</sub>	384.5	384.5	0	0
CO	326.9	297.8	0	29
ROC	146.7	146.7	0	0
SO <sub>x</sub>	21.8	19.4	0	2
PM <sub>10</sub>	170.3	60	.110	.0

a. The potential emissions increase is the proposed permit level less the current permit limit and less proposed mitigation.

Source: SPA 1999

### McClellan

SMUD is proposing to modify in late-2000 (CEC 1999) the peaking combustion turbine at McClellan to increase the capacity from 49.9 MW to about 75 MW. They will remove an output governor, and install an inlet air evaporative cooling system and a selective catalytic reduction NO<sub>x</sub> control system. They plan to increase the allowable hours of operation from approximately 175 hours per quarter to 500 to 1,000 hours per quarter (depending on the quarter).

Because of the increased hours of operation, SMUD was required to install the emission controls to limit NO<sub>x</sub> on an hourly and daily basis, and submit NO<sub>x</sub> offsets in Quarters 1 and 4. NO<sub>x</sub> emission concentrations decreased from 42 ppm to 5 ppm, and the emission rate changed from 135 lb/hr to 16.75 lb/hr. The proposal ensures that the turbines will still be designated as a minor source (<25

tons per year) for NO<sub>x</sub>. However, NO<sub>x</sub> emissions increase on a quarterly basis, as shown in Table 5. No additional emission controls were required for the other pollutants; the emission increases will correlate directly to operation increases. Air Quality Table 5 shows the potential air pollutant emission increases of the McClellen project on a daily and quarterly basis.

**Air Quality Table 5: McClellen Project Air Pollutant Emissions**

Pollutant	Qtr	Hrs/Qtr	Proposed Permit Limits	Historical Emissions	Proposed Mitigation	Potential Emission Increases (a)	Potential Emission Increases (b)
			Pounds/quarter				
NO <sub>x</sub>	Q1	500	47,763	1,016	270	7,480	NA
	Q2	500	4,548	2,751	0	6,015	NA
	Q3	1,000	550	10,646	0	6,942	NA
	Q4	800	7,000	1,433	5,130	7,500	NA
CO (c)	Q3	1,000	47,763	2,598	0	45,165	519
ROC (c)	Q3	1,000	4,548	269	0	4,279	108
SO <sub>x</sub> (c)	Q3	1,000	550	34	0	516	13.2
PM <sub>10</sub> (c)	Q3	1,000	7,000	938	0	6,062	168
<p>a. The potential emissions increase is the proposed permit level less the historical emissions and proposed mitigation.</p> <p>b. Based on 24 hours of operation, and including one turbine start-up.</p> <p>c. The third quarter is the highest quarter for these pollutants.</p>							

Sources: CEC 1996, SCA 1997

### Peaking Operation

Staff believes that the SMUD had identified a need for baseload and peaking power when it proposed the Carson Ice-Gen, the Campbell, and the P&G projects. Given the identified need and the scope of the proposed amendments and capital outlays, is likely that SMUD will build and operate the peaking capacity proposed at Carson, Campbell and McClellen. Further, SMUD has indicated that they will built and operate the P&G peaking unit by mid-2001 (CEC 1999).

Until the P&G peaking unit is built, and not accounting for system stability requirements<sup>1</sup>, the most likely dispatch order of the peaking units will be the Carson peaking unit, the McClellen peaking turbine, and then the power augmentation of Campbell.

Carson is more efficient compared to McClellen,<sup>ii</sup> even with the removal of the governor, allowing the McClellen turbine to be operated in its most efficient range.<sup>iii</sup> Additionally, the addition of the evaporative cooler and SCR systems to McClellen represent a large investment by SMUD, demonstrating the need for the capacity and energy represented by McClellen. It is likely that McClellen will operate much more than it did in the past.

Campbell, as a combined cycle is the most efficient of the three peaking options, however, the operation of the turbine above its maximum firing rate and with power augmentation may have serious maintenance and flame stability ramifications, which may lead to emission excursions. SMUD has reported that the Siemens turbine used at the Campbell project is highly sensitive to upset. Automatic protection devices switch the turbine from the lowest NO<sub>x</sub> emission mode (premix) to diffusion mode. SMUD is requesting excursion language for the Campbell project to permit a limited number of emission excursions per year (SPA 1999). SMUD is also implementing procedures that attempt to minimize the NO<sub>x</sub> emissions spike during excursions. However, it suggests that the operation of the turbine above its maximum firing rating and with power augmentation is likely to be the peaking capacity of last resort, given the sensitivity of the equipment to pressure and flame stability perturbations.

## **Impacts and Mitigation**

The proposed amendment proposes a ROC increase for the facility, not for peaking unit alone. The facility, besides the peaking unit, includes the combined cycle, the duct burner, two boilers, and six flares. The peaking unit currently uses natural gas only<sup>iv</sup>; the other facility emission sources use a mixture of natural gas and digester gas from the adjacent wastewater treatment facility. Therefore, the ROC emission cap for the facility includes natural gas and digester gas combustion by-products, which are potential ozone precursors.

ROC emissions are not criteria pollutants, and are generally not modeled for direct impacts. However, ROCs as precursors to ozone and PM<sub>10</sub>, are regulated to obtain, or maintain, compliance with ambient ozone and PM<sub>10</sub> standards for an area. It is not feasible to do ozone or PM<sub>10</sub> modeling of ROC emissions from a single source. Nor is it appropriate for this amendment to require extensive regional PM or ozone modeling of an entire air basin. However, any increase of an ozone or PM<sub>10</sub> precursor could cause or contribute to an existing violation of the state and federal ozone or PM<sub>10</sub> standards.

The increase in facility ROC emissions on a daily basis may contribute to ozone or PM<sub>10</sub> formation, and contribute to violations of the 1-hour and 24-hour standards, respectively. CEG is proposing to mitigate the ROC increases at Carson by inclusion of Carson in the ERC bubble over Campbell and P&G. The available excess ERCs (ROC ERCs or equivalent) under the bubble are shown in Air Quality Table 6. The excess ERCs are based on the ERCs surrendered by SCA for the two combined cycle units at P&G, and less any mitigation needed by

Campbell under the bubble. The ERC bubble does not consider the ERCs that would be surrendered if and when the P&G peaking unit is built.

Table 6 demonstrates that on a daily basis, the excess ERCs from the P&G bubble are adequate to mitigate the proposed ROC increase at Carson on a daily pound for pound basis. However, if P&G or Campbell change their operation, emissions, and/or mitigation packages, the excess ERCs may no longer be available to Carson Ice-Gen under the bubble. In order to make the allocation the excess mitigation from P&G enforceable, staff recommends that conditions of exemption be added to the Decision. Recommended conditions are attached to this amendment analysis.

**Air Quality Table 6: Carson Ice-Gen Project Propose Emissions Increase and Mitigation (lb/day)**

Offset Source/Project Emission	QUARTER	Q1	Q2	Q3	Q4
	Days/qtr	90	91	92	92
Net ERC (ROC or ROC equivalent) mitigation liability (+) surplus (-) from P&G ERC bubble (a)	Lb/day	-115.5	-287.1	-90.1	-171.1
Proposed ROC emission increase at Carson	Lb/day	29	29	29	29
Net ERC (ROC or ROC equivalent) mitigation liability (+) surplus (-) for P&G ERC bubble	Lb/day	-86.5	-258.1	-61.1	-142.1
a. The net ERCs available do not consider any changes in emissions, and mitigation required, by the proposed Campbell Soup amendment (SCA 1999).					

Source: CEG 1999, CEC 1997

### Cumulative Analysis

It should be noted that each of the projects, and/or the amendments above, comply, or will probably comply with all District rules and regulations. However, staff is concerned that SMUD is actively pursuing peaking power in small increments, allowing certain environmental aspects of the combined projects to go unmitigated. Meanwhile, SMUD is seeking to delay the construction of an approved and fully mitigated peaking unit at the P&G facility.

Staff believes that a cumulative analysis which includes the proposed Carson, Campbell, and McClellan peaking units, and the approved but delayed P&G peaking unit should be carried out. Staff believes that it would be most appropriate to do the analysis during the analysis of the proposed extension of the P&G peaking unit decision.

## **CONCLUSIONS AND RECOMMENDATION**

On a daily basis the excess ERCs from the P&G and Campbell ERC bubble are adequate to mitigate the proposed ROC increase at Carson. Staff recommends approval of the proposed amendment, with the proposed conditions of exemption.

### **Recommended Conditions of Exemption**

**AQ-3** The Carson Ice-Gen project owner/operator shall provide evidence to the CEC CPM that the Sacramento Cogeneration Authority (SCA) has secured Grace and Unocal NOx and Formica ROC emission reduction credits (ERCs) for the Procter & Gamble Cogeneration project in the amounts specified below.

#### Grace NOx

January through March – 20,080 lb/calendar quarter;  
April through June – 19,171 lb/calendar quarter;  
July through September – 19,542 lb/calendar quarter; and  
October through December – 19,760 lb/calendar quarter.

#### Unocal NOx

January through March – 41,616 lb/calendar quarter;  
April through June - 41,616 lb/calendar quarter;  
July through September - 41,616 lb/calendar quarter; and  
October through December - 41,616 lb/calendar quarter.

#### Formica ROC

January through March -1,580 lb/calendar quarter;  
April through June -6,276 lb/calendar quarter;  
July through September -6,716 lb/calendar quarter; and  
October through December - 5,988 lb/calendar quarter.

Verification: 15 days after adoption of the amendment, the project owner/operator shall submit to the CEC CPM copies of the banking certificates surrendered to the District, which show the NOx and ROC emission reductions of at least as much as those amounts specified in Condition 3.

**AQ-4:** The Carson Ice-Gen project owner/operator shall be responsible for identifying any changes in the permitted levels of air pollutants and emissions reduction credits surrendered for either the Procter & Gamble and Campbell projects.

Verification: 45 days after an adoption of an amendment that changes the permitted levels of air pollutants or emissions reduction credits surrendered for either the Procter & Gamble and Campbell projects, the project owner/operator shall provide the CEC CPM mitigation for the project's air emissions that are no longer mitigated under the ERCs bubble from either the Procter & Gamble and Campbell projects.

## REFERENCES

- California Air Resources Board (CARB). 1994 - 1997. *California Air Quality Data, Annual Summaries*, California Air Resource Board, Aerometric Division, Sacramento, CA
- Carson Energy Group (CEG) 1999, Application for Small Power Plant Exemption for the Carson Energy Group and Central Valley Financing Authority's Combine Cycle Cogeneration Facility, Docket No. 92-SPPE-1, PETITION TO AMEND the Conditions of Exemption Air Quality 1, April 12, 1999
- California Energy Commission (CEC) 1993a, COMMISSION DECISIONS, Application for Small Power Plant Exemption, Docket No. 92-SPPE-1, P800-93-007, June 23, 1993.
- California Energy Commission (CEC) 1993b, Initial Study, Application for Small Power Plant Exemption, Carson Energy Group and Sacramento Municipal Utility District, Carson Ice-Gen Project, Docket No. 92-SPPE-1, April 1993.
- California Energy Commission (CEC) 1999a, Report of Conversation, Between Bob Nelson and Ted Hough, SMUD and Matt Layton, CEC, June 18, 1999.
- California Energy Commission (CEC) 1999a, Report of Conversation, Between Gib Bosworth, General Electric, and Matt Layton, CEC, June 18, 1999.
- Sacramento Metropolitan Air Quality Management District (District 1999), Permit Carson Energy Group and Central Valley Financing Authority, Permit Nos. 12830, 11017, 11018.
- Sacramento Municipal Utility District (SMUD) 1999, Draft Negative Declaration and Initial Study, SMUD's – Combustion Turbine at McClellan Air Force Base Power Plant Upgrade, SCH# 99022042, February 16, 1999.
- Sacramento Cogeneration Authority (SCA) 1999, SCA COGENERATION PROJECT (93-AFC-2) REQUEST TO EXTEND TEMPORARY VARIANCE FOR CONDITIONS AQ-42 AND AQ-43 (COMMISSION ORDER NO. 97-1217-6), April 21, 1999.
- Sacramento Power Authority (SPA) 1999, Application for Certification of the Sacramento Power Authority Cogeneration Project at Campbell, Docket No. 93-AFC-3, PETITION TO AMEND AQ-11, AQ-12, AQ-13, AQ-15, AND AQ-19, April 19, 1999.

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<sup>i</sup> SMUD may dispatch specific peaking units for system reliability and stability reasons, without regard to relative unit performance.

<sup>ii</sup> The Carson Ice-Gen GE LM6000 average performance is 8,435 Btu/kWhr. A generic Frame 7E has an efficiency of >10,000 Btu/kWhr (CEC 1999b).

<sup>iii</sup> The efficiency of a Frame 7E improves by almost 12% when the maximum output increases from 49.9 MW to full load 75 MW. The evaporative cooler only increases the heat rate by approximately 1 %, but increases output by almost 3% (CEC 1999b).

<sup>iv</sup> The District Permit to Operate states that the peaking unit is natural gas-fired and that, while not currently configured, has the ability to fire on digester gas (District 1999).