REGIONAL HAZE FOUR-FACTOR ANALYSIS ADDENDUM

OXY USA WTP Limited Partnership
Indian Basin Gas Plant

Prepared By:

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Oxy appends the Four-Factor Analysis for Indian Basin Gas Plant with the following information provided in this addendum. In Oxy's original Four-Factor Analysis report submitted on October 31, 2019, any unit from each facility which had NO_x or SO_2 emissions greater than 10 lb/hr and 5 tpy was analyzed. Below in blue and italicized are Oxy's responses to the NMED's letter dated December 23, 2019 for additional information on the 4FA submitted on November 1, 2019 to the NMED.

1. Sour Gas Amine Treating Units

a. Consider and discuss adding a secondary control to the acid gas injection (AGI) system to reduce flaring emissions, such as LO-CAT sulfur recovery technology. If technically feasible, include a four-factor analysis.

Oxy Response: The AGI system is a fully enclosed system, with no clear/viable way Oxy could add a new system such as LO-CAT technology. The Indian Basin Plant does have a Sulfur Recovery Unit that removes H_2S from the acid gas flow to create elemental sulfur. This unit has been shut down since the AGI well was installed and operational but was known to have very poor reliability. The installation of a LO-CAT system would be technically infeasible.

2. **Flaring:** Please provide the following information for the flare Units at the IBGP Unit ES-42 Startup, Shutdown & Maintenance (SSM) (NOX and SO2), ES-50-SSM (SO2):
   a. Provide a description of each flare, the design and type, and its purpose.
   b. List and describe the reasons that trigger each type of flaring event. This is to identify and clarify the causes to help find potential solutions to reduce flaring emissions.
   c. Complete a review and include an analysis about how the entire facility and/or source specific operations can be improved to reduce the frequency of SSM flaring events. If it is not possible to make any improvements to the facility or its processes to reduce SSM flaring events, then please explain why.
   d. Include a discussion of any potential alternative control options or operational changes that could reduce flaring NOX and/or SO2 emissions, including but not limited to,
      i. infrastructure that allows re-routing or recirculating the gas within the facility or outside of the facility until an SSM event is over;
      ii. sulfur absorbent technology used to remove sulfur from pipelines and other auxiliary equipment to reduce inlet or plant flaring SO2 emissions;
      iii. Gas Capture Plans with facilities located downstream and upstream similar to those required for producers to better synchronize upstream and downstream services with the IBGP;
      iv. use of remote capture equipment; and
      v. better infrastructure planning and changes to existing infrastructure that connects the downstream and upstream operations to the IBGP to ensure that there is adequate processing capacity to move produced gas to market.
   e. For any technically feasible solutions, complete and submit a four-factor analysis. For additional information regarding potential alternative controls to flaring see the New Mexico Methane Strategy webpage.

Oxy Response: The majority of SSM events are related to startup and shutdown of the Turbines at the Plant. The Plant has worked to implement Solar Turbotronics controls on the Solar Turbines at the Plant. These controls help to minimize downtime of the units and provide the units with a longer lifespan before they need to be overhauled. During SSM events, Oxy reduces emissions through work

practice standards and good air pollution control practices. The flares at the facility are permitted with the least amount of emissions due to the fact Oxy has already reduced flaring emissions as low as the plant can possibly operate with. The acid gas flare is only used during maintenance or an upset of the AGI well. There are no further ways to reduce emissions from the acid gas flare other than those stated in the original 4FA submittal on November 1, 2019.

As for the inlet residue flare, this flare has minimal emissions associated with it. This flare is only used during maintenance events and when the plant has a turnaround. There are no further ways to reduce emissions from this flare. When maintenance or turnaround events are scheduled, Oxy makes every effort to schedule these events along with downstream and upstream facilities. This will help to mitigate emissions further during these types of events.

The NMED also listed a "remote gas capture system" as an alternative to flaring but this technology would be technically infeasible for the facility. The remote gas capture system would have to be able to remove acid gas from the stream and be able to accommodate 200 MMSCFD of inlet gas. Oxy is also contractually obligated to meet certain natural gas specifications before the gas can be sent to downstream facilities. If these specifications are not met, the downstream facilities will not accept the gas. At this time, Oxy does not know of any system that is capable of handling this amount of gas and removing the acid gas from the stream.

Oxy has the infrastructure needed to accommodate the gas the facility processes. There are no further infrastructure changes that could mitigate SSM emissions further for the facility.

3. **Simple Cycle Natural Gas Fueled Turbines**

Please provide the following information for Four Factor Analyses for NOX from Simple Cycle Turbines Unit Numbers ES-06/07, EP-08/09, and ES-10/11:

a. Provide the Good Combustion Practices and the routine maintenance schedule and procedures that are currently used to help mitigate NOx emissions and are proposed as a feasible control.
Oxy Response: Oxy has a maintenance contract with Solar for routine maintenance. Solar provides field support and performs all needed maintenance on Oxy's Turbines. The maintenance procedures followed are the ones Solar provides for the facility turbines.

b. Provide vendor specifications for the SoLoNOX Dry Low NOx (DLN) combustion technology that includes the guaranteed NOX emission rates used in cost analysis, the cost information, recommendations, and equipment specifications for the turbine control estimates.
Oxy Response: The NOx emission rate guarantee is attached. The cost recommendation was based on a similar unit that was installed at the facility and the invoice log is provided. This cost is considered confidential business information and is being submitted as a separate document.

c. How will upgrading the turbine combustors with SoLoNOX affect the turbine capacities and the emission rates of NOX and CO?
Oxy Response: The NOx and CO for the units will be reduced but the turbine capacities will be increased and then derated to the permitted limit in order to not increase capacity for the unit.

d. Provide the documentation from the turbine vendor stating why water injection is not technically feasible for Solar Turbines.
Oxy Response: Per correspondence with Solar, the turbines were not designed for water injection. Solar does not offer this older technology on the turbines. The only technology provided in Solar technical data sheets is for dry low NOx. None of the data sheets provide information on wet NOx which would be associated with water injection.

e. Provide the basis for the following statement; "communication with Solar has indicated that SCR *[selective catalytic reduction]* controls are available for each of the turbine models assessed here

but the facility engineers have determined the additional power demands required to install SCR controls on the turbines are infeasible". Is the increase in power demand not technically feasible or too costly? If this determination is based on cost, then a cost analysis that includes the increase in energy demand, must be provided.

Oxy Response: The increase in power is not technically feasible. There is no extra power at the facility to operate the SCR equipment. Oxy believes the major modification that would need to be completed in order to add a substation and add the control is outside the scope of this analysis. A full engineering redesign of the facility would need to take place to determine if a new substation and the SCR controls could be added to the facility. This engineering redesign would take months to determine the cost needed to modify the facility and if the redesign is even feasible. Oxy believes this redesign cost would be more expensive than the SoloNOx cost estimate that was provided since the addition of the SoloNOx would not require a redesign of the facility.

f. Consider and include a discussion on the feasibility and cost of load management including limited operating hours to reduce emissions.

Oxy Response: Oxy has contracts in place that require the current loads and hours permitted for the units. This is not an option for the units at the site.

g. Provide the electronic spreadsheets used for control technology cost calculations.

Oxy Response: These have been attached to the documents.

h. Please include a discussion of the following control options to reduce NO_X emissions:

   i. catalytic combustion such as a XONON^{TM} developed by Catalytic Combustion Systems, Incorporated (CESI);

   Oxy Response: This control option was not provided by Oxy as an option to control the turbines at the site. When completing an RBLC search over the last ten years, XONON has not been installed on turbines. The most notable control was a dry low NOx burner which Oxy discussed in the original submittal. Oxy has historically had issues with Solar turbines that were operated with different equipment that was not from Solar. There were more instances of downtime and overhauls had to be completed more often.

   ii. lean and staged (DLN) combustors from turbine manufacturers other than Solar and complete a Four-Factor analysis on technically feasible options. That Solar does not manufacturer a particular control method or turbine combustor is not grounds for eliminating an option for technical reasons.

   Oxy Response: SoloNOx is a dry low NOx combustor manufactured by Solar. Therefore, this method was discussed in the original 4FA submittal and will not be provided further in this document. Please note that adding aftermarket combustors to the turbines would void the warranty Oxy has with Solar. There would be no reason to install aftermarket controls when Solar manufactures controls specifically designed for the Solar Turbines.

APPENDIX A: SUPPORTING INFORMATION

Solar Turbines
A Caterpillar Company

PREDICTED EMISSION PERFORMANCE

Customer	Engine Model: CENTAUR 40-4700S CS/MD 59F MATCH
Job ID	
Inquiry Number	Fuel Type: SD NATURAL GAS; Water Injection: NO
Run By: David A Pocengal; Date Run: 1-Jun-16	Engine Emissions Data: REV. 0.1

	NOx EMISSIONS	CO EMISSIONS	UHC EMISSIONS
1 — 5151 HP — 100.0% Load — Elev. 0 ft — Rel. Humidity 60.0% — Temperature 0 Deg. F			
PPMvd at 15% O2	42.00	50.00	25.00
ton/yr	34.55	25.04	7.17
lbm/MMBtu (Fuel LHV)	0.168	0.122	0.035
lbm/(MW-hr)	2.05	1.49	0.43
(gas turbine shaft pwr) lbm/hr	7.89	5.72	1.64
2 — 5025 HP — 100.0% Load — Elev. 0 ft — Rel. Humidity 60.0% — Temperature 20.0 Deg. F			
PPMvd at 15% O2	42.00	50.00	25.00
ton/yr	33.66	24.40	6.99
lbm/MMBtu (Fuel LHV)	0.168	0.122	0.035
lbm/(MW-hr)	2.05	1.49	0.43
(gas turbine shaft pwr) lbm/hr	7.69	5.57	1.60
3 — 4678 HP — 100.0% Load — Elev. 0 ft — Rel. Humidity 60.0% — Temperature 59.0 Deg. F			
PPMvd at 15% O2	42.00	50.00	25.00
ton/yr	31.30	22.69	6.50
lbm/MMBtu (Fuel LHV)	0.167	0.121	0.035
lbm/(MW-hr)	2.05	1.48	0.43
(gas turbine shaft pwr) lbm/hr	7.15	5.18	1.48

Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
2. Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F or -20 deg C, and between 50% and 100% load for gas, fuel, and between 65% and 100% load for liquid fuel (except f or the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F or -20 deg C and betwee
3. Fuel must meet Solar standard fuel specification ES 9-98. Emissions are based on the attached fuel composition, or, San Diego natural gas or equivalent.
4. If needed, Solar can provide Product Information Letters to address turbine operation outside typical warranty ranges, as well as non-warranted emissions of SO2, PM10/2.5, VOC, and formaldehyde.
5. Solar can provide factory testing in San Diego to ensure the actual unit(s) meet the above values within the tolerances quoted. Pricing and schedule impact will be provided upon request.
6. Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Solar Turbines
A Caterpillar Company

PREDICTED EMISSION PERFORMANCE

Customer	Engine Model: CENTAUR 40-4700S CS/MD 59F MATCH
Job ID	
Inquiry Number	Fuel Type: SD NATURAL GAS; Water Injection: NO
Run By: David A Pocengal; Date Run: 1-Jun-16	Engine Emissions Data: REV. 0.1

	NOx EMISSIONS	CO EMISSIONS	UHC EMISSIONS
4 — 4008 HP — 100.0% Load — Elev. 0 ft — Rel. Humidity 60.0% — Temperature 85.0 Deg. F			
PPMvd at 15% O2	42.00	50.00	25.00
ton/yr	27.83	20.17	5.78
lbm/MMBtu (Fuel LHV)	0.166	0.120	0.034
lbm/(MW-hr)	2.13	1.54	0.44
(gas turbine shaft pwr) lbm/hr	6.35	4.60	1.32

Notes

1. For short-term emission limits such as lbs/hr., Solar recommends using "worst case" anticipated operating conditions specific to the application and the site conditions. Worst case for one pollutant is not necessarily the same for another.
2. Solar's typical SoLoNOx warranty, for ppm values, is available for greater than 0 deg F or -20 deg C, and between 50% and 100% load for gas, fuel, and between 65% and 100% load for liquid fuel (except f or the Centaur 40). An emission warranty for non-SoLoNOx equipment is available for greater than 0 deg F or -20 deg C and betwee
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6. Any emissions warranty is applicable only for steady-state conditions and does not apply during start-up, shut-down, malfunction, or transient event.

Solar Turbines
A Caterpillar Company

PREDICTED ENGINE PERFORMANCE

Customer	Model: CENTAUR 40-4700S
Job ID	Package Type: CS/MD
Run By: David A Pocengal — Date Run: 1-Jun-16	Match: 59F MATCH
Engine Performance Code: REV. 4.17.1.19.11 — Engine Performance Data: REV. 2.3	Fuel System: GAS
	Fuel Type: SD NATURAL GAS

DATA FOR NOMINAL PERFORMANCE

Elevation	feet	0
Inlet Loss	in H2O	0
Exhaust Loss	in H2O	0
Accessory on GP Shaft	HP	15.5

		1	2	3	4
Engine Inlet Temperature	deg F	0	20.0	59.0	85.0
Relative Humidity	%	60.0	60.0	60.0	60.0
Driven Equipment Speed	RPM	15500	15500	15500	15500
Specified Load	HP	FULL	FULL	FULL	FULL
Net Output Power	HP	5151	5025	4678	4008
Fuel Flow	mmBtu/hr	46.85	45.68	42.69	38.30
Heat Rate	Btu/HP-hr	9095	9091	9125	9557
Therm Eff	%	27.977	27.987	27.884	26.624
Engine Exhaust Flow	lbm/hr	166631	161458	150273	137230
PT Exit Temperature	deg F	774	793	835	855
Exhaust Temperature	deg F	774	793	835	855

Fuel Gas Composition (Volume Percent)

Methane (CH4)	92.79
Ethane (C2H6)	4.16
Propane (C3H8)	0.84
N-Butane (C4H10)	0.18
N-Pentane (C5H12)	0.04
Hexane (C6H14)	0.04
Carbon Dioxide (CO2)	0.44
Hydrogen Sulfide (H2S)	0.0001
Nitrogen (N2)	1.51

Fuel Gas Properties

LHV (Btu/Scf)	939.2	Specific Gravity	0.5970	Wobbe Index at 60F	1215.6

This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.

APPENDIX B: CONFIDENTIAL BUSINESS INFORMATION

This information will be provided to the NMED separately as it is classified as confidential business information (CBI).