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May 13, 2015

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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 regarding comments on the Redondo Beach Energy Project (RBEP) submitted by the California Energy Commission (CEC) on July 17, 2014.

RBEP Clarifying Questions Set 4

1. CEC Comment No. 4

Condition E193.4 currently states that three turbines may be commissioned at the same time. This determination was based on the commissioning period modeling results shown in Table 32 on pg. 89 of the PDOC. The 1-hour NO_2 maximum impact of 168.48 $\mu g/m^3$ (based on three turbines) combined with a background concentration of 169 $\mu g/m^3$ (SRA 3, Southwest Coastal LA County, No. 820, monitoring station in 2008) resulted in a total predicted impact of 337.48 $\mu g/m^3$, which is less than the state standard of 339 $\mu g/m^3$.

Normally, the background concentration is based on the highest concentration from the most recent three years of monitoring data available at the time an application is submitted. In this comment, however, CEC has noted that the background concentration from the LAX monitoring station in 2011 show an elevated background NO_2 value of 182.7 $\mu g/m^3$, thereby causing a violation of the state standard. My research indicates that the background concentration in 2011 from the SRA 3 monitoring station was 183.49 $\mu g/m^3$. Therefore, the background concentration will be revised to 183.49 $\mu g/m^3$ for 1-hour NO_2 in Tables 30 and 32 on pages 87 and 89 of the PDOC, respectively. It follows that

the total predicted impact for three turbines will be 351.97 μg/m^3, which is higher than the state standard of 339 μg/m^3. Therefore, three turbines may not be commissioned at the same time.

I asked Program Supervisor Jillian Wong whether CH2M HILL had provided modeling for the 1-hour NO_2 maximum impact from the commissioning of two turbines at the same time. She reviewed her old modeling files and indicated the available modeling results are for the commissioning of each turbine individually. The results were Turbine 1 – 108.46 μg/m^3; Turbine 2 – 89.11 μg/m^3; and Turbine 3 – 52.18 μg/m^3. If I conservatively assume that the 1-hour NO_2 maximum impact from two turbines is the sum of the maximum 1-hour impact from Turbines 1 and 2, then the maximum 1-hour impact from two turbines is 197.57 μg/m^3. If that is added to the background concentration of 183.49 μg/m^3, the total impact is 381.06 μg/m^3, which exceeds the state standard of 339 μg/m^3. Based on the available modeling results, two turbines may not be commissioned at the same time.

For the commissioning of a single turbine, Turbine 1 represents the worst case at 108.46 μg/m^3. If that is added to the 183.49 μg/m^3 background concentration, the total impact is 291.95 μg/m^3, which is less than the state standard of 339 μg/m^3.

Based on the available modeling results, condition E193.4 will be revised to allow the commissioning of one turbine at a time. (AQ-SC9 in PSA also allows the commissioning of one turbine at a time.)

Response: AES Southland Development, LLC (AES) will need to operate all three turbines simultaneously during the commissioning process. As AES understands the District's methodology presented above, the District has modeled each of the three turbines individually, then summed the maximum modeled impact for each turbine, adding the background concentration of 183.49 μg/m3, and comparing the result to the state ambient air quality standard. This approach overstates the expected maximum impact because it assumes the maximum modeled impact for each turbine occurs at the same receptor, which is impossible (as shown below). The RBEP air permit application included Table 5.1C.3 – Commissioning Modeling Results Summary (presented below for convenience) in Appendix 5.1C, which presents the modeling results for commissioning all three turbines simultaneously. This table shows that no commissioning scenario would violate the state 1-hour NO_2 ambient air quality standard after adding the background concentration. These modeling data were submitted along with the permit application and if needed, additional copies could be provided. Finally, a review of the RBEP air permit application Table 5.1B.1 – Summary of Commissioning Emission Estimates in Appendix 5.1B shows that, for most of the commissioning scenarios, the emission control system (specifically the oxidation catalyst and selective catalytic reduction systems) are in operation. AES suggests that the District could modify condition E193.4 (see below) to require that when commissioning more than one turbine, the emission control systems must be in operation (see underscored text).

Redondo Beach Energy Project
Table 5.1C.3
Commissioning Modeling Results Summary
November 2012

Scenario	Year	NO_2 ($\mu g/m^3$)	CO ($\mu g/m^3$)	
		1-hr	1-hr	8-hr
5% Load	2005	46.4	3,073	1,299
	2006	50.0	3,297	1,465
	2007	51.2	3,413	1,395
	2008	41.0	2,747	1,022
	2009	48.4	3,184	1,366
40% Load	2005	26.0	2,586	1,168
	2006	27.5	2,720	1,241
	2007	27.8	2,776	1,191
	2008	23.5	2,331	883
	2009	27.1	2,674	1,231
50% Load	2005	111	6,027	2,810
	2006	117	6,335	2,929
	2007	118	6,439	2,831
	2008	101	5,446	2,066
	2009	118	6,346	2,944
100% Load	2005	14.1	15.9	8.28
	2006	17.5	21.8	7.32
	2007	21.5	27.5	6.59
	2008	22.3	25.8	6.76
	2009	12.5	13.8	6.89

E193.4 The operator shall operate and maintain this equipment according to the following requirements:

The commissioning period shall not exceed 491 hours of operation for each turbine from the date of initial turbine start up. 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. . …

2. CEC Comment No. 8

Table 28 on pg. 86 of the PDOC shows the NOx and CO emission rates for the 1-hour averaging period during normal operations are based on all three turbines in start-up mode at 106 deg F ambient temperature, at maximum individual turbine emission rates of 25.4 lb/hr NOx and 114 lb/hr CO.

In this comment, CEC presents two potential scenarios for which the above

hourly rates for NOx and CO will be exceeded.

a. First Scenario

The first scenario presented is that a warm startup (32.5 min), normal operation with duct firing (17.5 min), and a shutdown (10 min) will occur all within an hour, which will result in a maximum emission rate of 29.76 lb/hr NOx. Although not presented, an analogous scenario is that a warm startup (32.5 min), normal operation without duct firing (17.5 min), and a shutdown (10 min) will occur all within an hour, which will result in a maximum emission rate of 28.68 lb/hr NOx.

i. Is it physically possible for one turbine to operate as described in the above first scenario (with duct firing) in one hour?

Response: It is physically possible to warm start a turbine, operate the turbine without duct burners, and commence a shutdown within a 60 minute period. The CCGT is not designed to use duct burners in a start up and shut down operating mode or to provide extra capacity. The duct burners are deployed to transition between operating states from one turbine operating to two or more turbines operating. The District's description at the bottom of PDOC page 41 accurately characterizes RBEP's duct burner operating profile.

ii. If physically possible, is it possible that CAISO would require one turbine to operate as described in the above first scenario (with duct firing) in one hour?

Response: No. The California Independent System Operator (CAISO) or offtaker designates a load requirement and time for capacity to be on line. They do not dictate operational characteristics. It is highly unlikely that RBEP would be called upon to start up and shutdown a turbine within a 60 minute period. Besides being an unusual request for capacity for such a short period of time, there is a direct financial impact with every start. The turbines require specific maintenance routines be performed after a specific number of operating hours and/or start up/shutdown cycles. Therefore, starting up a turbine has a direct financial cost which can be assessed for each turbine start due to the need to adhere to the proscribed maintenance schedules (as determined by the turbine manufacturer). The more starts/shutdowns occur, the more often maintenance is required, which reduces the potential availability of a generating unit.

As noted in the response to 2(a)(i), the RBEP duct burners are designed for transitioning from one turbine operating to multiple turbines operating and not for start up or increasing generating capacity.

iii. Is it physically possible for one turbine to operate as described in the above analogous scenario (without duct firing) in one hour?

Response: Yes; please see the response to 2(a)(i) above.

iv. If physically possible, is it possible that CAISO would require one turbine to operate as described in the above analogous scenario (without duct firing) in one hour?

Response: Please see the response to 2(a)(ii) above.

v. Is it physically possible for three turbines to OPERATE SIMULTANEOUSLY as described in the above first scenario (with duct firing), or as described in the above analogous scenario (without duct firing) or a combination thereof?

Response: As described on pages 41 and 42 of the PDOC, operation of three turbines with maximum duct burner firing would exceed the maximum heat input into the steam system. Three turbines could operate simultaneously with a total duct burner firing of approximately 105 MMBtu/hr-HHV (out of a total duct burner firing capacity of 1,521 MMBtu/hr-HHV); please see the response to 2(a)(i) above.

vi. If physically possible, is it possible that CAISO would require three turbines to OPERATE SIMULTANEOUSLY as described in the above first scenario (with duct firing), or as described in the above analogous scenario (without duct firing), or a combination thereof?

Response: Please see the response to 2(a)(ii) above.

b. Second Scenario

The second scenario presented is that a cold startup is completed within 60 minutes (instead of the permitted 90 minutes), which will result in maximum emission rates of 28.7 lb/hr NOx and 115.9 lb/hr CO.

i. Is it physically possible for one turbine to complete a cold startup within 60 minutes, thereby resulting in maximum emission rates of 28.7 lb/hr NOx and 115.9 lb/hr CO?

Response: No. The cold start up duration of 90 minutes is required to allow the gradual heating of the heat recovery steam generator (HRSG) and steam turbine generator systems to avoid damaging these systems. The cold start up duration is proscribed by the equipment manufacturer and will be accompanied by a warranty. Operating outside of the proscribed operating procedures would void the warranty.

Furthermore, if a cold start up were completed within less than 90 minutes, the resulting emissions would be proportionally less than the cold start NOx and CO emission rates of 28.7 and 115.9 pounds/start, respectively.

ii. Is it physically possible for three turbines to SIMULTANEOUSLY complete a cold startup within 60 minutes, thereby resulting in maximum emission rates of 28.7 lb/hr NOx and 115.9 lb/hr CO from each turbine?

Response: No; please see the response to 2(b)(i) above. Under most circumstances, the cold start up a combined cycle power plant (consisting of two or more combustion turbines) would normally be accomplished by starting a single turbine and allowing that turbine to provide the necessary heat to the steam turbine generator system. After this system reached the nominal operating temperature, the other turbines (comprising the combined cycle system) would be started. This approach avoids the need to operate multiple turbines at inefficient load rates for extended durations, with reduces air and greenhouse gas emissions.

iii. If physically possible, is it possible that CAISO would require three turbines to SIMULTANEOUSLY complete a cold startup within 60 minutes, thereby resulting in maximum emission rates of 28.7 lb/hr NOx and 115.9 lb/hr CO from each turbine?

Response: No, excluding an emergency. When providing generating capacity, an energy provider includes in its offer operating limitations associated with the facility, defined either by physical or legal constraints such as time required for a start up or the number of starts allowed per day or month. In the case of RBEP, AES would indicate in any offer that a cold start requires a 90 minute period.

c. Selection of Modeled Rates

i. Please discuss the rationale for basing the modeled emissions on three turbines in simultaneous start-up, with a maximum individual turbine emission rates of 25.4 lb/hr NOx and 114 lb/hr CO for each turbine.

Response: The NOx and CO emission rates of 25.4 and 114 pounds per hour, respectively, represent the highest hourly emission rates for any reasonably expected operating condition. Although the operating conditions proposed above are physically possible, the probability that RBEP would be called on to start up and shutdown within a 60 minute period is very low. Furthermore, a request to violate the cold start procedures specified by the equipment manufacturer could result in damage to the steam cycle and could void the manufacturer's warranty.

ii. If based on the scenarios presented by CEC, the modeled emissions rates are not the maximum rates for NOx and CO, please propose permit conditions to limit operations to ensure that the modeled emission rates are the maximum rates.

Response: The scenarios presented by the CEC are either physically impossible or present highly improbable and impractical operating scenarios. Therefore, no additional permit conditions are necessary.

3. CEC Comment No. 12

Pg. 55 of the PDOC states: The applicant has indicated combustor tuning is not required to be evaluated separately because the periodic combustor turning activities are not expected to result in emissions above either the startup/shutdown or normal operating mode.

In this comment, CEC has recommended that provision be analyzed to allow combustor tuning.

a. Please describe the combustor tuning events anticipated as the facility ages.

Response: Once commissioned, the combustors are not expected to require tuning.

b. Condition nos. A195.5, A195.6, and A195.7 require BACT levels for NOx, CO, and VOC except during commissioning, cold startups, warm startups, hot startups, and shutdown periods.

i. If it is correct that the periodic combustor tuning activities are not expected to result in emissions above the startup/shutdown mode, please discuss why an exemption for a specified number of hours need not be added for “combustor tuning events” or other type of “maintenance” to these conditions.

Response: As noted in the response to 3(a) above, the combustors are not expected to require tuning after commissioning. Therefore, an exemption for combustor tuning hours is not required.

ii. If an exemption is required, please specify the following:

aa. Definition for “combustor tuning events,” “maintenance,” or whichever term is proposed.

bb. Number of hours.

cc. Maintenance emission factors that will need to be added to condition A63.1.

dd. Change in emissions calculations because the maintenance emission will need to be accounted for. Typically, the entire number of hours is assumed to take place at one time.

Response: Please see the response to 3(b)(i) above.

c. Are the emissions rates from combustor tuning events expected to exceed the modeled emission rates on which the PDOC is based? Please discuss.

Response: Please see the response to 3(b)(i) above.

d. Are combustor tuning events expected to cause an exceedance of the monthly emission limits in condition A63.1? Please discuss.

Response: Please see the response to 3(b)(i) above.

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

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