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December 8, 2011

VIA EMAIL

Mr. Eric Solorio, Siting Project Manager
California Energy Commission
1516 Ninth Street
Sacramento, CA 95814

Re: Pio Pico Energy Center Project (11-AFC-01)
Applicant's Response to EPA's Questions Regarding PM BACT for Turbines for Pio Pico Energy Center's PSD Permit Application

Dear Mr. Solorio:

Enclosed herein please find Applicant Pio Pico Energy Center LLC's response to EPA's questions regarding PM BACT for turbines for the Pio Pico Energy Center's PSD Permit Application.

Respectfully submitted,

Melissa A. Foster

MAF:jmw
Enclosure
cc: See Proof of Service

December 8, 2011

sierra research

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Mr. Gerardo Rios
Chief, Permits Office
U.S. EPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105

Subject: Pio Pico Energy Center PSD Permit Application
PM BACT for Simple-Cycle Turbines

Dear Mr. Rios:

As requested by EPA in a telephone conversation between Roger Kohn (EPA) and Steve Hill (Sierra Research) on November 29, 2011, we are submitting clarifying information on behalf of Pio Pico Energy Center, LLC (Applicant). EPA requested additional analysis to support the determination in the repackaged PSD application of BACT for PM emissions from the simple-cycle turbines.

Summary of BACT Analysis Contained in the September 15th PSD Package

On September 15, 2011, the Applicant submitted a repackaged PSD application. The top-down PM BACT analysis demonstrated that $PM/PM_{10}/PM_{2.5}$ BACT for normal operation of the simple-cycle gas turbines is the use of natural gas as the primary fuel source. The Applicant proposed an emission limit of 5.5 lb/hr, based on vendor guarantees and the experience of the Applicant and others with similar installations.

EPA staff also requested confirmation of the sulfur levels used by the Applicant in its emission calculations. The Applicant based its emission calculations on fuel sulfur levels of 0.25 gr/100 scf (annual average) and 0.75 gr/100 scf (hourly average).[1]

Control Level

EPA has not indicated that it disagrees with the Applicant's demonstration that BACT for this project is the use of natural gas as the primary fuel source; but did request additional justification for the proposed compliance limit of 5.5 lb/hr. Additionally, EPA has indicated that the compliance limit should be expressed as an emission rate in units of lb/MMbtu (HHV) of heat input.

[1] See repackaged PSD Application (September 2011), pp. PSD-4.34, PSD-4.55, and PSD-App-1.53.

Comment: *In order to facilitate comparison with other projects, EPA requests that the proposed limit be expressed as an emission rate (in units of lb/MMBtu).*

Response: The Applicant's originally proposed compliance limit of 5.5 lb/hr was intended to apply under all circumstances, including full load, low load, startup, and shutdown. Because fuel use is different under these conditions, the lb/MMBtu rate will be different as well.

Compliance with the PM limits is demonstrated through the use of periodic source tests. As specified in 40 CFR 60.8(a)(4)(c), performance tests are conducted "under such conditions as the Administrator shall specify based on representative performance of the affected facility." The Applicant is willing to accept the emission limit of 0.0065 lb/MMBtu (HHV), which is equivalent to the Applicant's proposed limit of 5.5 lb/hr, when the turbine is operated at or near full load.[2] Compliance with this limit would be demonstrated by a source test that complies with all of the requirements set forth in 40 CFR § 60.8 and 40 CFR Part 60 Appendix A, conducted at or near full load.[3]

Comment: *Please provide additional justification for the proposed limit. Compare with the limits achieved in practice by other gas turbines. Following the top-down BACT procedure, rank the examples from lowest to highest and either explain why they do not apply to the project, or revise your proposed BACT emission rate to reflect achieved-in-practice limits.*

Response: Particulate emissions from combustion of natural gas are usually below the limits of detection of current EPA test methods. As a result, PM test results from gas-fired combustion equipment are highly variable, and are often dominated by testing artifacts. Differences in PM emission rates proposed for PSD permits are often attributable to the risk tolerance of the applicant and/or equipment vendor, rather than to any technical specification. Nonetheless, we have reviewed additional PM BACT determinations as requested by EPA.

The sources listed in the attached Table 1 were considered for this analysis. Information in this table was taken from EPA's fact sheet for the Palmdale Hybrid PSD Permit.

The most recently permitted units with total PM limits expressed as lb/MMBtu are Palmdale Hybrid in California (Palmdale), Warren County Power Station in Virginia (Warren County), and Chouteau Power Plant in Oklahoma (Chouteau). Of these three facilities, only the Chouteau unit is operational. Because neither Palmdale nor Warren County has any operating history, the permit limits are not relevant to an analysis of achieved-in-practice emission rates. Therefore, all of the sources listed in Table 1, except Chouteau, were eliminated from further consideration.

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[2] 0.0065 lb/MMBtu = (5.5 lb/hr) / (851.5MMBtu). The heat rate is the lowest peak fuel use rate from the design cases.

[3] EPA Methods 5 and 202, or Methods 201A and 202, for PM, PM_{10}, and $PM_{2.5}$, or CTM-039 in lieu of Method 202.

The new turbines at Chouteau are subject to a PM limit of 0.0035 lb/MMBtu, averaged over 24 hours.[4] Because the source test methodology used to demonstrate compliance is comprised of three test runs that can be as short as one hour each, it is impossible to determine compliance with a 24-hour average limit for PM expressed as lb/MMbtu.

PM source tests were conducted at Chouteau on May 18-25, 2011, and again on July 6-8, 2011.[5] The results from initial compliance testing of total PM at Chouteau are summarized in Table 2 (attached). Table 2 shows that Chouteau did not comply with its PM limits; therefore, this unit does not demonstrate achieved-in-practice BACT.

As shown in the following table, a statistical analysis of the Chouteau test results indicates a mean PM value of 0.0052 lbs/MMbtu, with a relative standard deviation of 30%. Since permit limits must be met on an on-going basis for the life of the plant, an analysis of source test data must include an allowance for variability. The mean plus two standard deviations, based on the Chouteau test data, is 0.0084 lbs/MMbtu; thus, if these are used to establish a permit limit, the limit should be no lower than 0.0084 lbs/MMbtu.

Summary of Chouteau PM Test Results (lbs/MMbtu)

Date	5/25/2011	5/22-23/2011	5/18/2011	7/7-8/2011	7/7/2011	7/6/2011	7/6/2011	7/7/2011
Unit	21	22	22	21	21	21	22	33
Unit Load	100%	100%	60%	60%	100%	100%	100%	100%
DB Load	0%	0%	0%	0%	70%	100%	70%	100%
Run 1	0.0036	0.0042	0.0056	0.0054	0.0058	0.0078	0.0082	0.0069
Run 2	0.0029	0.0035	0.0043	0.0055	0.0061	0.0079	0.0080	0.0039
Run 3	0.0035	0.0040	0.0048	0.0043	0.0047	0.0048	0.0061	0.0039
Average	0.0033	0.0039	0.0049	0.0051	0.0055	0.0068	0.0074	0.0049

Overall Average	0.0052
Overall Std Deviation	0.0016
Relative Std Deviation	30%
Mean plus 2 S.D	0.0084

The PM control level proposed by the Applicant, 0.0065 lb/MMBtu at peak turbine load, was based on source test data from similar units operating in Southern California, and is the lowest emission rate that assures continuous compliance. It is lower than the level for which the turbine vendor will provide guarantees, and it is lower than the value suggested by the Chouteau data.

The Applicant's proposed limit of 0.0065 lbs/MMbtu is not applicable to low load operation, startup, or shutdown. We understand that EPA wishes to consider including in the permit an emission rate limit that is applicable to low load operations. We believe there is insufficient data upon which to establish a low-load emission rate (in units of

[4] Oklahoma DEQ Permit No. 2007-115-C (M-1) PSD, Condition 1, limits PM_{10} emissions from Turbines EU 1-03 and 1-04 to 6.24 lb/hr (3-hour average, without duct firing), 6.59 lb/hr (3-hour average, with duct firing) and 0.0035 lb/MMBtu (24-hour average).

[5] Letter, dated August 19, 2011 from Tadd Henry (Associated Electric Cooperative) to Kendal Stegman (Oklahoma DEQ).

lbs/hr) different from that applicable at maximum load. Because the hourly emissions are expected to be about the same for the Pio Pico Energy Center turbines (5.5 lb/hr) at all loads, the highest emission rate (in lbs/MMbtu) will occur at the lowest fuel usage, or low load. While each turbine will normally operate at close to full load when it is operating, each turbine is expected to operate at loads as low as 50% on occasion. The expected emission rate at low load is 0.01 lb/MMBtu.[6]

If you have any questions regarding this information, please contact the Applicant's representative David Jenkins at (317) 431-1004, or Gary Rubenstein or me at (916) 444-6666.

Sincerely,

Steve Hill

cc: John McKinsey, Stoel Rives LLP
David Jenkins, Apex Power Group
Steve Moore, SDAPCD

[6] 0.01 lb/MMBtu = (5.5 lb/hr) / (542.5MMBtu). This heat input rate is the lowest low load fuel use rate from the design cases.

Table 1
Summary of Recent PM BACT Limits for Combined-Cycle, Natural Gas-Fired Combustion Turbines

Facility	Location	PM Limit Without Duct Firing	Type of PM Filterable (F) Total (T)	Averaging period	Control	Permit Issuance	Source	Basis for Excluding
Pio Pico Energy Center	**California**	**5.5 lb/hr, 0.0065 lb/MMBtu**	**TPM10, TPM2.5**	**3-hour**	**Natural Gas Fuel**	**This Application**	**PSD Permit Application**	
Avenal Energy Project	California	8.91 lb/hr	TPM10	12-month rolling	Natural Gas Fuel	June 2011	PSD Permit	Not yet constructed; not lb/MMBtu
Warren County Power Station	Virginia	0.0027 lb/MMBtu	TPM10, TPM2.5	3-hour	--	December 2010	PSD Permit	No operating data
Carty Plant	Oregon	2.5 lb/MMscf	FPM10	--	Clean Fuel	Draft December 2010	RBLC #OR-0048	Not yet constructed; Filterable PM
Langley Gulch Power Plant	Idaho	No limit	FPM10	--	GCP	Draft December 2010	RBLC # ID-0018	Not yet constructed; Filterable PM
Colusa Generating Station	California	13.5 lb/hour	TPM, TPM10	12-month rolling	Natural Gas Fuel	March 2010	PSD Permit	No operating data; not lb/MMBtu
Victorville II Hybrid Power Project	California	12.0 lb/hr	TPM, TPM2.5	12-month rolling	Natural Gas Fuel	March 2010	PSD Permit	Not lb/MMBtu
Chouteau Power Plant	Oklahoma	0.0035 lb/MMBtu	TPM10	3-hour	Natural Gas Fuel	January 2009	RBLC # OK-0129	Not in compliance with conditions
Cane Island Power Park	Florida	2 gr S/100 SCF	TPM10	--	Fuel Spec	September 2008	RBLC # FL-0304	Fuel specification, not source test
FPL West County Energy Center Unit 3	Florida	2 gr S/100 SCF	PM, PM19/PM2.5		Clean Fuel	July 2008	RBLC # LA-0136	Fuel specification, not source test
Plaquemine Cogeneration Facility	Louisiana	0.02 lb/MMBtu	FPM10,TPM	--	Clean Fuel	July 2008	RBLC #LA-0136	Less stringent than PPEC
Arsenal Hill Power Plant	Louisiana	24.23 lb/hr	FPM	--	Pipeline Natural Gas	March 2008	RBLC # LA-0224	Filterable PM
Kleen Energy Systems	Connecticut	11 lb/hr	FPM10	--	--	February 2008	RBLC # CT-0151	Filterable PM
Palmdale Hybrid	California	0.0048 lb/MMBtu	TPM	9-hour	Better-than-PUC quality natural gas	October 2011	PSD Permit	Not yet constructed

Table 2
2011 Chouteau Source Test Results

Date	Unit	CT Load (%)	DB Load (%)	Particulate Emissions (lb/hr)[a]			Permit Limit (lb/hr)	Particulate Emissions (lb/MMbtu)[a]			Permit Limit (lb/MMbtu)
May 25	21	100	0	6.01	4.70	5.56	6.24	0.0036	0.0029	0.0035	0.0035
				5.42				**0.0033**			
May 18	22	60	0	6.97	5.41	6.15	6.24	0.0056	0.0043	0.0048	0.0035
				6.18				**0.0049**			
May 22-23	22	100	0	7.09	5.68	6.52	6.24	0.0042	0.0035	0.0040	0.0035
				6.43				**0.0039**			
July 7-8	21	60	0	6.68	6.63	5.33	6.24	0.0054	0.0055	0.0043	0.0035
				6.21				**0.0051**			
July 7	21	100	70	10.4	11.1	8.58	6.59	0.0058	0.0061	0.0047	0.0035
				10.0				**0.0055**			
July 6	21	100	100	14.6	14.9	8.53	6.59	0.0078	0.0079	0.0048	0.0035
				12.7				**0.0068**			
July 6	22	100	70	14.8	14.2	10.9	6.59	0.0082	0.0080	0.0061	0.0035
				13.3				**0.0074**			
July 7	22	100	100	12.8	7.35	7.23	6.59	0.0069	0.0039	0.0039	0.0035
				9.13				**0.0049**			

[a] Individual test run results shown in top row; three-run average shown in bold in bottom row.
Three-run averages highlighted in yellow exceed applicable limit.

BEFORE THE ENERGY RESOURCES CONSERVATION AND DEVELOPMENT
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APPLICATION FOR CERTIFICATION
FOR THE *PIO PICO ENERGY CENTER, LLC*

Docket No. 11-AFC-1
PROOF OF SERVICE
(Revised 11/22/11)

Pio Pico Energy Center, LLC
Applicant's Response to EPA's Questions Regarding PM BACT for Turbines for Pio Pico Energy Center's PSD Permit Application dated December 8, 2011

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DECLARATION OF SERVICE

I, Judith M. Warmuth, declare that on December 8, 2011, I deposited copies of the aforementioned document and, if applicable, a disc containing the aforementioned document in the United States mail at 500 Capitol Mall, Suite 1600, Sacramento, California 95814, with first-class postage thereon fully prepaid and addressed to those identified on the Proof of Service list above.

AND/OR

Transmission via electronic mail, personal delivery and first class U.S. mail were consistent with the requirements of California Code of Regulations, Title 20, sections 1209, 1209.5, and 1210. All electronic copies were sent to all those identified on the Proof of Service list above.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct, that I am employed in the county where this mailing occurred, and that I am over the age of 18 years and not a party to the proceeding.

Judith M. Warmuth