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Filer:	Jerry Salamy
Organization:	CH2M HILL
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Salamy, Jerry/SAC

From: Vicky Lee <VLee1@aqmd.gov>
Sent: Thursday, January 14, 2016 1:39 PM
To: stephen.okane@AES.com; Salamy, Jerry/SAC
Cc: John Yee; Andrew Lee
Subject: AES Alamitos--Comments on Your Responses, 1/7/16, to SCAQMD AEC Questions, 12/18/15
Attachments: AEC_SCAQMD_Completeness_20160107_Final.pdf

PLEASE POST ON CALIFORNIA ENERGY COMMISSION WEBSITE.

Stephen and Jerry,

Thank you for the attached letter in response to my e-mail, dated 12/18/15, requesting additional information. I have revised my Modeling Review Request Memo to incorporate your responses.

Although the applications were deemed complete today, I think it is important that I provide comments and clarifications on your attached letter. Below are my comments and clarifications.

11. Auxiliary Boiler 30-Day Averages
    d. Comment on AES's Response to 11.b
    Thank you for clarifying in your response to 11.b. in Response Letter, dated 1/7/16, that the maximum annual fuel consumption of 310,096 MMBtu is not derived from the maximum monthly fuel consumption of 26,327 MMBtu/hr (as was indicated in your response to item 13.a.ii. in Response Letter, dated 12/11/15) and providing corrected maximum annual fuel consumption calculations.

    e. Comments on AES's Response to 11.c
        i. Your response indicated that the first discrepancy in my emissions calculations is that two different molar conversion factors are used to calculate carbon monoxide (CO) and nitrogen oxides (NOx) emissions. As clarification, the 379 cubic feet used for CO is based on standard conditions of 60 deg F and 1 atmosphere. The 385 cubic feet used for NOx is based on standard conditions of 68 deg F and 1 atmosphere as defined for RECLAIM under Rule 2012, Appendix A, Attachment F. Therefore, the discrepancy is correct.

        ii. Your response indicated that the second discrepancy in my emissions calculations is that my calculations erroneously assume the auxiliary boiler is operated at the maximum heat input of 71 MMBtu/hr for 24 hours per day, 7 days per week for 30 days. Your response clarified that AES assumed an average hourly fuel consumption of **35.3 MMBtu/hr**.

        When you provided the requested process description in item 10.b. in your Response Letter, dated 12/11/15, it became clear that the auxiliary boiler will not operate at 100 % load at all times because the boiler will be operated at its minimum turndown rate until a combined-cycle turbine start is requested. My understanding that AES requested that the emissions calculations be based on 100% load is due to the following statements in the Application, which accompanied the emissions calculations.

            First, page 5.1-18 states: "Steady-State Operating Emissions. The auxiliary boiler operational emission rates for steady-state operations, shown in Table 5.1-19, have been estimated based on the maximum heat input rating and the assumption that the boiler will operate at 100 percent load. Detailed calculations are provided in Appendix 5.1B."

Second, page 5.1-19 states: "Table 5.1-21 presents the maximum fuel use expected for each of the combustion emission sources included at the AEC, as well as the facility total. Detailed calculations are provided in Appendix 5.1-B." *Table 5.1-21—Estimated Facility Fuel Use (MMBtu)* shows the estimated fuel use per year for the Auxiliary Boiler is 310,096 MMBtu, the same as in your response to 11.c. Footnote c to *Table 5.1-21* indicates that for the auxiliary boiler, "Fuel use was based on operation at 100 percent load. Additionally, the annual fuel use assumed 120 startups and 8,760 hours of operation."

Third, in *Appendix 5.1B, Table 5.1B.11—Auxiliary Boiler: Performance Data* has two tables. Footnote 3 to the second table, entitled *Auxiliary Boiler Emission Rates*, states: "Monthly and annual emissions assume two cold starts, four warm starts, and four hot starts per month, and operation at the maximum hourly firing rate."

All three of the above references indicate AES requested that the emissions calculations be based on 100 percent load and the maximum hourly firing rate. SCAQMD will not arbitrarily select a lower percentage load, unless requested by the Applicant.

f. My Revised Emissions Calculations

For the PDOC, the emissions calculations are required to be performed pursuant to standard SCAQMD methodology. I have revised my emissions calculations to base the normal operating emissions rate on 35.3 MMBtu/hr. As a heads-up, the PDOC will be based on the following emissions calculations (without the strikeouts and underlines).

Emissions Calculations for Auxiliary Boiler

Operating schedule per month: 31 days, two cold starts, four warm starts, four hot starts
Cold start: 170 minutes (2.83 hr)
Warm start: 85 minutes (1.42 hr)
Hot start: 25 minutes (0.42 hr)

Normal operating hrs = (31 days)(24 hr) – (2 cold starts)(2.83 hr/cold start) –
(4 warm starts)(1.42 hr/warm start) - (4 hot starts)(0.42 hr/hot start) = 730.98 hr

CO: 50 ppm CO
NOx: 5 ppmv NOx per Rule 1146(c)(1)(F)
ROG, PM, SOx: AER default emission factors for natural gas fired boiler.

Note: In a letter dated 1/7/16, AES requested the normal operating emission rate be based on a 50% load of 35.3 MMBtu/hr because the auxiliary boiler will not be operated at 100% load at all times.

CO, lbs/hr = (~~71,000,000~~ **35,300,000** Btu/hr) (8710 dscf/10^6 Btu) (50 ppm CO per guarantee /10^6)
(20.9/(20.9-3.0)) (28 lbs CO/379 scf) = ~~2.67~~ **1.33** lb/hr

(730.98 hr)(~~2.67~~ **1.33** lb/hr) + (2 cold starts)(4.34 lb/cold start) + (4 warm starts)
(2.17 lb/warm start) + (4 hot starts)(0.64 lb/hot start) = ~~1971.64~~ **992.12** lb/month

lbs/day = (~~1971.64~~ **992.12** lb/month)/(30 days) = ~~65.72~~ **33.07** lb/day
30 DA = ~~65.72~~ **33.07** lb/day

NOx, lbs/hr = (~~71,000,000~~ **35,300,000** Btu/hr) (8710 dscf/10^6 Btu) (5 ppm per Rule 1146/10^6)
(20.9/(20.9-3.0)) (46 lbs NOx/385 scf) = ~~0.43~~ **0.21** lb/hr

(730.98 hr)(~~0.43~~ **0.21** lb/hr) + (2 cold starts)(4.22 lb/cold start) + (4 warm starts)
(2.11 lb/warm start) + (4 hot starts)(0.62 lb/hot start) = ~~333.68~~ **172.87** lb/month

lbs/day = (~~333.68~~ **172.87** lb/month)/(30 days) = ~~11.12~~ **5.76** lb/day

30 DA = ~~11.12~~ **5.76** lb/day

ROG: Guarantee = 0.003 lb/MMBtu, AES used 0.004 lb/MMBtu for safety margin.
ROG, lbs/hr = (~~71,000,000~~ **35,300,000** Btu/hr) (0.004 lb/MMBtu /10^6) = ~~0.28~~ **0.14** lb/hr

(730.98 hr)(~~0.28~~ **0.14** lb/hr) + (2 cold starts)(4.69 lb/cold start) + (4 warm starts) (2.34 lb/warm start) + (4 hot starts)(0.69 lb/hot start) = ~~226.17~~ **123.83** lb/month

lbs/day = (~~226.17~~ **123.83** lb/month)/(30 days) = ~~7.54~~ **4.13** lb/day
30 DA = ~~7.54~~ **4.13** lb/day

For combustion emissions, the standard assumption is PM_{10} = PM.
PM_{10}, lbs/hr = (~~71,000,000~~ **35,300,000** Btu/hr) (0.0043 lb/MMBtu per guarantee/10^6) = ~~0.305~~ **0.15** lb/hr

(31 days)(24 hr/day)(~~0.305~~ **0.15** lb/hr) = ~~226.92~~ **111.60** lb/month

lbs/day = (~~226.92~~ **111.60** lb/month)/(30 days) = ~~7.54~~ **3.72** lb/day
30 DA = ~~7.54~~ **3.72** lb/day

SOx, lbs/hr = (~~71,000,000~~ **35,300,000** Btu/hr) (cf/1050 Btu) (0.6 lb SOx AER/10^6 cf) = ~~0.04~~ **0.02** lb/hr

(31 days)(24 hr/day)(~~0.04~~ **0.02** lb/hr) = ~~29.76~~ **14.88** lb/month

lbs/day = (~~29.76~~ **14.88** lb/month)/(30 days) = ~~0.99~~ **0.50** lb/day
30 DA = ~~0.99~~ **0.50** lb/day

23. Commissioning of Combined-Cycle Turbines Modeling
24. Commissioning of Simple-Cycle Turbines Modeling
    a. Thank you for clarifying that the average annual emission rate for NO_2 in lb/hr presented in *Table 5.1-12—GE 7FA.05 Turbine Commissioning Emission Rate* and in *Table 5.1-13-- GE LMS-100 Turbine Commissioning Emission Rate* represent the maximum potential emission rates during commissioning for combined-cycle and simple-cycle turbines, respectively, and do not relate directly to the dispersion modeling analyses.

    My understanding that these average annual emission rates were related to the dispersion modeling analyses is due to footnotes c to *Table 5.1-12* and *Table 5.1-13*, which indicate "Annual average hourly emissions for evaluating annual impacts are based on the sum of total commissioning emissions and annual operation emissions per turbine, divided by 8,760." SCAQMD evaluates "annual average hourly emissions" and "annual impacts" for the purpose of dispersion modeling only.

Again, thank you for the clarifications.

Vicky Lee
Air Quality Engineer
909-396-2284

From: Jerry.Salamy@CH2M.com [mailto:Jerry.Salamy@CH2M.com]
Sent: Thursday, January 7, 2016 3:09 PM
To: Vicky Lee
Cc: John Yee; Andrew Lee; stephen.okane@AES.com; Elyse.Engel@ch2m.com
Subject: RE: AES Alamitos--AEC Questions

Ms. Lee,

Attached is AES's response to your December 18th request for additional information.

Thanks,

Jerry Salamy
Principal Project Manager
CH2M HILL
2485 Natomas Park Drive, Suite 600
Sacramento, CA 95833
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Cell Phone: 916.769.8919

From: Vicky Lee [mailto:VLee1@aqmd.gov]
Sent: Friday, December 18, 2015 5:56 PM
To: stephen.okane@AES.com; Salamy, Jerry/SAC <Jerry.Salamy@CH2M.com>
Cc: John Yee <JYee@aqmd.gov>; Andrew Lee <ALee@aqmd.gov>
Subject: AES Alamitos--AEC Questions

Stephen and Jerry,

The South Coast Air Quality Management District (SCAQMD) received permit applications for the proposed Amended Alamitos Energy Center (AEC) (Application) on October 23, 2015. On November 20, 2015, SCAQMD deemed the applications incomplete and provided a list of issues identified during the initial completeness review. Thank you for your data request responses, dated December 11, 2015. I performed a preliminary review of your responses and continued to review the application package. Please provide the following additional information. The follow-up questions to your December 11, 2015 response letter retain the same numbering as in the letters, and the new questions start at question no. 22.

Follow-up Questions

9. SCR and CO Oxidation Catalyst Specifications and Guarantees
   b. Simple Cycle
      i. SCR
         dd. The response to bb. was that the maximum allowable pressure drop across the catalyst is 120 inches of water column. For the combined-cycle SCR, the response was that the allowable pressure drop is 1.6 inches water column (9.a.i.bb.). For the auxiliary boiler, the response was that the allowable pressure drop is 1.6 inches water column (9.c.i.aa.). The 120 inches of water column appears to be the pressure drop across a clean catalyst. As the SCR is operated, deposition of particulates on the catalyst increases this pressure drop over time. Please provide the increase in pressure drop due to the deposition that is allowed.

10. Auxiliary Boiler
    e. Commissioning
       iii. Rule 1313(g)(2) requires a permit condition limiting maximum monthly emissions.

            aa. For the initial commissioning month, will normal monthly emissions based on 31 days, two cold starts, four warm starts, and four hot starts, be sufficient?

            bb. If not, please provide the pounds of additional NOx, CO, and VOC emissions that are requested to be added for the commissioning month. Please keep in mind that RTCs and ERCs are based on the highest monthly emissions.

11. Auxiliary Boiler 30-Day Averages
    b. The response to item 11.a. indicated that 26,327 MMBtu/month (exclusive of startups/shutdowns) was used in the 30-day average calculations. Also, the response to item 13.a.ii. indicated that 26,327

MMBtu/month was used in the derivation of the maximum annual heat input of 310,096 MMBtu/yr for the calculation of the air toxic emissions rates.

Please explain how the 26,327 MMBtu/month was derived by providing an equation, and providing numerical values for the variables in the equation.

c. Following are my emissions calculations performed pursuant to standard SCAQMD methodology. Please confirm that my understanding of the requested operating schedule and other parameters are correct.

Emissions Calculations for Auxiliary Boiler

Operating schedule per month: 31 days, two cold starts, four warm starts, four hot starts
Cold start: 170 minutes (2.83 hr)
Warm start: 85 minutes (1.42 hr)
Hot start: 25 minutes (0.42 hr)

Normal operating hrs = (31 days)(24 hr) – (2 cold starts)(2.83 hr/cold start) –
(4 warm starts)(1.42 hr/warm start) - (4 hot starts)(0.42 hr/hot start) = 730.98 hr

CO: 50 ppm CO
NOx: 5 ppmv NOx per Rule 1146(c)(1)(F)
ROG, PM, SOx: AER default emission factors for natural gas fired boiler.

CO, lbs/hr = (71,000,000 Btu/hr) (8710 dscf/10^6 Btu) (50 ppm CO per guarantee /10^6)
(20.9/(20.9-3.0)) (28 lbs CO/379 scf) = 2.67 lb/hr

(730.98 hr)(2.67 lb/hr) + (2 cold starts)(4.34 lb/cold start) + (4 warm starts)
(2.17 lb/warm start) + (4 hot starts)(0.64 lb/hot start) = 1971.64 lb/month

lbs/day = (1971.64 lb/month)/(30 days) = 65.72 lb/day
30 DA = 65.72 lb/day

NOx, lbs/hr = (71,000,000 Btu/hr) (8710 dscf/10^6 Btu) (5 ppm per Rule 1146/10^6)
(20.9/(20.9-3.0)) (46 lbs NOx/385 scf) = 0.43 lb/hr

(730.98 hr)(0.43 lb/hr) + (2 cold starts)(4.22 lb/cold start) + (4 warm starts)
(2.11 lb/warm start) + (4 hot starts)(0.62 lb/hot start) = 333.68 lb/month

lbs/day = (333.68 lb/month)/(30 days) = 11.12 lb/day
30 DA = 11.12 lb/day

ROG: Guarantee = 0.003 lb/MMBtu, AES used 0.004 lb/MMBtu for safety margin.
ROG, lbs/hr = (71,000,000 Btu/hr) (0.004 lb/MMBtu /10^6) = 0.28 lb/hr

(730.98 hr)(0.28 lb/hr) + (2 cold starts)(4.69 lb/cold start) + (4 warm starts)
(2.34 lb/warm start) + (4 hot starts)(0.69 lb/hot start) = 226.17 lb/month

lbs/day = (226.17 lb/month)/(30 days) = 7.54 lb/day
30 DA = 7.54 lb/day

For combustion emissions, the standard assumption is PM_{10} = PM.
PM_{10}, lbs/hr = (71,000,000 Btu/hr) (0.0043 lb/MMBtu per guarantee/10^6) = 0.305 lb/hr

(31 days)(24 hr/day)(0.305 lb/hr) = 226.92 lb/month

lbs/day = (226.92 lb/month)/(30 days) = 7.54 lb/day

30 DA = 7.54 lb/day

SOx, lbs/hr = (71,000,000 Btu/hr) (cf/1050 Btu) (0.6 lb SOx AER/10^6 cf) = 0.04 lb/hr

(31 days)(24 hr/day)(0.04 lb/hr) = 29.76 lb/month

lbs/day = (29.76 lb/month)/(30 days) = 0.99 lb/day
30 DA = 0.99 lb/day

12. Turbines Toxic Emissions and Rule 1401 Health Risk Assessment
    c. Stack Parameters

    Page 5.9-7 indicates the maximum hourly turbine impacts for both the combined-cycle and simple-cycle turbines were predicted using the exhaust parameters for the 65.3 ºF, minimum load case, which represents the turbine exhaust parameters associated with the maximum predicted 1-hour ground-level impact in the dispersion modeling, combined with the maximum possible toxic air contaminant (TAC) emission rates. The annual turbine impacts were also predicted for the 65.3 ºF, minimum load case, which represents the average annual temperature and load scenario resulting in the maximum predicted annual ground-level impact in the dispersion modeling.

    The modeling review request memo lists the exhaust temperature and exhaust velocity for both the hourly and annual impacts for each equipment. The above discussion does not provide that information explicitly.

    i. Combined-Cycle Turbine
        aa. Hourly Impacts
            (1) Page 5.9-7 indicates maximum predicted 1-hour ground-level impact is for 65.3 ºF. Do you mean 28 ºF?
            (2) Please confirm the stack temperature is 350 ºK and the stack velocity is 12.2 m/sec per Scenario CC03.

        bb. Annual Impacts
            (1) Please confirm the stack temperature is 350 ºK and the stack velocity is 11.8 m/sec per Scenario CC07.

    ii. Simple-Cycle Turbine
        aa. Hourly Impacts
            (1) Page 5.9-7 indicates maximum predicted 1-hour ground-level impact is for 65.3 ºF. Do you mean 28 ºF?
            (2) Please confirm the stack temperature is 749 ºK and the stack velocity is 23.8 m/sec per Scenario CC03.

        bb. Annual Impacts
            (1) Please confirm the stack temperature is 746 ºK and the stack velocity is 23.6 m/sec per Scenario CC07.

13. Auxiliary Boiler Toxic Emissions and Rule 1401 Health Risk Assessment
    a. Toxic Emissions
        iii. As discussed in 11.b., above, clarification is requested for the derivation of the 26,327 MMBtu/month.

        iv. *Table 13-1—Air Toxic Emission Rates Modeled for AEC Operation: Auxiliary Boiler* does not include propylene. Please provide the hourly and annual emissions for propylene.

        v. *Table 13-1* does not include ammonia. Please provide the hourly and annual emissions for ammonia.

b. Rule 1401 Health Risk Assessment

ii. Please confirm propylene and ammonia were included in the HRA.

New Questions

22. Number of Startups per Day

The number of startups and shutdowns per day are limited by permit condition.

a. Footnote a to *Table 5.1-31--AEC CCGT Emission Rates and Operating Scenarios Corresponding to the Highest Predicted AERMOD Impacts* on pages 5.1-30 and 5.1-31 indicates that the 8-hour CO emission rate is based on one cold start-up, one warm startup, two shutdown events, and operating at minimum load for the remaining hours. The implication is that the maximum daily startups are two. For each combined-cycle turbine, please confirm the maximum number of startups are two per day.

b. Footnote a to *Table 5.1-32--AEC SCGT Emission Rates and Operating Scenarios Corresponding to the Highest Predicted AERMOD Impacts* on pages 5.1-31 and 5.1-32 indicates that the 8-hour CO emission rate is based on two start-up events, two shutdown events, and operating at minimum load for the remaining hours. The implication is that the maximum daily startups are two. For each simple-cycle turbine, please confirm the maximum number of startups are two per day.

c. Footnote a to *Table 5.1-33—Auxiliary Boiler Emission Rates and Stack Parameters* on page 5.1-33 indicates that the 8-hour CO emission rate is based on one cold start-up event and operating at the maximum firing rate for the remaining hours. The implication is that the maximum daily startups are one. For the auxiliary boiler, please confirm the maximum number of startups is one per day.

23. Commissioning of Combined-Cycle Turbines Modeling

a. In *Table 5.1C.2—Commissioning Emission Rates* in *Appendix 5.1C*, the annual NO_2 emission rate used is 9.12 lb/hr.

The 9.12 lb/hr is from the "Combined Commissioning and Operation" parameters and emission rates in *Table 5.1-29—AEC CCGT Commissioning Dispersion Modeling Scenarios* on page 5.1-29. Footnote b to the table explains for the "Combined Commissioning and Operation," the "[e]mission rates, stack exit velocity, and stack temperature for the combined annual commissioning and operation are based on the operational load resulting in the highest modeled impact of NOx, PM_{10}, and $PM_{2.5}$."

From *Table 5.1-12—GE 7FA.05 Turbine Commissioning Emission Rate* on page 5.1-14, the "Annual Average Hourly, lb/hr (per turbine)" for NOx is 12.3 lb/hr. Footnote c to the table explains for the "Annual Average Hourly, lb/hr (per turbine)," the "Annual average hourly emissions for evaluating annual impacts are based on the sum of total commissioning emissions and annual operation emissions per turbine, divided by 8,760."

i. The only discrepancy between *Tables 5.1-29* and *5.1-12* are the annual NOx rates. Please explain why the 9.12 lb/hr was used for modeling instead of the 12.3 lb/hr.

ii. Please provide emissions calculation for the 9.12 lb/hr, which includes numerical values for the variables and the case no. from T*able 5.1B.3*.

iii. If not appropriate for modeling, please explain the purpose for presenting the 12.3 lb/hr in *Table 5.1-12.*

iv. Please provide emissions calculation for the 12.3 lb/hr, which includes numerical values for the variables and the case no. from T*able 5.1B.3*.

b. To expedite the modeling review, please provide an explanation of how the modeling was performed for the commissioning of the combined-cycle turbines. The explanation is to include, but not be limited, to reference to *Tables 5.1C.1 – 5.1C.5* in *Appendix 5.1C*.

24. Commissioning of Simple-Cycle Turbines Modeling

a. In *Table 5.1C.2—Commissioning Emission Rates* in *Appendix 5.1C*, the annual NO_2 emission rate used is 2.95 lb/hr.

The 2.95 lb/hr is from the "Combined Commissioning and Operation" parameters and emission rates in *Table 5.1-30—AEC SCGT Commissioning Dispersion Modeling Scenarios* on page 5.1-29. Footnote b to the table explains for the "Combined Commissioning and Operation," the "[e]mission rates, stack exit velocity, and stack temperature for the combined annual commissioning and operation are based on the operational load resulting in the highest modeled impact of NOx, PM_{10}, and $PM_{2.5}$."

From *Table 5.1-13—GE LMS-100 Turbine Commissioning Emission Rate* on page 5.1-15, the "Annual Average Hourly, lb/hr (per turbine)" for NOx is 3.65 lb/hr. Footnote c explains for the "Annual Average Hourly, lb/hr (per turbine)," the "Annual average hourly emissions for evaluating annual impacts are based on the sum of total commissioning emissions and annual operation emissions per turbine, divided by 8,760."

i. The only discrepancy between *Tables 5.1-30* and *5.1*-13 are the annual NOx rates. Please explain why the 2.95 lb/hr was used for modeling instead of the 3.65 lb/hr.

ii. Please provide emissions calculation for the 2.95 lb/hr, which includes numerical values for the variables and the case no. from T*able 5.1B.7*.

iii. If not appropriate for modeling, please explain the purpose for presenting the 3.65 lb/hr in *Table 5.1-13.*

iv. Please provide emissions calculation for the 3.65 lb/hr, which includes numerical values for the variables and the case no. from T*able 5.1B.7*.

b. On page 5.1-37, footnote a to *Table 5.1-37—AEC SCGT Commissioning Impacts Analysis-Maximum Modeled Impacts Compared to the Ambient Air Quality Standards* indicates that maximum modeled concentrations include impacts from commissioning of four GE LMS-100 turbines and operation of two GE 7FA.05 turbines and the auxiliary boiler. Page 5.1-28 indicates that all four simple cycle turbines would be undergoing simultaneous commissioning activities while both combined-cycle turbines were operating in cold-start mode. Page 5.1-37 indicates, however, that the two combined-cycle turbines were simultaneously operating with the steady state emissions presented in *Table 5.1-31*.

i. *Table 5.1C.2—Commissioning Emission Rates* shows the 1-hour NO_2, 1-hr CO, and 8-hr CO for the combined-cycle turbines are from *Table 5.1-31*. Please confirm that both combined-cycle turbines were not assumed to be operating in cold-start mode for all averaging periods.

Please confirm the emission rates for each pollutant and corresponding averaging period from *Table 5.1-31* were used for the simultaneous modeling of the combined cycle turbines.

c. To expedite the modeling review, please provide an explanation of how the modeling was performed for the commissioning of the simple-cycle turbines. The explanation is to include, but not be limited, to references to *Tables 5.1C.1 – 5.1C.5* in *Appendix 5.1C*.

25. Normal Operation of Facility

a. Auxiliary Boiler Emission Rates

On page 5.1-33, *Table 5.1-33—Auxiliary Boiler Emission Rates and Stack Parameters* presents the emission rates for each pollutant and averaging period.

i. NO_2 for annual averaging period

aa. Please confirm the annual averaging period emission rate for NO_2 was based on 8,760 hours of total operation, 24 cold starts, 48 warm starts, 48 hot starts, as indicated in footnote a to *Table 5.1-33.*

bb. *Table 5.1*-33 shows the annual averaging emission rate is 0.23 lb/hr NO_2.

Following are my calculations for the emission rate:

Normal operating hours = 8760 hr - (24 cold starts)(2.83 hr/cold start, based on 170 min) – (48 warm starts)(1.42 hr/warm start, based on 85 min)
- (48 hot starts)(0.42 hr/hot start, based on 25 min) = 8603.76 hr

[(8603.76 hr)(0.43 lb/hr from my emissions calculations) + (24 cold starts)(4.22 lb/cold start) + (48 warm starts)(2.11 lb/warm start) + (48 hot starts)(0.62 lb/hot start)] ÷ 8760 hr = 0.45 lb/hr

Please explain why the NO_2 emission rate is 0.23 lb/hr.

ii. <u>SO_2 for 24-hr averaging period</u>

aa. Please confirm the daily emission rate for SO_2 were based on 31 days of operation, 2 cold starts, 4 warm starts, 4 hot starts, averaged over 30 days, as indicated in footnote a to *Table 5.1-33.* Typically, the 24-hr emission rate is based on maximum emissions for a 24-hour day, but CH2M Hill's method would yield higher emissions.

bb. *Table 5.1*-33 shows the 24-hr averaging period emission rate is 0.025 lb/hr.

Following are my calculations for the emission rate:

[(31 days)(24 hr/day)(0.04 lb/hr from my emissions calculations)] ÷ [(30 days)(24 hr/day)] = 0.05 lb/hr

Please explain why the SO_2 emission rate is 0.025 lb/hr.

iii. <u>$PM_{10}/PM_{2.5}$ for 24-hr averaging period</u>

aa. Please confirm the daily emission rates for $PM_{10}/PM_{2.5}$ were based on 31 days of operation, 2 cold starts, 4 warm starts, 4 hot starts, averaged over 30 days, as indicated in footnote a to *Table 5.1-33.*

bb. *Table 5.1*-33 shows the 24-hr averaging period emission rate is 0.16 lb/hr.

Following are my calculations for the emission rate:

[(31 days)(24 hr/day)(0.305 lb/hr from my emissions calculations)] ÷ [(30 days)(24 hr/day)] = 0.32 lb/hr

Please explain why the $PM_{10}/PM_{2.5}$ emission rate is 0.16 lb/hr.

iv. <u>$PM_{10}/PM_{2.5}$ for annual averaging period</u>

aa. Please confirm the annual emission rates for $PM_{10}/PM_{2.5}$ were based on 8,760 hours of total operation, 24 cold starts, 48 warm starts, 48 hot starts, as indicated in footnote a to *Table 5.1-33.*

bb. *Table 5.1*-33 shows the annual averaging period emission rate is 0.15 lb/hr.

Following are my calculations for the emission rate:

[(8760 hr/yr)(0.305 lb/hr from my emissions calculations)] ÷ 8760 hr = 0.31 lb/hr

Please explain why the $PM_{10}/PM_{2.5}$ emission rate is 0.15 lb/hr.

b. Combined-Cycle Turbine Loads

i. On pages 5.1-30 and 5.1-31, *Table 5.1-31—AEC CCGT Emission Rates and Operating Scenarios Corresponding to the Highest Predicted AERMOD Impacts* indicates the "Operating Load (%)" is minimum or average for each averaging period. I see this operating load designation is from *Table 5.1B.3—Combined-Cycle: GE 7FA.05 Performance Data* in *Appendix 5.1B*, which refers to the "CTG load (as % of emissions compliant load range)" as max, average, or min. Please translate the maximum, average, and minimum loads to percentage loads to allow comparison against the approximate percentage CTG loads in *Table 5.1B.24—Combined-Cycle: GHG BACT Analysis.*

c. Simple-Cycle Turbine Emission Rates

On page 5.1-31 and 5.1-32, *Table 5.1-32—AEC SCGT Emission Rates and Operating Scenarios Corresponding to the Highest Predicted AERMOD Impacts* presents the emission rates for the pollutants/averaging periods.

i. NO_2 for 1-hr and 1-hr (federal) averaging periods

aa. Please confirm the hourly emission rate for NO_2 was based on 60 minutes of a start-up event, as indicated in footnote a to *Table 5.1-32.*

bb. *Table 5.1*-32 shows the 1-hour averaging period emission rate is 21.2 lb/hr.

Following are my calculations for the emission rate:

Normal operating hours = 1 hr – (0.5 hr/startup, based on 30-minutes) (1 startup) = 0.5 hr

(16.6 lb/startup) + (0.5 hr) (5.18 lb/hr from Case 3) = 19.19 lb/hr

Please explain why the NO_2 emission rate is 21.2 lb/hr.

ii. CO for 1-hr averaging period

aa. Please confirm the hourly emission rate for NO_2 was based on 60 minutes of a start-up event, as indicated in footnote a to *Table 5.1-32.*

bb. *Table 5.1*-32 shows the 1-hour averaging period emission rate is 44.9 lb/hr.

Following are my calculations for the emission rate:

Normal operating hours = 1 hr – (0.5 hr/startup, based on 30-minutes) (1 startup) = 0.5 hr

(15.4 lb/startup) + (0.5 hr)(5.04 lb/hr from Case 3) = 17.92 lb/hr

Please explain why the CO emission rate is 44.9 lb/hr.

d. Page 5.1-38 presents *Table 5.1-38--AEC Operation Impacts Analysis—Maximum Modeled Impacts Compared to the Ambient Air Quality Standards*. Please confirm the facility impact analysis includes the simultaneous operation of the two combined-cycle turbines, the four simple-cycle turbines, and the auxiliary boiler, because that is not stated in the Application.

e. To expedite the modeling review, please provide an explanation of how the modeling was performed for the normal operation of the facility for the purposes of Rule 1303 and 2005. The explanation is to include, but not be limited, to references to *Tables 5.1C.5 – 5.1C.8b* in *Appendix 5.1C*.

I will be out of the office for the next two weeks. John Yee is scheduled to be in next week, and Andrew Lee the following week. Happy Holidays!

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