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August 7, 2015

Vicky Lee
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Re: Redondo Beach Energy Project Response
(Facility ID 115536)

Dear Ms. Lee:

This letter provides the information you requested via electronic mail to support your updates to the Redondo Beach Energy Project (RBEP) Final Determination of Compliance (FDOC), as well as to help address comments received for the RBEP.

RBEP Clarifying Questions Set 5

1. Rule 1304(a)(2) Offset Plan

a. In an e-mail dated 1/9/14, Jerry Salamy indicated that RBEP's gross capacity of 546 MWs will be enabled by the retirement of Redondo Beach Generating Station (RBGS) Unit 7 (480 MWs) and 66 MWs from the retirement of RBGS Units 6 and 8. The PDOC was premised on that statement. In the PDOC comment letter, dated 7/25/14, Stephen O'Kane indicated that RBGS Units 5 and 7 (total of 655 MW) will be shut down to enable RBEP. My understanding is that this change had been provided for the AES Alamitos repowering project.

Please provide an update identifying the RBGS Units that will be shut down and the number of MWs provided by each such unit, to offset the 546.4 MW gross for RBEP.

Response: RBEP's gross capacity of 546.4 megawatts (MW) will be offset by the retirement of RBGS Unit 8 (480 MW) and RBGS Unit 5 (175 MW), for a total of 655 MW.

b. New applications for smaller repowering projects for AES Huntington Beach and AES Alamitos are anticipated to be submitted to SCAQMD this summer. Since the discussion on the AES Rule 1304(a)(2) Offset Plan and Table 1A on pages 36-37 of the PDOC will need to be revised, please provide an update for the use of the surplus MWs from the four RBGS Units 5, 6, 7, and 8, as available.

Response: AES Redondo Beach, LLC (AES) proposes to replace existing RBGS with RBEP, which consists of a 3-on-1 combined-cycle gas turbine power block, rated at 546.4 MW gross. To offset the 546.4 MW for the RBEP, 480 MW is coming

from the retirement of RBGS Unit 8 (480 MW) and RBGS Unit 5 (175 MW). Table 1 presents the scheduled retirement for AES units at the Alamitos, Redondo, and Huntington sites. The use of the surplus megawatts from these retirements and for retirement of the remaining AES-owned units has not be identified at this time.

Table 1

AES Rule 1304(a)(2) Offset Plan

Project	Phase	First Fire or Shutdown Date	MW Gross
HBEP	Combined Cycle Block[a]	10/1/2019	693.822
	HBGS Unit 1 Retired	11/1/2019	215
	RBGS Unit 7 Retired	10/1/2019	480
	Simple Cycle Block[b]	11/1/2023	201.628
	HBGS Unit 2 Retired	12/31/2020	215
	MW Installed		895.45
	MW Retired		910
	Surplus MW		14.55
RBEP	Combined Cycle Block	11/1/2019	546.4
	RBGS Unit 5 Retired	12/31/2019	175
	RBGS Unit 8 Retired	12/31/2019	480
	MW Installed		546.4
	MW Retired		655
	Surplus MW (HBEP & RBEP)		123.15
AEC	Combined Cycle Block[c]	10/1/2019	692.951
	AGS Unit 1 Retired	12/29/2019	175
	AGS Unit 2 Retired	12/29/2019	175
	AGS Unit 5 Retired	12/29/2019	480
	AGS Unit 3 Retired	12/31/2020	320
	Simple Cycle Block[d]	6/1/2021	401.751
	MW Installed		1,094.702
	MW Retired		1150
Total MWs Installed and Retired	Total MW Installed		2,536.552
	Total MW Retired		2,715.00

a. Based on 65.8 F with evaporative coolers operating.

b. Based on 65.8 F with evaporative coolers operating.

c. Based on 59 F without evaporative coolers operating.

d. Based on 59 F without evaporative coolers operating.

2. Rule 1304.1 Fees

On pg. 95 of the PDOC, Table 33 shows the Rule 1304.1 Emissions Offset Fee Calculator. The PDOC indicated that the "Average Last 2 Years of Existing Units(s)

Actual Generation (MWh/yr)" would be provided by AES for the last twenty-four month period immediately prior to the issuance of the permits to construct once the date of permit issuance is established.

For the FDOC, please provide the "Average Last 2 Years of Existing Units(s) Actual Generation (MWh/yr)" for the RBGS Units that will be retired to allow an updated estimate of the total annual fee to be calculated. The FDOC will explain that the total annual fee is an estimate and will be finalized once the date of permits issuance, if the permits are approved, is established.

Response: As noted in the response to 1(a) above, RBGS Units 5 and 8 will be retired to enable the operation of RBEP. The 2-year average of the actual generation (megawatt-hours per year [MWh/yr]) for these two units is 130,814 MWh. This value is based on 2013 and 2014 generation as provided to the California Energy Commission, as presented in Table 2 below.

Table 2
RBGS 2-Year Average Megawatt-hours

Year	Unit 5 MWh-Net	Unit 8 MWh-Net
2014	35,461	143,340
2013	17,669	65,157
2-Year Average	26,565	104,249

Source: http://energyalmanac.ca.gov/electricity/web_qfer/plant_stats_2.php

3. Commissioning

Condition E193.4 on pg. 24 of the PDOC allows three turbines to be commissioned. This determination was based on the commissioning modeling results shown in Table 32 on pg. 89 of the PDOC. The maximum impact would occur if all three turbines were simultaneously undergoing commissioning activities with the highest unabated emissions (initial full-speed, no-load CTG testing, steam blows, HRSG, and steam safety valve settings). The 1-hour NO2 maximum impact of 168.48 µg/m3 (based on three turbines) combined with a background concentration of 169 µg/m3 (SRA 3, Southwest Coastal LA County, No. 820, monitoring station in 2008) resulted in a total predicted impact of 337.48 µg/m3, which is less than the state standard of 339 µg/m3. In a letter dated 7/14/14, CEC noted that the NO2 background concentration increased to 182.7 µg/m3 (actually 183.49 µg/m3) in 2011, thus the commissioning of all emissions at maximum load would violate the state standard.

My e-mail dated 4/10/15, to Stephen O'Kane and Jerry Salamy explained that the condition will be revised to allow commissioning of one turbine at a time. The letter dated 5/13/15, from Stephen O'Kane responded that the modeling for the AFC showed that the maximum impact for all three turbines simultaneously undergoing commissioning is less than Program Supervisor Jillian Wong's maximum modeled concentration of 168.48 µg/m3. He speculated that Ms. Wong had modeled the commissioning of each turbine individually, then erroneously added the individual results to obtain the result for three turbines commissioned simultaneously, instead of modeling three turbines undergoing commissioning simultaneously.

Jillian Wong confirmed that she correctly modeled each turbine individually and three turbines simultaneously. The modeling results for the AFC are too low because "SCAQMD modeling staff found that the AERMOD runs for those scenarios were performed using PVMRM and an ambient NO_2/NO_X ratio of 0.8. This is not consistent with the SCAQMD's recommended methodology and conflicts with the ambient NO_2/NO_X ratio of 0.9, which was included in the Modeling Protocol submitted on July 10, 2012."

In his letter, Stephen O'Kane indicated that three turbines need to be commissioned at one time. He proposed the following condition: "Only one turbine may be operated during commissioning without the use of the CO oxidation catalyst and SCR control systems in operation. Once the CO oxidation catalyst and SCR control systems are in operation, one or more turbines can be operated during the commissioning period simultaneously."

In the RBEP Preliminary Staff Assessment (PSA), CEC included condition AQ-SC9 to limit the simultaneous commissioning of the three turbines due to the increased background concentration of NO_X. The condition states: "The facility shall be operated such that simultaneous commissioning of two or more combustion turbines without abatement of nitrogen oxide or carbon monoxide emissions by its SCR system and oxidation catalyst system will not occur. Operation of one combustion turbine during commissioning without abatement shall be limited to times when the second and/or third combustion turbines are either non-operational or are in compliance with emission limits for routine operation." AES did not comment on this condition in its PSA comment letter, dated 6/4/15.

a. AES's proposed condition appears to be specifying that only one turbine may be commissioned if none of the turbines have the CO catalyst/SCR systems in operation. However, once one turbine has the CO oxidation catalyst/SCR in operation, then up to three turbines may be commissioned simultaneously. Please provide clarification regarding the meaning of the proposed condition.

   Response: The intent of this proposed condition is to limit simultaneous commissioning of turbines with uncontrolled emissions. Specifically, two or more turbines may be commissioned simultaneously as long as no more than one of the turbines is commissioned without full operation of the carbon monoxide (CO) oxidation catalyst and selective catalytic reduction (SCR) control systems.

b. CEC condition AQ-SC9 appears to be specifying that only one turbine without CO catalyst/SCR system in operation may be commissioned unless the other two turbines are controlled to BACT levels or non-operational, based on their modeling results, including concurrent construction and demolition activities, presented in PSA Air Quality Table 27 on page 4.1-33. Is AES's proposed condition consistent with AQ-SC9?

   Response: Yes.

c. The "Commissioning" section on pages 88-89 of the PDOC will need to be revised to incorporate the higher background NO2 concentration. Program Supervisor Jillian Wong has provided me with the maximum impacts from each turbine commissioned individually, and the maximum impact from three turbines commissioned simultaneously, using the SCAQMD's recommended methodology and an ambient NO_2/NO_X ratio of 0.9, which was included in the Modeling

Protocol submitted on July 10, 2012. The results available to me are not sufficient to support AES's proposed condition.

i. For your proposed condition, please provided modeled impacts for NO2, using the SCAQMD's recommended methodology and an ambient NO_2/NO_X ratio of 0.9, which was included in the Modeling Protocol submitted on July 10, 2012. These results will be incorporated in Table 32 - Model Results, Commissioning, on pg. 89 of the PDOC.

Response: Table 3 present the emission parameters used in the revised NO2 commissioning modeling. Only two NO_X emission rates are presented in Table 3 for uncontrolled or controlled commissioning events. The uncontrolled NO_X emissions assume no emission controls are functioning and the controlled emissions assume the SCR and oxidation catalyst systems are operating at a control efficient of 75 and 33 percent, respectively. A review of the Application for Certification Appendix Table 5.1B.1 shows that once the SCR and oxidation systems are employed, the highest NO_X commissioning emission rate is 25.97 pounds per hour, consistent with the values in Table 3 below.

Table 3
RBEP Worst-Case Uncontrolled and Worst-Case Controlled Commissioning Scenarios

Source Description	Easting (X) (m)	Northing (Y) (m)	Base Elevation (m)	Stack Height (ft)	Temperature (K)	Exit Velocity (ft/s)	Stack Diameter (ft)	NO2 (lb/hr)
Turbine 1 Uncontrolled	371060	3746515	4.42	140	379	32.5	18	110
Turbine 2 Uncontrolled	371096	3746520	4.42	140	379	32.5	18	110
Turbine 3 Uncontrolled	371132	3746525	4.42	140	379	32.5	18	110
Turbine 1 Controlled	371060	3746515	4.42	140	392	32.6	18	26
Turbine 2 Controlled	371096	3746520	4.42	140	392	32.6	18	26
Turbine 3 Controlled	371132	3746525	4.42	140	392	32.6	18	26

Table 4 presents the results of the commissioning modeling. The dispersion modeling analysis was conducted using the more simplistic EPA Tier 2 NO_2 to NO_X Ambient Ratio Method (ARM) of 0.8 (EPA, 2011) rather than the more complex Tier 3 methodology suggested by the District.

Since the previous CO impacts showed that when all three turbines were operated simultaneously, the impacts were less than the ambient air quality standards after adding the background CO concentrations. Therefore, revised CO modeling was not performed and the results presented PDOC Table 32 – Modeling Results, Commissioning are still applicable.

The revised modeling analysis assesses the NO_2 impacts from the scenarios presented in Table 3 above. The worst-case uncontrolled scenario would have all turbines operating at 50 percent load and a NO_X emission rate of 110 pounds per hour per turbine. The NO_2 impact from this scenario shows a violation of the California 1-hour NO_2 Ambient Air Quality Standard (CAAQS) of 339 microgram per cubic meter ($\mu g/m^3$). However, the NO_2 impacts for the remaining commissioning scenarios demonstrates that one turbine can be operated in an uncontrolled condition while operating the other turbines in a controlled condition without violating the 1-hour NO_2 CAAQS. Five compact discs containing the dispersion modeling files are attached.

Table 4
RBEP Maximum NO_2 Impacts from Commissioning

Scenario	Scenario Description	Maximum Impact ($\mu g/m^3$) [a]	Background Concentration ($\mu g/m^3$) [b]	Total impact ($\mu g/m^3$)	CAAQS ($\mu g/m^3$
LOAD50	All Turbines uncontrolled	178	184	362	339
LOAD40	All Turbines controlled	42	184	226	339
S1_50	Turbine 1 uncontrolled, Turbines 2 and 3 controlled	148	184	332	339
S2_50	Turbine 2 uncontrolled, Turbines 1 and 3 controlled	103	184	287	339
S3_50	Turbine 3 uncontrolled, Turbines 1 and 2 controlled	65	184	249	339

[a] Maximum 1-hr NO_2 impacts include a NO_2 to NO_X ambient ratio of 0.8 (EPA, 2011).

[b] Background NO_2 concentration is the maximum value recorded at the SCAQMD Southwest Coastal LA County monitor from 2011-2013 (SCAQMD, 2015).

ii. Please also provide a discussion of the basis for the revised modeled impacts so that the "Commissioning" section on pages 88-89 of the PDOC may be revised.

Response: Please see the response to Item 3.c.i. above.

iii. The above discussion should include a discussion of the NO_X emission level from the turbine(s) with CO oxidation catalyst/SCR system in operation, as it is unclear whether the emissions are partially controlled or controlled to BACT levels.

Response: During commissioning, the NO_X emissions are partially controlled with the SCR and oxidation catalyst systems. However, the NO_X emissions do not reach BACT levels until the commissioning activities are completed.

iv. Please describe how the NO_2 emission level from the turbine(s) with CO oxidation catalyst/SCR system in operation can be monitored during simultaneous commissioning of more than turbine. The monitoring will be included in a permit condition.

Response: During commissioning, the turbine operating rate is not constant and turbine load rates change frequently over the course of an hour resulting in significant changes in flue gas flow. Therefore, it is very

difficult to measure NO_X mass emission rates consistent with EPA and SCAQMD methods using a continuous emissions monitoring system or source test. Only the concentration of NOx in a non-isokinetic flow could be measured. PDOC Condition A99.1 provides a method to track NO_x emissions during commissioning.

4. RBEP Schedule

On pages 37 - 38 of the PDOC, the proposed schedule is discussed and summarized in Table 2--RBEP Schedule Major Milestones.

AES provided the following comment on the PSA: "Please revise the start of construction to the 3rd quarter of 2016 with the subsequent dates extended by the 3 calendar quarters." In e-mails dated 6/18/15 between Keith Winstead and Jerry Salamy (TN#: 205092), it appears that the subsequent dates should be extended by 2 calendar quarters.

Please confirm that the each date on pages 37-38 and in Table 2 of the PDOC should be extended by two calendar quarters, or 60 days.

Response: Table 2 provides a schedule of major RBEP milestones.

Table 2 RBEP Schedule of Major Milestones

Activity	Date
Begin dismantling and removal of retired Units 1 – 4	Third quarter 2016
Removal of equipment from retired Units 1 – 4	Second quarter 2017
Begin construction of new power block	Fourth quarter 2017
Retire existing Units 5 – 8 and auxiliary boiler no. 17	Fourth quarter 2019
Begin demolition of existing Units 5 – 8 and auxiliary boiler no. 17	First quarter 2020
Startup and test new power block	Fourth quarter 2019
Complete construction/start commercial operation	Fourth quarter 2019
Complete demolition	Second quarter 2021

5. Actual Emissions for Existing Plant

On pg. 52 of the PDOC, Table 11 provides actual emissions for the Redondo Beach Generating Station for 2011 and 2012. To update this table, please provide the actual emissions for 2013 and 2014, and the two-year average, for CO, NOx, PM10, PM2.5, ROG, SOx, and CO_2e for Boilers No. 5, 6, 7, 8, 17 and the total facility.

Response: Table 2 provides actual emissions for RBGS for 2013 and 2014, including the 2-year average. These emissions are based on Annual Emission Reports submitted to the District. Boiler 17 was last fired in 2012 and is listed as non-operational on the Title V permit. Therefore, no emissions are reported for boiler 17 in Table 5.

Table 5
Actual Emissions for RBGS for 2013 and 2014

Unit	Year	Emissions (tons/year)						
		CO	NO_X	PM_{10}	$PM_{2.5}$	ROG	SO_X	CO_2e
Unit 5	2013	6.51	1.24	0.40	0.40	0.41	0.04	18,082
	2014	1.44	2.13	2.08	2.08	0.77	0.08	33,703
	2-Year Average	3.97	1.69	1.24	1.24	0.59	0.06	25,893
Unit 6	2013	98.51	2.91	0.95	0.95	1.01	0.11	44,552
	2014	95.91	2.05	0.36	0.36	0.70	0.08	30,991
	2-Year Average	97.21	2.48	0.65	0.65	0.86	0.09	37,771
Unit 7	2013	14.27	9.10	0.97	0.97	4.87	0.53	109,147
	2014	20.11	5.70	0.13	0.13	1.24	0.14	27,752
	2-Year Average	17.19	7.40	0.55	0.55	3.06	0.33	68,450
Unit 8	2013	86.11	5.04	0.44	0.44	2.04	0.22	45,573
	2014	68.79	5.48	0.56	0.56	4.19	0.46	93,817
	2-Year Average	77.45	5.26	0.50	0.50	3.11	0.34	69,695
Facility Total	2013	205.39	18.29	2.77	2.77	8.33	0.91	217,354
	2014	186.25	15.36	3.13	3.13	6.90	0.75	186,262
	2-Year Average	195.82	16.83	2.95	2.95	7.62	0.83	201,808

CO_2e = carbon dioxide equivalents
CO = carbon monoxide
NO_X = nitrogen oxides
PM_{10} = particulate matter with an aerodynamic diameter less than 10 microns
$PM_{2.5}$ = particulate matter with an aerodynamic diameter less than 2.5 microns
ROG = reactive organic gases
SO_X = sulfur oxides

If you have any additional questions, please contact either me or Jerry Salamy (916-286-0207).

Sincerely,

Stephen O'Kane
Vice-President
AES Southland Development, LLC

Attachment

cc: J. Didlo/AES
G. Wheatland/ESH
J. Salamy/CH2M
C. Salazar/CH2M