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December 17, 2015

VIA E-FILING

Mary Dyas
Compliance Project Manager
California Energy Commission
Siting, Transmission and Environmental Protection (STEP) Division
1516 Ninth Street
Sacramento, CA 95814-5512

Subject: Sonoran Energy Project (02-AFC-01C)
Additional Information in Response to CEC Staff's Data Requests 2 and 4

Dear Ms. Dyas:

Following submittal of Data Responses, Set 1, for the Sonoran Energy Project on November 12, 2015, Sierra Research, consultants to Project Owner AltaGas Sonoran Energy, Inc. ("Project Owner") were contacted by CEC Staff with requests for additional information regarding Data Requests 2 and 4. Specifically, Staff requested the following additional information:

- Supporting information from the boiler vendor regarding the origin of the NO_2/NOx ratios for the auxiliary boiler; and
- Revised one-hour NO_2 modeling analyses for the project utilizing NO_2/NOx ratios for the Sonoran and Blythe combined-cycle gas turbines that are representative of the specific turbine technology (that is, GE 7HA and Siemens V84).

In response to Staff's requests, enclosed please find revised responses to Data Requests 2 and 4. Revised tables are numbered with "R2" and the current changes are shown with a double underline to distinguish them from the versions provided in Data Response Set 1. Revised one-hour NO_2 modeling files are being provided electronically.

If you require additional information, please feel free to contact me or Nancy Matthews of Sierra Research at 916.273.5124.

Sincerely,

Melissa A. Foster
MAF:jmw

Enclosure

BACKGROUND: IN-STACK NO2/NOX RATIOS

The facility owner used the Ozone Limiting Method (OLM) to calculate the NO_2 impacts of the proposed project modification. The OLM requires an in-stack NO_2/NOx ratio to determine how much of the NOx in the exhaust is already in the form of NO_2 when the pollutants exit the stack.

Page 3-44 of the PTA shows that the facility owner used an in-stack NO_2/NOx ratio of 13 percent during normal operating hours and 24 percent during startup/shutdown periods and commissioning tests when SCR is not fully operational for the proposed combustion turbine. The facility owner states that these ratios were recommended by the combustion turbine vendor, General Electric (GE). However, staff noticed that these ratios were for the GE LMS100 simple-cycle turbines for Pio Pico Energy Center and Carlsbad Energy Center projects. For the current amendment request, the facility owner proposed a combined-cycle unit using one-on-one single shaft arrangement with a different GE combustion turbine (a GE 7HA.02 gas turbine) and a D652 steam turbine. The proposed turbine technology is different than those approved for Pio Pico Energy Center and Carlsbad Energy Center projects. Staff needs adequately-justified in-stack NO_2/NOx ratio data to be used for different operating scenarios suitable for the proposed combined-cycle unit.

For the auxiliary boiler, the facility owner used an in-stack NO_2/NOx ratio of 29 percent for operation above 25 percent rated load (for normal operating hours) and 12.5 percent for operation below 25 percent rated load (during hours in which a startup/shutdown occurs). The facility owner states that these ratios were recommended by auxiliary boiler vendor (i.e. Babcock & Wilcox). However, for combustion turbines, staff has used higher in-stack NO_2/NOx ratios during startup/shutdown than during normal operations. Staff needs justification to show why the in-stack NO_2/NOx ratio for the auxiliary boiler would be lower during startup/shutdown than during normal operations.

The facility owner used an in-stack NO_2/NOx ratio of 13 percent for each of the existing Blythe Energy Project combustion turbines. The existing Blythe Energy Project combustion turbines are from Siemens and also operate as a combined-cycle unit. Staff needs adequate justification for the data used for the in-stack NO_2/NOx ratios for the existing Blythe Energy Project combustion turbines.

DATA REQUESTS

2. Please provide vendor or other reliable data showing the in-stack NO_2/NOx ratios for different operating scenarios suitable for the proposed combined-cycle unit, the auxiliary boiler, and the existing Blythe Energy Project combustion turbines.

Revised Response: The project owner has consulted with the auxiliary boiler vendor and the manufacturer of the proposed combined-cycle gas turbine (GE). The auxiliary boiler vendor has confirmed that the in-stack NO_2/NOx ratios provided for normal operations and for startup (under the load conditions as described above) were obtained through measurements, [1] so these ratios have been verified as being appropriate and representative for the boiler proposed for use for the SEP. GE has confirmed[2] that the following in-stack NO_2/NOx ratios, provided for

[1] Personal communication between Sierra Research, Project Owner's consultant, and Bob Blanchard, Process Controls Company, December 1, 2015.
[2] Personal communication between Sierra Research, Project Owner's consultant, and Craig Matis of General Electric, December 8, 2015.

7HA gas turbine to be used for the Puente Power Project, are appropriate for use for the SEP gas turbine as GE has no additional data or analysis to change the ratios:

- 30% during steady state operation; and
- 40% during startup/shutdown and commissioning operation.

Finally, we used data from EPA's NO_2/NOx In-Stack (ISR) Ratio Database website to develop an appropriate and representative NO_2/NOx ratio for the Siemens V84.3A combustion turbine generators at BEP. The NO_2 ISR alpha database includes 26 test results for three Siemens V84.3A gas turbines at the Walton Power Plant in Georgia. Although the Walton gas turbines operate in simple cycle, the combustors in those turbines are the same as the BEP gas turbine combustors and therefore the NO_2/NOx ratios measured at the Walton gas turbines are expected to be representative of NO_2/NOx ratios in the BEP gas turbine exhaust.

The highest NO_2/NOx ratio reported for the Walton gas turbines in the ISR database is 17.11%. A ratio of 20% was used for the BEP gas turbines to be conservative.

4. Please update the NO_2 modeling analysis for changes to the NO_2/NOx ratios.

Revised Response: The one-hour NO_2 modeling analysis has been updated to reflect the NO_2/NOx ratios described in Data Response 2. The updated NO_2 modeling analysis also includes a reduction in the maximum NOx emission rate during commissioning, which is expected to occur during steam blows, from 625 lb/hr to 550 lb/hr.

The revised NOx emission rate during commissioning and the revised modeling results are shown in Attachment DR4-R2.

Attachment DR4-R2
Revised Maximum Hourly NOx Emission Rate During Commissioning and Revised One-Hour NO_2 Modeling Results

Table 3.1-24R2. Maximum Initial Commissioning Emissions for the SEP Gas Turbine

Period	NOx	SO_2	CO	VOC	$PM_{10}/PM_{2.5}$
CTG/HRSG, lb/hr	~~625~~ 550	4.9	4,919	464	8.0
CTG/HRSG, lb/day	~~15,610~~ 13,750	118	28,500	2,620	211
CTG/HRSG, total tons	~~70~~ 66	3.1	22	3.0	4.9

Table 3.1-37R2. Maximum Modeled Impacts During Project Construction

Pollutant	Averaging Period	Maximum Modeled Concentration During SEP Construction ($\mu g/m^3$)	Modeled Concentration, BEP[a] ($\mu g/m^3$)	Combined Concentration, SEP + BEP ($\mu g/m^3$)[b]
NO_2[c]	1-hour[d]	~~130.7~~ 134.9	~~4.8~~ 8.7	~~130.7~~ 143.6
	Annual	~~3.6~~ 3.4	0.1	~~3.6~~ 3.5
SO_2	1-hour[d]	~~1.9~~ 1.6	~~0.8~~ 1.3	~~1.9~~ 1.6
	3-hour	~~1.6~~ 1.3	~~0.7~~ 1.0	~~1.6~~ 1.3
	24-hour	~~0.35~~ 0.29	~~0.25~~ 0.29	~~0.44~~ 0.32
CO	1-hour	~~1,009.2~~ 849.6	~~5.1~~ 8.5	~~1,009.2~~ 849.6
	8-hour	~~504.6~~ 415.0	~~2.1~~ 4.2	~~504.6~~ 415.0
PM_{10}	24-hour	~~17.1~~ 19.3	~~0.8~~ 1.0	~~17.2~~ 19.4
	Annual	~~1.3~~ 1.2	~~0.1~~ 0.2	~~1.4~~ 1.3
$PM_{2.5}$	24-hour ~~(98th percentile)~~	~~2.8~~ 2.7	~~0.8~~ 1.0	2.8
	Annual	~~0.2~~ 0.14	~~0.1~~ 0.2	0.3

Notes:

[a] Modeled concentrations at location of maximum modeled concentration during SEP construction.

[b] Combined concentration does not necessarily equal the sum of the individual concentrations because the individual maxima may occur during different hours at the same receptor.

[c] The maximum 1-hour NO_2 concentration is based on OLM, and the maximum annual NO_2 concentration shows an NO_2 to NOx equilibrium ratio of 0.75.

[d] Only highest first high is shown, for comparison with state standard. Federal standard is based on a 3-hour average, and construction period will last for less than 2 years.

Table 3.1-38R2 Maximum Modeled Impacts for the Commissioning Period

Pollutant	Averaging Period	Maximum Modeled Impact, SEP, µg/m^3	Monitored Background Concentration, µg/m^3	Maximum Modeled Impact, BEP, µg/m^3	Total Impact, µg/m^3	Most Stringent Standard, µg/m^3	Percent of Most Stringent Standard
NO_2	1 hour[a]	~~178.1~~ 266.4	~~77.1~~ 90.2	~~12.73~~ 16.8	~~231.9~~ 320.9[b]	339	~~68%~~ 95%
CO	1 hour	4,265.7	4,000	26.70	8,288	23,000	36%
	8 hours	960.9	1,698	7.15	2,661	10,000	27%

a. Based on AERMOD-OLM.

b. Total impact does not equal sum of individual maximum impacts because individual maxima occur at different times and in different locations.

Table 3.1-39R2. Air Quality Modeling Results

		Modeled Maximum Concentrations (µg/m^3)		
Pollutant	**Averaging Time**	**Normal Operation AERMOD**	**Startup/Shutdown AERMOD**	**Fumigation ~~SCREEN3~~ AERSCREEN**
Gas Turbine				
NO_2[g]	1-hour	~~11.55~~ 13.67	~~101.58~~ 140.2	~~3.87~~ 9.3
	98th percentile	6.00	~~53.7~~ 54.8	-
	Annual	~~0.17~~ 0.18	a	c
SO_2	1-hour	2.89	b	~~0.73~~ 1.8
	3-hour	1.49	b	~~0.60~~ 1.6
	24-hour	0.39	b	~~0.25~~ 0.70
	Annual	0.02	b	c
CO	1-hour	9.23	117.9	~~2.36~~ 5.7
	8-hour	7.90	a	~~1.42~~ 4.0
$PM_{2.5}/PM_{10}$	24-hour	~~1.14~~ 1.42	b	~~0.56~~ 1.7
	Annual	~~0.06~~ 0.07	b	c
Auxiliary Boiler				
NO_2	1-hour	~~1.08~~ 1.28	~~8.37~~ 9.32	~~0.88~~ 3.2
	98th percentile	0.99	7.47	–
	Annual	0.05	a	c
SO_2	1-hour	0.23	b	~~0.14~~ 0.52
	3-hour	0.18	b	~~0.12~~ 0.36
	24-hour	0.12	b	~~0.05~~ 0.12
	Annual	0.004	b	c
CO	1-hour	6.21	63.0	~~3.84~~ 13.8
	8-hour	9.18	a	~~2.38~~ 6.1
$PM_{2.5}/PM_{10}$	24-hour	0.54	b	~~0.25~~ 0.60
	Annual	0.04	b	c
Emergency Diesel Fire Pump Engine				
NO_2	1-hour	~~59.3~~ 60.7	d	e
	98th percentile	51.4	d	-
	Annual	0.04	d	c,e
SO_2	1-hour	0.1	d	e
	3-hour	0.02	d	e
	24-hour	0.005	d	e
	Annual	<0.001	d	c,e
CO	1-hour	15.8	d	e
	8-hour	0.5	d	e
$PM_{2.5}/PM_{10}$	24-hour	0.02	d	~~0.3~~ e
	Annual	0.001	d	c

Table 3.1-39R2. Air Quality Modeling Results

Pollutant	Averaging Time	Modeled Maximum Concentrations (µg/m^3)		
		Normal Operation AERMOD	Startup/Shutdown AERMOD	Fumigation ~~SCREEN3~~ AERSCREEN
Cooling Tower				
$PM_{2.5}/PM_{10}$	24-hour	4.9	d	e
	Annual	~~0.4~~ 0.5	d	c,e
Combined Impacts, All SEP Equipment				
NO_2[g]	1-hour	~~59.3~~ 60.7	~~101.6~~ 140.2	~~3.9~~ h
	98th percentile	51.4	~~53.8~~ 54.8	–
	Annual	0.2	a	~~c~~ h
SO_2	1-hour	2.9	b	~~0.7~~ h
	3-hour	1.5	b	~~0.6~~ h
	24-hour	0.4	b	~~0.2~~ h
	Annual	0.02	b	~~c~~ h
CO	1-hour	15.8	117.9	~~2.4~~ h
	8-hour	9.2	a	~~1.4~~ h
$PM_{2.5}/PM_{10}$ [f]	24-hour	~~5.3~~ 5.4	b	~~0.6~~ h
	Annual	~~0.5~~ 0.6	b	~~c~~ h

[a] Not applicable, because startup/shutdown emissions are shown in the modeling for this averaging period.

[b] Not applicable, because emissions are not elevated above normal operation levels during startups/shutdowns.

[c] Not applicable, because inversion breakup is a short-term phenomenon and as such is evaluated only for short-term averaging periods.

[d] Not applicable, because engine emissions are the same during gas turbine startups/shutdowns.

[e] Not applicable, because fumigation ~~this type of~~ modeling is not performed by the models for ~~small combustion~~ sources with relatively short stacks.

[f] Encompasses cooling tower.

[g] 1-hour NO_2 modeled using OLM. Annual NO_2 modeled using ARM.

[h] Not applicable, because AERSCREEN is a single-source model.

Table 3.1-40R2. Maximum Modeled Impacts from Construction and the Ambient Air Quality Standards

Pollutant	Averaging Period	Maximum Modeled Concentration[a] ($\mu g/m^3$)	Background Concentration[b] ($\mu g/m^3$)	Total Predicted Concentration ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2	1-hour[c,d]	~~130.7~~ 143.6	~~77.1~~ 97.8	~~196.2~~ 241.4	339	—
	Annual[c]	~~3.6~~ 3.5	13.2	~~16.8~~ 16.7	57	100
SO_2	1-hour[d]	~~1.9~~ 1.6	22.9	~~24.8~~ 24.5	655	—
	3-hour	~~1.6~~ 1.3	22.6	~~24.2~~ 23.9	—	1,300
	24-hour	~~0.4~~ 0.3	2.6	~~3.0~~ 2.9	105	365
CO	1-hour	~~1,009.2~~ 849.6	4,000	~~5,009.2~~ 4,849.6	23,000	40,000
	8-hour	~~504.6~~ 415.0	1,698	~~2,202.6~~ 2,113.0	10,000	10,000
PM_{10}	24-hour	~~17.2~~ 19.4	127	~~144.2~~ 146.4	50	150
	Annual	~~1.4~~ 1.3	22.1	~~23.5~~ 23.4	20	—
$PM_{2.5}$	24-hour ~~(98th percentile)~~	2.8	13.8	16.6	—	35
	Annual	0.3	6.5	6.8	12	15

[a] Includes BEP. See Table 3.1-37R1.

[b] Background concentrations were the highest concentrations monitored between 2012 and 2014. See Table 3.1-11.

[c] The maximum 1-hour NO_2 concentration is based on OLM, and the maximum annual NO_2 concentration shows an NO_2 to NOx equilibrium ratio of 0.75.

[d] Only highest first high is shown, for comparison with state standard. Federal standard is based on a 3-hour average, and construction period will last for less than 2 years.

Table 3.1-41R2. Operation Impacts Analysis—Maximum Modeled Impacts Compared to the Ambient Air Quality Standards

Pollutant	Averaging Time	Maximum Modeled Concentration ($\mu g/m^3$)[a]	Modeled Impact, BEP ($\mu g/m^3$)	Background Concentration ($\mu g/m^3$)[b]	Total Combined Predicted Concentration ($\mu g/m^3$)	State Standard ($\mu g/m^3$)	Federal Standard ($\mu g/m^3$)
NO_2[c]	1-hour	~~101.6~~ 125.7	~~21.4~~ 25.4	~~77.1~~ 97.8	~~167~~ 249	339	—
	Federal 1-hour[d]	~~53.8~~ 54.2	~~11.1~~ 11.3	77.1	115	—	188
	annual	0.2	0.2	13.2	14	57	100
SO_2	1-hour	2.9	4.1	22.9	30	655	—
	Federal 1-hour[e]	2.9	4.1	13	20	—	196
	3-hour	1.5	1.9	22.6	26	—	1,300
	24-hour	0.4	0.64	2.6	3.4	105	365
CO	1-hour	117.9	26.7	4,000	4,141	23,000	40,000
	8-hour	9.2	7.2	1,698	1,711	10,000	10,000
PM_{10}	24-hour	~~5.3~~ 5.4	2.8	127	132	50	150
	Annual	~~0.5~~ 0.6	0.4	22.1	23	20	—
$PM_{2.5}$	24-hour[d]	~~5.3~~ 5.4	2.8	13.8	19	—	35
	Annual	~~0.5~~ 0.6	0.4	6.5	7.2	12	15

[a] SEP only.

[b] Background concentrations were the highest concentrations monitored during 2011--2013.

[c] The maximum 1-hour NO_2 concentration is modeled using AERMOD OLM, and the maximum annual NO_2 concentration uses the ambient ratio method (ARM) with the default NO_2 to NOx equilibrium ratio of 0.75.

[d] Total predicted concentrations for the federal 1-hour NO_2 standard and 24-hour $PM_{2.5}$ standard are the respective maximum modeled concentrations combined with the three-year average of 98th percentile background concentrations.

[e] Total predicted concentrations for the federal 1-hour SO_2 standard is the maximum modeled concentrations combined with the 3-year average of 99th percentile background concentrations.

Table 3.1-42R2. Comparison of Maximum Modeled Impacts and PSD Significant Impact Levels, SEP

Pollutant	Averaging Time	Significant Impact Level, µg/m^3	Maximum Modeled Concentrations for SEP, µg/m^3 [a]	Exceed Significant Impact Level?
NO_2	1-Hour	7.5[b]	~~101.6~~ 140.2[c]	Yes
	Annual	1	0.2	No
SO_2	1-Hour	7.8	2.9	No
	3-Hour	25	2	No
	24-Hour	5	0.4	No
	Annual	1	0.02	No
CO	1-Hour	2000	118	No
	8-Hour	500	9	No
PM_{10}	24-Hour	5	5	No
	Annual	1	~~0.5~~ 0.6	No
$PM_{2.5}$	24-Hour	1.2[d]	~~5.3~~ 5.4	Yes
	Annual	0.3[d]	~~0.50.5~~ 0.6	Yes

[a] Modeled concentrations have been rounded to the same number of significant figures as the SIL.

[b] EPA has not yet defined significance levels (SILs) for one-hour NO_2 and SO_2 impacts. However, EPA has suggested that, until SILs have been promulgated, interim values of 4 ppb (7.5 µg/m^3) for NO_2 and 3 ppb (7.8 µg/m^3) for SO_2 may be used (USEPA (2010b); USEPA (2010c)). These values will be used in this analysis as interim SILs.

[c] Concentration occurs during gas turbine startup; encompasses operation of the emergency diesel fire pump engine.

[d] While EPA sought and the U.S. Court of Appeals for the District of Columbia Circuit recently granted remand and vacatur of these SILs as they apply for purposes of avoiding a cumulative impacts analysis under federal PSD requirements (40 CFR § 51.166(k)(2) and § 52.21(k)(2)), EPA has retained these SILs for purposes of demonstrating whether a source locating in an attainment/unclassifiable area will be deemed to cause or contribute to a violation in a downwind nonattainment area. See Sierra Club v. EPA, No. 10-1413 (D.C. Cir. 2013), slip op. 9. Accordingly, application of these SILs for purposes of satisfying the District's requirement to ensure that the construction and operation of new or modified sources does not interfere with the attainment and maintenance of ambient air quality standard (MDAQMD Rule 1300) may be appropriate.