Docket Number:	07-AFC-06C				
Project Title:	Carlsbad Energy Center - Compliance				
TN #:	202627				
Document Title:	Supplemental Information Re: Project Owner's Application for Authority to Construct				
Description:	6/27/14				
Filer:	Dee Hutchinson				
Organization:	Locke Lord LLP				
Submitter Role:	Applicant Representative				
Submission Date:	6/27/2014 3:42:30 PM				
Docketed Date:	6/27/2014				



500 Capitol Mall, Suite 1800 Sacramento, CA 95814 Telephone: 916-930-2500 Fax: 916-930-2501 www.lockelord.com

John A. McKinsey Direct Telephone: 916-930-2527 Direct Fax: 916-720-0443 jmckinsey@lockelord.com

June 27, 2014

VIA E-FILING AND HAND-DELIVERY

Carlsbad Energy Center Project Petition to Amend (07-AFC-06C)
Mike Monasmith, Staff Project Manager
California Energy Commission
1516 Ninth Street, MS-2000
Sacramento, CA 95814-5512

Re: Carlsbad Energy Center Project Petition to Amend (07-AFC-06C)

Supplemental Information Regarding Project Owner's Application for Authority to Construct

Dear Mr. Monasmith:

Carlsbad Energy Center LLC's ("**Project Owner**") representative provided the enclosed letter and compact disk containing modeling data to the San Diego County Air Pollution Control District (the "**Air District**") yesterday. These items contain supplemental information requested by the Air District on May 29, 2014, in relation to Project Owner's application for Authority to Construct the amended Carlsbad Energy Center Project (07-AFC-06C) ("**CECP**"), as proposed to the California Energy Commission in TN Nos. 202287-1, 202287-2 and 202287-3. Due to the sizes and configurations of the enclosed modeling files, Project Owner has provided this information on compact disk. Please contact me or Tom Andrews at Sierra Research if there are questions.

Locke Lord LLP

Bv:

John A. McKinsey

Attorneys for Carlsbad Energy Center LLC

JAM: awph

Enclosures (compact disks to be hand-delivered)

June 26, 2014

sierra research

1801 J Street Sacramento, CA 95811 Tel: (916) 444-6666 Fax: (916) 444-8373

Ann Arbor, MI Tel: (734) 761-6666 Fax: (734) 761-6755

Steven Moore Senior Air Pollution Control Engineer San Diego County Air Pollution Control District 10124 Old Grove Road San Diego, CA 92131

Subject: ATC Application for Amended CECP

Dear Mr. Moore:

On behalf of Carlsbad Energy Center LLC, Sierra Research is pleased to submit the following responses to the information requested in Section A of the SDAPCD's May 29, 2014 letter regarding the Authority to Construct (ATC) application package for the Amended Carlsbad Energy Center Project (CECP).

<u>Request 1</u>: For Table 5.1B2, turbine operating parameters for 50% load and at sync-idle load (a fuel heat input rate of approximately 129 MMBtu, higher heating value) such as those already provided for 100% and 25% load.

Response: The LMS 100 GE gas turbine performance runs for the 50% load and syncidle load are provided in Attachment 1.

Request 2: A detailed description of the reverse osmosis and polishing demineralization processes, including the types of equipment to be used and key operating parameters necessary to determine their performance, and the design basis for the removal efficiency of total dissolved solids and arsenic, cadmium, hexavalent chromium, copper, manganese, mercury, selenium, nickel, lead, sulfates, and fluorides from the input reclaimed and sea water streams. The analysis must include the expected concentrations of total dissolved solids and arsenic, cadmium, hexavalent chromium, copper, manganese, mercury, selenium, nickel, lead, sulfates, and fluorides for the inlet reclaimed and sea water and supporting documentation for these inlet concentrations; the expected concentrations of the inlet species in the reverse osmosis product water; the expected concentrations of the inlet species in the polishing demineralization product water; any regulatory limits on the inlet concentrations in the inlet water supply; and any vendor or other specification for the concentrations of contaminants in the combustion turbine injection water.

Response: The detailed description of the reverse osmosis and polishing demineralization processes proposed for the Amended CECP is included in Attachment 2. The analysis of the expected concentrations of total dissolved solids and metals in the inlet reclaimed water and sea water and the controlled concentrations prior

to use by the gas turbines is included in Attachment 3. This analysis also shows that the controlled concentrations will meet the GE specifications.

Request 3: The detailed supporting calculations for the baseline emissions in Tables 5.1B-7-1 through 5.1B-7-7 for the EPS Unit Nos. 1–5 and the peaking combustion turbine, including the minute-by-minute continuous emission monitoring system (CEMS) data for operating time, NOx emissions, and fuel flow data for each unit, as applicable, in Excel spreadsheet or other electronic spreadsheet format acceptable by the District.

Response: The Excel spreadsheet with the detailed baseline emission calculations (including CEMS data) for EPS Units 1-5 and the peaking combustion turbine is included in the enclosed compact disc.

<u>Request 4</u>: Documentation such as the vendor guarantees, source tests, or any other information supporting the proposed 3.5 pound per hour particulate matter emission level proposed as BACT for the gas turbine engines including, but not limited to, any limitations on achieving such an emission level, such as air inlet filter cleaning requirements and water quality for the combustion turbine water injection.

Response: Please see the GE performance runs for the LMS 100 gas turbines provided in the ATC application package for this project (ATC application package, Appendix 5.1B, Table 5.1B-2) that show the 3.5 lbs/hr PM₁₀ emission level. GE is now treating its performance runs as equivalent to the letters it previously issued regarding expected emission levels for a given make/model machine.

<u>Request 5</u>: Minimum operating temperature for ammonia injection for the selective catalytic reduction (SCR) catalyst.

Response: According to GE, the minimum ammonia injection temperature for the SCR catalyst is approximately 540 °F.

<u>Request 6</u>: The maximum continuous and maximum intermittent operating temperature that the SCR catalyst can sustain without incurring significant damage to the catalyst.

Response: According to GE, the maximum continuous SCR catalyst operating temperature without incurring significant damage is approximately 870 °F and the maximum intermittent operating temperature without incurring significant damage is approximately 932 °F.

<u>Request 7</u>: The following additional modeling scenarios to ensure that the potential worst-case emission air quality impacts have been identified:

a. For PM_{10} and $PM_{2.5}$, 24-hour impacts for operation at 50% load and at sync-idle load

Response: Included in Attachment 4 is a summary of the screening level results for the previous air quality modeling done for the Amended CECP. This summary also includes the screening level results for the 50% load and sync-idle load cases for the new gas turbines. As shown by this summary, the maximum $PM_{10}/PM_{2.5}$ 24-hour impacts for the 50%

operating load cases are lower than the maximum operating case (i.e., hot ambient, 25% load, see ATC Application Package, Table 5.1E-3) previously modeled for the Project. Therefore, there is no need to perform any further 24-hour $PM_{10}/PM_{2.5}$ modeling for the 50% load case.

As shown in Attachment 4, the sync-idle load screening level PM₁₀/PM_{2.5} 24-hour impacts are higher than the maximum operating case previously modeled. Therefore, a revised PM₁₀/PM_{2.5} 24-hour refined modeling analysis was performed for the commissioning phase for the new gas turbines (only period with prolonged sync-idle operation). As with the previous commissioning phase modeling performed for the Project, the analysis assumes all six new gas turbines are undergoing commissioning simultaneously with the existing Units 1-5 and the peaker gas turbine also operating. While it would be very unlikely that all six new units would be operating in the sync-idle load simultaneously, this analysis accounts for this event. As shown in Attachment 5, the revised commissioning modeling results do not change the conclusion reached for the previous modeling analysis—during commissioning activities, the results indicate that the Amended CECP will not cause or contribute to violations of state or federal air quality standards, with the exception of the annual state PM₁₀/PM_{2.5} standards and annual federal PM_{2.5} standard (existing background concentrations already exceed state/federal standards). The detailed modeling files are included in the enclosed compact disc.

b. For NO₂ and CO, 1-hour impacts for operation at sync-idle load

Response: Included in Attachment 4 is a summary of the screening level modeling results for the previous modeling done for the Amended CECP, including the impacts for the 50% load and sync-idle load cases. As shown by this summary, the maximum 1-hour NO₂ and CO impacts for the 50% operating load and the sync-idle load cases are lower than the maximum operating case (i.e., commissioning impacts) previously modeled for this project. Therefore, there is no need to perform any further NO₂ and/or CO 1-hour modeling for the 50% load and/or sync-idle cases.

c. Maximum acute toxic impacts, from shoreline fumigation

Response: Included in Attachment 6 are the maximum acute toxic impact results based on fumigation and shoreline fumigation for normal operation, startups/shutdowns, and commissioning. As shown by these results, the maximum acute impacts are below the SDAPCD significant threshold. The detailed modeling files are included in the enclosed compact disc.

<u>Request 8</u>: The following additional data for the proposed fire-pump engine and emergency engine:

a. Proposed model year and EPA family for each proposed engine with certified emission rates for each family

Response: The emergency fire-pump and generator engine vendor specification sheets were include in the ATC application package, Appendix 5.1B, Tables 5.1B-9 and 5.1B-10, respectively. As shown on Table 5.1B-9, the emergency fire-pump engine specifications were for a 2013 model year engine, EPA engine family DJDXL09.0114. While not shown on the vendor specification sheet provided for the emergency generator engine, this engine is also a 2013 model year engine, EPA engine family EXCPXL15.2HZA. With regards to certified emission rates for each EPA engine family, the most current EPA certified emission rates for the make/model emergency engines proposed for the Amended CECP are summarized in Attachment 7. While 2013 engine model year emission factors were used in the ATC application package, the EPA certified emission factors shown in Attachment 7 are for 2014 model year engines. It should be noted that depending on the time required for the District and CEC to approve this application, 2014 model engines may no longer available when the project is approved. In that event, the applicant will use comparable newer model engines, and will notify the District and CEC appropriately.

b. Information, including any relevant local, state, or federal laws, ordinances and regulations or other operational limitations, that [provides] support for the assumption of 50% load during engine testing along with use of 100% load emission factors for calculating potential to emit.

Response: The emergency fire-pump/generator engine emission estimates provided in the ATC application package were associated with the periodic operation of these engines for routine testing/maintenance purposes. During these routine tests, the engines will be operated at low load (50% load or less). Therefore, the emission calculations in the ATC application package assume that the engines would be operated at 50% load for one hour per day periodically during the year. The annual emission calculations in the ATC application package assumed that the engines are operated at 50% load for 200 hours of operation per year (the maximum allowed for emergency engines under the CARB ATCM, NSPS Subpart IIII, Rule 69.4, and Rule 69.4.1). These emission calculations were done using the 100% load emission factors provided on the vendor specification sheets.

It is our understanding that the District would like these calculations revised using the emission factors based on EPA certification test results. It is also our understanding that the District would like the annual emission estimates for both a 50 operating hour case (maximum allowed for testing/maintenance under CARB ATCM/NSPS Subpart IIII for emergency engines) and a 200 operating hour case (maximum allowed for all modes of operation including emergency operation under CARB ATCM, NSPS Subpart IIII, Rule 69.4, and Rule 69.4.1 for emergency engines). The revised daily and annual emission estimates are provided in Attachment 8.

c. Breakdown of the 200 operating hours per year per engine based on whether the operation is defined as emergency or non-emergency use under each applicable rule including District rules 69.4 and 69.4.1, the ATCM for Stationary Diesel Compression Ignition Engines (17 CCR 93115), and NSPS subpart IIII, and whether the required amount of nonemergency operation will classify either engine as non-emergency under each respective rule

Response: The 200 operating hours per year per engine analyzed in the ATC permit application package are the total operating hours per engine for all modes of operation including testing/maintenance and emergency operation. The non-emergency engine operation will be limited to 50 hours per year per engine. The limits of 50 hours/200 hours per year are allowed under CARB ATCM, NSPS Subpart IIII, and District rules 69.4 and 69.4.1 for emergency engines.

d. Rule analyses for the State Air Toxic Control Measure (ATCM) for Stationary Compression Ignition Engines (17 CCR 93115)

Response: As discussed above, the proposed fire-pump and generator engines qualify as emergency engines under the CARB ATCM. Outlined below is a summary of the applicable requirements under the CARB ATCM and compliance with respect to each requirement.

- Emission standard for new generator engine (§ 93115.6.a.3.A.1.b)
 ...certified to new nonroad CI engine emission standards for 2007 and later model year engines as specified under CFR Part 60, Subpart IIII. [Response: As discussed above, the proposed engine will be certified to current 2014 model year EPA Tier 4i nonroad CI engine requirements. This complies with the applicable CFR Part 60, Subpart IIII requirements for emergency engines.]
- Emission standard for new firepump engine (§ 93115.6.a.4.A.1.b) ...meet the new firepump engine certification requirements/emission standards required by CFR Part 60, Subpart IIII, §60.4202(d). [Response: As discussed above, the proposed engine will be certified to EPA Tier 3 nonroad CI engine requirements. This complies with the applicable CFR Part 60, Subpart IIII, §60.4202(d) requirements.]
- Operating limit for new generator engine (§ 93115.6.a.3.A.1.c) ...not operate more than 50 hours per year for maintenance and testing purposes. [*Response*: As discussed above, the engine will not be operated for more than 50 hours per year for testing/maintenance purposes.]
- Operating limit for new firepump engine (§ 93115.6.a.4.A.1.c) –
 ...not operate more than the number of hours necessary to comply
 with the testing requirements of the National Fire Protection
 Association (NFPA) 25 "Standard for the Inspection, Testing,

and Maintenance of Water-Based Fire Protection Systems." [Response: The NFPA 25 regulations (Section 8.3.2) require a weekly test of the firepump engine operation. The proposed firepump engine testing of 50 hours per year used in the ATC application package does not exceed this requirement.]

e. If the potential to emit for NOx, VOC, SOx, or PM₁₀ during nonemergency operation, including maintenance and testing exceeds 10 lb/day for either engine, a BACT analysis must be submitted for that engine, including analysis of alternative technologies such as natural gas fired engines.

Response: As shown in the ATC application package, Appendix 5.1B, Table 5.1B-13 and in the revised emission estimates in Attachment 8, the daily emissions for engine testing are below 10 lbs/day for each engine for each pollutant.

<u>Request 9</u>: Comparison of thermal efficiencies for similar available simple cycle combustion turbine engines to justify the claim that the proposed simple cycle combustion turbines have the highest thermal efficiency of all available turbines. The comparison should include both maximum thermal efficiency, and thermal efficiency at expected typical operating conditions.

Response: The summary of the heat rates for the similar available simple cycle combustion turbines are shown in Attachment 9. As shown by this summary, the heat rate for the LMS 100 units proposed for the Amended CECP is at the lower end of these heat rates. This supports the claim that the proposed units have the highest thermal efficiency of the available simple cycle machines.

If you have any questions or need any additional information, please do not hesitate to contact me at 916-273-5139.

Sincerely,

Yom Andrews Principal Engineer

Attachments

ATTACHMENT 1 GE GAS TURBINE PERFORMANCE RUNS



Performance By: Kessler, Daniel Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 8k1.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btu/lb,LHV

Fue	: Site Gas	Fuel#900-4103, 20598 Btu/lb,LHV Version: 3.9.8
S #	400	
Case #	106	
Ambient Conditions	00.0	
Dry Bulb, °F	60.3	
Wet Bulb, °F	56.4	
RH, %	79.1	
Altitude, ft	20.9	
Ambient Pressure, psia	14.685	
Engine Inlet		
Comp Inlet Temp, °F	60.3	
RH, %	79.1	
Conditioning	NONE	
Tons(Chilling) or kBtu/hr(Heating)	0	
Pressure Losses		
Inlet Loss, inH20	3.40	
Exhaust Loss, inH20	5.90	
Partload %	50	
kW, Gen Terms	54420	
Est. Btu/kW-hr, LHV	9436	
Guar. Btu/kW-hr, LHV	<i>5</i> 430	
stantin, bit	_	
Fuel Flow		
MMBtu/hr, LHV	513.5	
lb/hr	24930	
10/111	24000	
Fuel Flow (Margined)		
MMBtu/hr, LHV	526.3	
MMBtu/hr, HHV	583.5	
lb/hr	25553	
107111	20000	
NOx Control	Water	
	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Water Injection		
lb/hr	10705	
Temperature, °F	100.0	
remperature, r	100.0	
	Dry Fin	
Intercooler	Fan	
Humidification	OFF	
IC Heat Extraction, btu/s	16182	
KOD Water Extraction, lb/s	0.0	
KOD Water Extraction, ib/s	0.0	
Exhaust Parameters		
	800.0	
Temperature, °F		
lb/sec	348.3	
lb/hr	1253895	1
Energy, Btu/s- Ref 0 °R	112187	
Cp, Btu/lb-R	0.2723	
Estimated Maximum Emissions		aust) *
NOx ppmvd Ref 15% O2	25	
NOx as NO2, lb/hr	53	
CO ppmvd Ref 15% O2	113	
CO, lb/hr	147	
VOC, ppmvd Ref 15% O2	2.0	
VOC, lb/hr	1.49	
PM-10, lb/hr	3.5	
e.		
* Gas Fuel Sulfur contents of <	/+ 0.25 gra	ins/100 scf
Estimated Maximum Emissions	(at Stack) *	*
NOx ppmvd Ref 15% O2	2.5	
INIO NIOO ILIL-		
NOx as NO2, lb/hr	5.3	
CO ppmvd Ref 15% O2	5.3 4.0	
CO ppmvd Ref 15% O2 CO, lb/hr	5.3 4.0 5.2	
CO ppmvd Ref 15% O2	5.3 4.0	
CO ppmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2	5.3 4.0 5.2 2.0	
CO ppmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2 VOC, lb/hr	5.3 4.0 5.2 2.0 1.5	
CO ppmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2 VOC, lb/hr NH3, ppmvd Ref 15% O2	5.3 4.0 5.2 2.0 1.5 5.0	
CO ppmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2 VOC, lb/hr NH3, ppmvd Ref 15% O2 NH3, lb/hr	5.3 4.0 5.2 2.0 1.5 5.0 4.0	
CO ppmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2 VOC, lb/hr NH3, ppmvd Ref 15% O2	5.3 4.0 5.2 2.0 1.5 5.0	
CO pmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2 VOC, lb/hr NH3, ppmvd Ref 15% O2 NH3, lb/hr PM-10, lb/hr	5.3 4.0 5.2 2.0 1.5 5.0 4.0 3.5	ins/100 scf
CO ppmvd Ref 15% O2 CO, lb/hr VOC, ppmvd Ref 15% O2 VOC, lb/hr NH3, ppmvd Ref 15% O2 NH3, lb/hr	5.3 4.0 5.2 2.0 1.5 5.0 4.0 3.5	ins/100 scf



Performance By: Kessler, Daniel Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 8k1.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btu/lb,LHV

Case #	10	6	
Exh Wght % Wet (NOT FOR USE	IN ENVIRONM	ENTAL PERMITS) (GT Exhaust)
AR	1.240	5	
N2	72.758	6	
O2	14.706	3	
CO2	5.355	6	
H20	5.934	6	
SO2	0.000	0	
co	0.001	5	
HC	0.000	1	
NOX	0.002	8	
Exh Mole % Dry (NOT FOR USE I			T Exhaust)
AR	0.967		
N2	80.917		
02	14.319		
CO2	3.791		
H20	0.000		
SO2	0.000	0	
CO	0.001	6	
HC	0.000	3	
NOX	0.002	8	
Exh Mole % Wet (NOT FOR USE			GT Exhaust)
AR	0.877		
N2	73.385		
02	12.986	2	
CO2	3.438	5	
H20	9.308	D	
SO2	0.000	0	
co	0.001	5	
HC	0.000	2	
NOX	0.002	5	
Aero Energy Fuel Number	900-4103 (Ste	ve Rose Sample 59F)
	Volume %	Weight %	
Hydrogen	0.0000	0.0000	
Methane	95.8700	91.1296	
Ethane	1.8080	3.2212	
Ethylene	0.0000	0.0000	
Propane	0.3360	0.8779	
Propylene	0.0000	0.0000	
Butane	0.1220	0.4201	
Butylene	0.0000		
Butadiene	0.0000	0.0000	
Pentane	0.0430	0.1838	
Cyclopentane	0.0000	0.0000	
Hexane	0.0260	0.1328	
Heptane	0.0000	0.0000	
Carbon Monoxide	0.0000	0.0000	
Carbon Dioxide	1,1130	2.9025	
Nitrogen	0.6820	1.1321	
Water Vapor	0.0000	0.0000	
Oxygen	0.0000	0.0000	
Hydrogen Sulfide	0.0000	0.0000	
Ammonia	0.0000	0.0000	
rainiving.	0.0000	5.0000	
Btu/lb, LHV	20598		
Btu/scf, LHV	918.4		
Btw/scf, HHV	1018.2		
Btu/lb, HHV	22836		
Fuel Temp, °F	59.0		
NOx Scalar	0.978		
Specific Gravity Wobbe	0.58		
	52.834		



Performance By: Vu, Christopher Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 8k1.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btu/lb,LHV

		SPECIFICATION CONTINUES CONTINUES	
Case #	305		
Ambient Conditions	505		
Dry Bulb, °F	44.5		
Wet Bulb, °F	42.6		
RH, %	86.1		
Altitude, ft	20.9		
Ambient Pressure, psia	14.685		
Ambient Pressure, psia	14.000		
Florida (UIV)			
Engine Inlet	44.5		
Comp Inlet Temp, °F			
RH, %	86.1 NONE		
Conditioning	0		
Tons(Chilling) or kBtu/hr(Heating)	U		
Pressure Losses			
Inlet Loss, inH20	5.00		
Exhaust Loss, inH20	10.00		
Partioad %	50		
kW, Gen Terms	53835		
Est. Btu/kW-hr, LHV	9504		
Guar. Btu/kW-hr, LHV	9304		
Guar. Blu/kw-fir, LHV	_		
Fuel Flow			
MMBtu/hr, LHV	511.6		
lb/hr	24840		
10/111	24640		
Fuel Flow (Margined)			
MMBtu/hr, LHV	524.4		
MMBtu/hr, HHV	581.4		
lb/hr	25461		
IDMI	23401		 8
NOx Control	Water		
Water Intention			
Water Injection lb/hr	11423		
	100.0		
Temperature, °F	100.0		
	But Fin		
	Dry Fin		
Intercooler	Fan		
Humidification	OFF		
IC Heat Extraction, btu/s	14391		
KOD Water Extraction, lb/s	0.0		
Futures Boundaries			
Exhaust Parameters Temperature, °F	800.5		
lb/sec	348.9		
lb/hr	1256096		
	1256096		
Energy, Btu/s- Ref 0 °R			
Cp, Btu/lb-R	0.2716		
Estimated Maximum Emissions	(at GT Exhauet) *		
NOx ppmvd Ref 15% O2	25		
NOx as NO2, lb/hr	53		
CO ppmvd Ref 15% O2	113		
CO, lb/hr	146		
VOC, ppmvd Ref 15% O2	2.0		
VOC, lb/hr	1.48		
PM-10, lb/hr	3.5		
1 111 1 3, 12111	0.0		
* Gas Fuel Sulfur contents of <	/+ 0.25 grains/ 100 scf		
Estimated Maximum Emissions	(at Stack) *		
NOx ppmvd Ref 15% O2	2.5		
NOx as NO2, lb/hr	5.3		
CO ppmvd Ref 15% O2	4.0		
CO, lb/hr	5.2		
VOC, ppmvd Ref 15% O2	2.0		
VOC, pplilvd Rei 15% 02 VOC, lb/hr	1.5		
NH3, ppmvd Ref 15% O2	5.0		
NH3, lb/hr	3.9		
PM-10, lb/hr	3.5		
15, 10/11	5.5		
* Gas Fuel Sulfur contents of <	/+ 0 25 grains/100 sef		
Sas i dei odinai comenta di	oreo gramar 100 au		



Performance By: Vu, Christopher Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 8k1.scp
Generator: BDAX 8-2-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btu/lb,LHV

	uel: Site Gas Fue	I#900-4103, 20598 Btu/lb,LHV	
Case #	305	5	
Exh Wght % Wet (NOT FOR U	SE IN ENVIRONM	ENTAL PERMITS) (GT Exhaust)	
AR	1.2442	2	
N2	72.9754	4	
O2	14.8133	3	
CO2	5.3274	4	
H20	5.6353		
SO2	0.0000		
co	0.0014		
HC	0.0001		
NOX	0.0028		
Evb Mole % Dor (NOT FOR US	E IN ENVIRONME	ENTAL PERMITS) (GT Exhaust)	
AR	0.9672		
N2	80.8931		
02	14.3760		
CO2	3.7591		
H20	0.0000		
SO2	0.0000		
CO	0.0016		
HC	0.0003		
NOX	0.0028		
NOX	0.0026		
		ENTAL PERMITS) (GT Exhaust)	
AR	0.8815		
N2	73.7310		
O2	13.1032	2	
CO2	3.4263	3	
H20	8.8538	3	
SO2	0.0000	0	
co	0.0014	4	
HC	0.0002	2	
NOX	0.0025	5	
Aero Energy Fuel Number		eve Rose Sample 59F)	
-	Volume %	Weight %	
Hydrogen	Volume % 0.0000	Weight % 0.0000	
Hydrogen Methane	Volume % 0.0000 95.8700	Weight % 0.000 91.1296	
Hydrogen Methane Ethane	Volume % 0.0000 95.8700 1.8080	Weight % 0.0000 91.1296 3.2212	
Hydrogen Methane Ethane Ethylene	Volume % 0.0000 95.8700 1.8080 0.0000	Weight % 0.0000 91.1296 3.2212 0.00000	
Hydrogen Methane Ethane Ethylene Propane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779	
Hydrogen Methane Ethane Ethylene Propane Propylene	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201	
Hydrogen Methane Ethane Ethylene Propylene Propylene Butane Butylene	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000	Weight %	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430	Weight % 0.000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.0000 0.1838	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430 0.0000	Weight % 0.000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0888 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0430 0.0000 0.0260	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1838 0.0000 0.1328	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butylene Butadiene Pentane Cyclopentane Hexane Heptane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.0000 0.1838 0.0000 0.1328 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 1.1130 0.0000 1.1130	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 0.1328 0.0000 0.1328 1.1321	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor	Volume '%, 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0266 0.0000 0.0066 0.0000 0.0066 0.0000 0.0000 0.0620 0.0000 0.0620 0.0000 0.0620 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butaliene Pentane Cyclopentane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen	Volume '% 0.000 0.55,8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0000 0.0000 0.0430 0.0000 0.0280 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 0.1328 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0280 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butaliene Pentane Cyclopentane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen	Volume '% 0.000 0.55,8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0000 0.0000 0.0430 0.0000 0.0280 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 0.1328 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0280 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0280 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV	Volume '%, 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.00	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butalene Ethylene Butane Cyclopentane Hexane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butylene Butylene Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV Btu/scf, LHV Btu/scf, LHV	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV Btu/scf, LHV	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0000 0.0000 0.0280 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butalene Butalene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/lscf, LHV Btu/lscf, LHV Btu/lscf, HHV Btu/lb, HHV Btu/lb, HHV	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0430 0.0000 0.0280 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	
Hydrogen Methane Ethane Ethylene Propane Propylene Butlane Butylene Butalene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/lscf, LHV Bt	Volume '%, 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.00	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	





Performance By: Vu, Christopher Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 8k1.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btu/lb,LHV

Ambient Conditions Opto Bulb, F 96.0		
207 Bulb, "F 986 14 98 986 14 98 986 98 98 98 98 98 9	Case #	406
Vet Bulb.		
No.	Dry Bulb, °F	96.0
Alkitude, ft 20.3 Ambient Pressure, psia 14.68t Engine Inlet 96.0 Comp Inlet Temp, °F 96.0 None 30.0 Conditioning NONE Conditioning NONE Considering NONE Pressure Losses 10.00 net Loss, inH20 5.00 Partload % 5 Stant But/RW-hr, LHV 10018 Buar, Btu/RW-hr, LHV 10019 Buar, Btu/RW-hr, LHV 472.9 Stell Flow (Margined) 4MBtu/hr, LHV MMBtu/hr, LHV 484.4 MMBtu/hr, LHV 484.4 Sohr 23523 4Ox Control Wate Vater Injection 965 Sohr 965 Long Control Wate Vater Injection 965 Cohr Pop Intercooler Fa turnidification OF Cohart Fa turnidification OF Cohar	Wet Bulb, °F	74.1
Ambient Pressure, psia		36.0
Engine Inlet Comp Inlet Temp, °F		
Comp Inlet Temp, °F 96.8	Ambient Pressure, psia	14.685
Comp Inlet Temp, °F 96.8	Engine Inlet	
No. Section		00.0
Conditioning		
Pressure Losses		
Pressure Losses nlet Loss, inH20		0
nlet Loss, inH20	rons(chilling) of kbtu/in(Heating)	U
nlet Loss, inH20	Praceura Laceac	
Exhaust Loss, inH20 2artload % 50 2artload %		5.00
Partiol of % Writer Files Water Injection Partial Carbon Water Injection Partial Carbon Partial Carbo		10.00
A		50
St. BurkW-hr, LHV 10016	kW, Gen Terms	47186
Suer. Btu/kW-hr, LHV Suel Flow #MBtu/hr, LHV 472.8 Fuel Flow (Margined) #MBtu/hr, LHV 537.7 #MBtu/hr, LHV 537.7 #MBtu/hr, LHV 537.7 #MStu/hr, LHV 537.7 #MStu/hr 542.8 #MStu/hr 54.8 #MStu/	Est. Btu/kW-hr, LHV	10019
### Flow ### Area	Guar. Btu/kW-hr, LHV	-
MMBtu/hr, LHV 472, Fuel Flow (Margined) MMBtu/hr, LHV 484, MMBtu/hr, LHV 537. MMBtu/hr, LHV 537. MMBtu/hr, HHV 537. MMBtu/hr, HHV 537. More Control Water Injection Othr 9657 Temperature, "F 100.0 The Temperature, "F 100.0 The Leat Extraction, btu/s 15425 COD Water Extraction, bts 15425 Margine		
MMBtu/hr, LHV 472, Fuel Flow (Margined) MMBtu/hr, LHV 484, MMBtu/hr, LHV 537. MMBtu/hr, LHV 537. MMBtu/hr, HHV 537. MMBtu/hr, HHV 537. More Control Water Injection Othr 9657 Temperature, "F 100.0 The Temperature, "F 100.0 The Leat Extraction, btu/s 15425 COD Water Extraction, bts 15425 Margine	Fuel Flow	
Section Sect	MMBtu/hr, LHV	472.8
Fuel Flow (Margined) MMBtu/hr, LHV 484.4 MMBtu/hr, HHV 5377. MMBtu/hr, HHV 5377. MMBtu/hr, HHV 5377. MARCONTROI Water Mater Injection D/hr 9655 Temperature, °F 100.0 Dry Firit Intercooler Far Aumidification OFF Cheat Extraction, btu/s 15425 COD Water Extraction, bts 15425 COD Water Extraction, bts 15425 Exhaust Parameters Temperature, °F 870. Exhaust Parameters Temperature, °F 10658 Exhaust Parameters Temperature, °F 10658 Temperature	lb/hr	22952
MMBtu/hr, LHV 494, 494, 494, 494, 494, 494, 494, 494		
MMBtu/hr, LHV 494, 494, 494, 494, 494, 494, 494, 494	Fuel Flow (Margined)	
MMBtuhr, HHV 537.* bihr 23528 IOx Control Water Injection bihr 9655.* emperature, "F 100.0 Intercooler Far Humidification OFF C Heat Extraction, btu/s 15428 COD Water Extraction, bts 90.0 C Heat Extraction, bts 90.0 C Heat Extraction, bts 90.0 Exhaust Parameters emperature, "F 870.* bisec 310.5 bisec 310.5 bisec 11196 inergy, Btu/s- Ref 0 "R 10558* cop, Btu/lb-R 0.2766 Estimated Maximum Emissions (at GT Exhaust Ox, pbmvd Ref 15% O2 111 20, Ib/hr 133 IOC, ppmvd Ref 15% O2 2.0 IOC, Ib/hr 133 "Gas Fuel Sulfur contents of 133 "Gas Fuel Sulfur contents of 2.5 Estimated Maximum Emissions (at Stack) * IOX as NO2, Ib/hr 3.3 "Gas Fuel Sulfur contents of 2.5 IoX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 2.5 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 4.0 IOX bihr 4.5 IOX ppmvd Ref 15% O2 4.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 4.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 4.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 5.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 5.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 5.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 5.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 5.0 IOX as NO2, Ib/hr 4.5 IOX ppmvd Ref 15% O2 5.0 IOX as NO2, Ib/hr 1.4 III.3, Ib/hr 3.5 III.3 III.	MMBtu/hr, LHV	484.6
## Available	MMBtu/hr, HHV	537.2
Mater Injection 2/hr 9652	lb/hr	23525
Mater Injection 2/hr 9652		
ohr 965. Temperature, °F 100.6 The temperature, °F 100.6 The temperature, °F 100.6 The temperature, °F 100.6	NOx Control	Water
ohr 965. Temperature, °F 100.6 The temperature, °F 100.6 The temperature, °F 100.6 The temperature, °F 100.6	NAME OF A STATE OF A S	
Temperature, "F 100.6 10		
Dry Fit Intercooler		
Intercooler Fair United States Fair States	Temperature, "F	100.0
Intercooler Fair United States Fair States		
Humidification OFF C Heat Extraction, btu/s 15425 COD Water Extraction, lb/s 0.1 Exhaust Parameters 870. Emperature, °F 870. b/br 111916 lenergy, Btu/s- Ref 0 °R 10658* p, Btu/b- R 10658* p, Btu/b-R 10658* p, Btu/b-R 107 Estimated Maximum Emissions (at GT Exhaus 100 ppmvd Ref 15% O2 100 xa s NO2, lb/hr 44 100 ppmvd Ref 15% O2 11 100, lb/hr 1.3 M-10, lb/hr 1.3 W-10 ppmvd Ref 15% O2 2.5 Glox as NO2, lb/hr 4.9 10x ps Fuel Sulfur contents of 4.0 20x as NO2, lb/hr 4.9 10x ppmvd Ref 15% O2 2.5 10x ppmvd Ref 15% O2 4.0 20, lb/hr 4.0 10c, lb/hr 4.0		
C Heat Extraction, blu/s COD Water Extraction, lb/s COD Water Extraction, lb/s COD Water Extraction, lb/s Exthaust Parameters Emperature, "F 870." blsec 310.3 blsec 310.3 blsec 310.5 blner 1119166 10558 1		
According to the content of the co		
Exhaust Parameters lemperature, "F 870." lo/sec 310.9. 110/hr 1111916 lonergy, Btu/s- Ref 0 °R 10569 Dp, Btu/lb-R 0.276 Setimated Maximum Emissions (at GT Exhaus IOX ppmvd Ref 15% O2 2: IOX as NO2, lb/hr 43 IOC, lb/hr 133 IOC, lb/hr 133 IOC, lb/hr 3.5 Setimated Maximum Emissions (at GT Exhaus IOX ppmvd Ref 15% O2 2: IOX as NO2, lb/hr 3.5 Setimated Maximum Emissions (at Stack)* IOX ppmvd Ref 15% O2 2: IOX ppmvd Ref 15% O2 2: IOX ppmvd Ref 15% O2 2: IOX ppmvd Ref 15% O2 4: IOX ppmvd Ref 15% O2 5: IOX ppmvd Ref 15% O2 5: IOX ppmvd Ref 15% O2 6: IOX ppmvd Ref 15% O2 6: IOX ppmvd Ref 15% O2 7:		
Temperature, "F bob/sec 310.5	KOD Water Extraction, lb/s	0.0
Temperature, "F bob/sec 310.5		
Sec 310.5		Aug (Change)
b/hr 111916 b/hr 11916		870.1
10686 107	lb/sec	310.9
Dept Dept Dept	lb/hr	
Stimated Maximum Emissions (at GT Exhaus		
IOx ppmvd Ref 15% O2	Cp, Btu/lb-R	0.2763
IOx ppmvd Ref 15% O2		
ACX as NO2, b/hr 44		
CD ppmvd Ref 15% O2 111. CD, Ib/hr 133. COC, ppmvd Ref 15% O2 2. COC, Ib/hr 1.33. * Gas Fuel Sulfur contents of + 0.25 grains/ * Stimated Maximum Emissions (at Stack) * COX ppmvd Ref 15% O2 2. COX as NO2, Ib/hr 4. COX ppmvd Ref 15% O2 4. COC, ppmvd Ref 15% O2 4. COC, ppmvd Ref 15% O2 5. COC, ppmvd Ref 15% O2 5. COC, ppmvd Ref 15% O2 5. COC, pbmvd Ref 15% O2 5. C</td <td></td> <td>25</td>		25
13		49
//OC, ppmvd Ref 15% O2 2.0 (C), [b/hr 1.3] **Gas Fuel Sulfur contents of 2.1 (3) **Gas Fuel Sulfur contents of 3.5 (3) **Gas Fuel Sulfur contents of 4.0.25 grains/ **Stimated Maximum Emissions (at Stack) ** **IOX ppmvd Ref 15% O2 2.5 (10X as NO2, lb/hr 4.8 (10X as NO2, lb/hr 4.8 (10X as NO2, lb/hr 4.8 (10X as NO2, lb/hr 1.4 (10X as NO2, lb/h		
//OC, ib/hr 1.3 PM-10, lb/hr 3.8 * Gas Fuel Sulfur contents of + 0.25 grains/ Estimated Maximum Emissions (at Stack) * IOX ppmvd Ref 15% O2 4.0 CO, lb/hr 4.1 COC, ppmvd Ref 15% O2 2.0 COC, lb/hr 1.4 IH3, ppmvd Ref 15% O2 3.0 IH3, lb/hr 3.3 IMM-10, lb/hr 3.3 IMM-10,</td <td></td> <td></td>		
**Gas Fuel Sulfur contents of + 0.25 grains/ Estimated Maximum Emissions (at Stack) ** IOx ppmvd Ref 15% O2 2.9 IOx as NO2, lb/hr 4.9 IOx ppmvd Ref 15% O2 4.9 IOx lb/hr 4.9 IOx ppmvd Ref 15% O2 4.9 IOx lb/hr 1.9 IOx ppmvd Ref 15% O2 5.9 IOx lb/hr 1.9 IOX ppmvd Ref 15% O2 5.9 IOX ppmvd Ref 15% O3 5.9 IOX ppmvd Ref 15%</td <td></td> <td></td>		
* Gas Fuel Sulfur contents of + 0.25 grains/ Estimated Maximum Emissions (at Stack) * IOX ppmvd Ref 15% O2 2.00 as NO2, lb/hr 4.90 ppmvd Ref 15% O2 4.00 ppmvd Ref 15% O2 2.00 ppmvd Ref 15% O2 3.00 ppmvd Ref 15% O2 3.00</td <td></td> <td></td>		
Stimated Maximum Emissions (at Stack) *	FW-10, ID/III	3.5
Stimated Maximum Emissions (at Stack) *	* Gas Fuel Sulfur contents of 4</td <td>+ 0.25 arains/10</td>	+ 0.25 arains/10
IOx ppmvd Ref 15% O2	Jus ruer suntil contents of Vi	v.Eu granis/ 10
IOx ppmvd Ref 15% O2	Estimated Maximum Emissions (a	at Stack) *
ACX as NO2, b/hr		2.5
CO ppmvd Ref 15% O2 CO, Ib/hr 4.8 C/OC, ppmvd Ref 15% O2 C/OC, Ib/hr 1.9 H/3, ppmvd Ref 15% O2 IH3, Ib/hr 3.6 M-10, Ib/hr 3.8		4.9
CO, lb/hr 4.0 CO, pmvd Ref 15% O2 2.0 CVC, lb/hr 1.4 IH3, ppmvd Ref 15% O2 5.0 IH3, lb/hr 3.0 PM-10, lb/hr 3.3		4.0
/OC, ppmvd Ref 15% O2 2.0 (OC, lb/hr 11.4 H3, ppmvd Ref 15% O2 5.0 H43, lb/hr 3.0 PM-10, lb/hr 3.0	CO, lb/hr	4.8
/OC, İb/hr 1.4 H13, ppmvd Ref 15% O2 5.0 H13, Ib/hr 3.0 PM-10, Ib/hr 3.5		
IH3, ppmvd Ref 15% O2 5.0 IH3, lb/hr 3.0 PM-10, lb/hr 3.6		
NH3, lb/hr 3.6 PM-10, lb/hr 3.6		5.0
PM-10, lb/hr 3.5	NH3, lb/hr	3.6
	PM-10, lb/hr	3.5
* Gas Fuel Sulfur contents of + 0.25 grains/</td <td>1</td> <td>5.5</td>	1	5.5
	* Gas Fuel Sulfur contents of 4</td <td>+ 0.25 grains/10</td>	+ 0.25 grains/10
	advanta contents of v	



Performance By: Vu, Christopher Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 8k1.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btu/lb,LHV

Fue	el: Site Gas Fuel	#900-4103, 20598 Btu/lb,LHV	Version: 3.9.8	
Case #	406			
Exh Wght % Wet (NOT FOR USE		NTAL PERMITS) (GT Exhaust)		
AR	1.2344			
N2	72.3983			
O2	14.3576			
CO2	5.5219			
H20	6.4831			
SO2	0.0000			
co	0.0017			
HC	0.0001			
NOX	0.0029			
Exh Mole % Dry (NOT FOR USE		NTAL PERMITS) (GT Exhaust)		
AR	0.9687			
N2 O2	81.0247			
CO2	14.0677			
H20	3.9338 0.0000			
SO2	0.0000			
SO2 CO	0.0000			
HC	0.0003			
NOX	0.0029			
11.021	0.0020			
Exh Mole % Wet (NOT FOR USE	IN ENVIRONME	NTAL PERMITS) (GT Exhaust)		
AR	0.8705			
N2	72.8098			
O2	12.6414			
CO2	3.5350			
H20	10.1387			
SO2	0.0000			
co	0.0017			
HC	0.0003			
HC NOX	0.0003 0.0026			
NOX	0.0026	D		
	0.0026 900-4103 (Ste	ve Rose Sample 59F)		
NOX Aero Energy Fuel Number	0.0026 900-4103 (Ste Volume %	Weight %		
NOX Aero Energy Fuel Number Hydrogen	0.0026 900-4103 (Ste Volume % 0.0000	Weight % 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane	0.0026 900-4103 (Ste Volume % 0.0000 95.8700	Weight % 0.0000 91.1296		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080	Weight % 0.0000 91.1296 3.2212		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butane	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butdiene	0.0026 900-4103 (Ste Volume % 0.0000 95,8700 1.8080 0.0000 0.3360 0.0000 0.1120 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butylene Butadiene Pentane Cyclopentane Hexane	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Hexane	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430 0.0000 0.0280 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1338 0.0000 0.1328 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heylane Carbon Monoxide	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430 0.0000 0.0260 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethane Ethylene Propane Propylene Butane Butylene Butylene Butadiene Pentane Cyclopentane Hexane Hexane Heptano Carbon Monoxide Carbon Dioxide	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.0000 1.1130	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 0.0000 2.9025		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Hexane Heptane Carbon Dioxide Nitrogen	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000 0.0000 0.0260 0.0000 0.0000 1.1130 0.8620	Weight % 0.0000 91.1296 3.2212 0.0000 0.9779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Heytane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 1.1130 0.6820 0.6820	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butalene Butylene Butadiene Pentiane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 0.0000 0.1328 1.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heplane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.1220 0.0000 0.1220 0.0000 0.0256 0.0000 0.11130 0.0000 1.1130 0.6820 0.0000 0.00000 0.00000 0.00000 0.00000 0.00000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butalene Butylene Butadiene Pentiane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 0.0000 0.1328 1.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000 0.0260 0.0000 0.0000 1.1130 0.8620 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethane Ethylene Proppine Butane Butylene Butylene Butylene Butadiene Pentane Cyclopentane Hexane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butalene Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.3380 0.0000 0.1220 0.0000 0.0000 0.0000 0.0430 0.0000 0.0260 0.0000 0.11130 0.6820 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/sef, LHV Btu/sef, LHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butalene Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.1220 0.0000 0.1220 0.0000 0.0260 0.0000 0.0260 0.0000 0.0000 1.11130 0.6620 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
NOX Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butalene Butylene Butadiene Pethane Cyclopentane Hexane Heytane Carbon Inoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV Btu/scf, LHV Btu/scf, HHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.3360 0.0000 0.3360 0.0000 0.1220 0.0000 0.0260 0.0000 0.0260 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propylene Butane Butylene Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV Btu/scf, LHV Btu/scf, HHV Btu/lb, HHV Btu/lb, HHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 1.8080 0.0000 0.1220 0.0000 0.01220 0.0000 0.0430 0.0000 0.0430 0.0000 0.0260 0.0000 0.0260 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		
Aero Energy Fuel Number Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heytane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/ssf, LHV	0.0026 900-4103 (Ste Volume % 0.0000 95.8700 0.0000 0.3360 0.0000 0.1220 0.0000 0.0260 0.0000 0.0260 0.0000 0.0000 0.0000 0.00000 0.0000 0.000000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1338 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000 0.0000		



Performance By: Vu, Christopher Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA Deck Info: G0179E - 8k1 Generator: BDAX 82-445 Fuel: Site Gas Fue

o: G0179E - 8k1.scp	Date: 2/6/2014
or: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)	Time: 3:44:53 PM
Site Gas Fuel#900-4103 20598 Btu/lb LHV	Version: 3.9.8

1 40.0		SELECTION CONTRACTOR C	
Case #	311		
Ambient Conditions	9.11		
	44.6		
Dry Bulb, °F	44.5		
Wet Bulb, °F	42.6		
RH, %	86.1		
Altitude, ft	20.9		
Ambient Pressure, psia	14.685		
Engine Inlet			
Comp Inlet Temp, °F	44.5		
	86.1		
RH, %			
Conditioning	NONE		
Tons(Chilling) or kBtu/hr(Heating)	0		
Pressure Losses			
Inlet Loss, inH20	5.00		
Exhaust Loss, inH20	10.00		
Partload %	0		
kW, Gen Terms	-		
Est. Btu/kW-hr, LHV			
Guar. Btu/kW-hr, LHV	-		
Fuel Flow			
MMBtu/hr, LHV	112.8		
lb/hr	5474		
ID/III	3474		
Fuel Flow (Margined)			
MMBtu/hr, LHV	115.6		
MMBtu/hr, HHV	128.1		
lb/hr	5611		
NOx Control	Water		
10(-4			
Water Injection			
lb/hr	0		
Temperature, °F	100.0		
	Dry Fin		
Intercooler	Fan		
	OFF		
Humidification			
IC Heat Extraction, btu/s	938		
KOD Water Extraction, lb/s	0.0		
Exhaust Parameters			
Temperature, °F	982.3		
	111 9		
lb/sec	111.9		
lb/sec lb/hr	402777		
lb/sec			



Performance By: Vu, Christopher Project Info: NRG Carlsbad - Avg. Ambient Load Sweep R0

Engine: LMS100 PA
Deck Info: G0179E - 3k1.scp
Generator: BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (EffCurve#: 35404; CapCurve#: 35407)
Fuel: Site Gas Fuel#900-4103, 20598 Btw/lb,LHV

		900-4103, 2059	Service and displayers of the control of the contro	
Case #	311			
Exh Wght % Wet (NOT FOR USE I		NTAL PERMITS	(GT Evhaust)	
AR	1.2639	MIALI EKIMIN	, (OT Exhaust)	
N2	74.1224			
02	17.5561			
CO2	3.6541			
H20	3.3996			
SO2	0.0000			
CO	0.0007			
HC	0.0017			
NOX	0.0020			
NOX	0.0020			
Exh Mole % Dry (NOT FOR USE IN	ENVIDONMEN	TAL DEDMITS	(GT Exhauet)	
AR	0.9560	IAC I EKIMITS	(GT Exhaust)	
N2	79.9520			
02	16,5790			
CO2	2.5090			
H20	0.0000			
SO2	0.0000			
CO	0.0019			
HC	0.0002			
NOX	0.0002			
NOX	0.0019			
Exh Mole % Wet (NOT FOR USE II	FNVIRONME	ITAL PERMITS) (GT Exhaust)	
AR	0.9044	TAL I LIMITO	, (OT Exhaust)	
N2	75.6388			
02	15,6846			
CO2	2.3736			
H20	5.3947			
SO2	0.0000			
CO	0.0018			
HC	0.0002			
NOX	0.0002			
NOX	0.0016			
	900-4103 (Ste	ve Rose Same		
Aero Energy Fuel Number		ve Rose Samp	le 59F)	
-	Volume %	Weight %	le 59F)	
Hydrogen	Volume % 0.0000	Weight % 0.0000	ile 59F)	
Hydrogen Methane	Volume % 0.0000 95.8700	Weight % 0.0000 91.1296	ile 59F)	
Hydrogen Methane Ethane	Volume % 0.0000 95.8700 1.8080	Weight % 0.0000 91.1296 3.2212	ile 59F)	
Hydrogen Methane Ethane Ethylene	Volume % 0.0000 95.8700 1.8080 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000	de 59F)	
Hydrogen Methane Ethane Ethylene Propane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1838	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0430 0.0000 0.0260	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butalene Pentane Cyclopentane Hexane	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0430 0.0000 0.0260 0.0000 0.0260 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butlane Butylene Butlane Pentane Cyclopentane Hexane Heptane Carbon Monoxide	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0430 0.0000 0.0260 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1328 0.0000 0.1328 0.0000 0.0000 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hetane Carbon Monoxide Carbon Dioxide	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0000 0.0000 0.0260 0.0000 0.0000 1.1130	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1328 0.0000 0.0000 0.1328 0.0000 0.29025	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadene Pentane Cyclopentane Hexane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen	Volume '% 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0260 0.0260 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 0.0000 2.9025 1.1321	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor	Volume '%, 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 1.1130 0.6820 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1838 0.0000 0.1328 0.0000 2.9025 1.1321 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen	Volume vo	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1838 0.0000 0.1328 0.0000 0.0000 2.9025 1.1321 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide	Volume '%, 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Hexane Heptane Carbon Dioxide Nitrogen Water Vapor Oxygen	Volume vo	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.0000 0.1838 0.0000 0.1328 0.0000 0.0000 2.9025 1.1321 0.0000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia	Volume vo	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butlane Butlane Butlylene Butadiene Pentane Cyclopentane Hetxane Hetptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV	Volume '%, 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.0000 0.00	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butane Butylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia	Volume v. 0000 0.0000 0.0000 0.3360 0.0000 0.1220 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.00000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethane Ethylene Propane Propylene Butane Butylene Butalene Pentane Cyclopentane Hexane Hetpane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV Btu/scf, LHV	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0260 0.0000 0.0260 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethylene Propane Propylene Butlane Butylene Butlane Butladiene Pentane Cyclopentane Hexane Hexane Hestane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV Btu/scf, LHV Btu/scf, LHV Btu/scf, LHV	Volume v. 0.000 0.0000 0.0000 1.8080 0.0000 0.3360 0.0000 0.0260 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethalene Ethylene Propane Propylene Butane Butylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia	Volume v 0.000 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.0220 0.0000 0.0430 0.0000 0.0260 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethane Ethylene Propane Propylene Butlane Butylene Butadiene Pentane Cyclopentane Hetxane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia Btu/lb, LHV Btu/scf, LHV	Volume % 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.1220 0.0000 0.0430 0.0000 0.0260 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	
Hydrogen Methane Ethane Ethalene Ethylene Propane Propylene Butane Butylene Butane Butylene Butadiene Pentane Cyclopentane Hexane Heptane Carbon Monoxide Carbon Dioxide Nitrogen Water Vapor Oxygen Hydrogen Sulfide Ammonia	Volume v 0.000 0.0000 95.8700 1.8080 0.0000 0.3360 0.0000 0.0220 0.0000 0.0430 0.0000 0.0260 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000	Weight % 0.0000 91.1296 3.2212 0.0000 0.8779 0.0000 0.4201 0.0000 0.1328 0.0000 0.1328 0.0000 2.9025 1.1321 0.00000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.0000 0.000	ie 59F)	

ATTACHMENT 2 RECLAIMED WATER AND SEE WATER PROCESS DESCRIPTIONS

Reclaimed Water and Sea Water Process Descriptions – Amended CECP

Reclaimed Water Process Description: Reclaimed water exits the process water storage tank and is pumped through a set of ultra-filtration (UF) modules for suspended solids and sediments removal. The effluent is then treated with an anti-scalant and biocide reagent prior to entering the cartridge filters (CF) for additional solids removal. Upon exiting the cartridge filters the water is pumped through the first pass reverse osmosis (RO) membranes. The permeate from the first pass RO is then either sent to the mix tank for mixing with raw water for use in the evaporative coolers or pumped through the second pass RO membranes. Second pass RO permeate then passes through mixed bed polishing vessels to further reduce minerals, and is then stored in the 250,000 gallon demineralized water storage tank. The second pass RO reject water is recycled by reinjecting upstream of the first pass RO. The polishing vessels are taken off-site for regeneration.

<u>Sea Water Process Description</u>: Sea water exits the water storage tank and is pumped through a set of multi-media filters (MMF) for solids removal. The effluent is then treated with an anti-scalant and biocide reagent prior to entering the cartridge filters (CF) for additional solids removal. Upon exiting the cartridge filters the water is pumped through the first pass reverse osmosis (RO) membranes. Because of the higher salinity of the sea water, a two-stage RO system is utilized. The permeate from the first pass RO is stored in a 40,000 gallon service water tank, where it is stored for use in the combustion turbine evaporative cooler or it is pumped through the second pass RO membranes. Second pass RO permeate then passes through mixed bed polishing vessels to further reduce minerals, and is then stored in the 250,000 gallon demineralized water storage tank. The second pass RO reject water is recycled by reinjecting upstream of the first pass RO. The polishing vessels are taken off-site for regeneration.

Key Parameters Indicating System Function: Some of the values used to determine system function are pressure differential across filters (ultra-filtration, multi-media and cartridge) as well as RO membranes. These values will be used in conjunction with manufacturer recommendations to replace or flush filters as necessary. Adequate biocide injection is confirmed by sampling for biological growth. An anti-scalant is injected prior to the RO membranes to help prevent the precipitation of salts on the membranes. Conductivity measurements between RO stages and before and after polishing will indicate system performance, as well as regeneration intervals on the mixed bed polishing units. Additional measurements will include suction and discharge pressures for all pumps, as well as variable frequency drive (VFD) function for each motor controlled by VFD.

ATTACHMENT 3 WATER ANALYSIS

TABLE 3A							
Reclaimed Water (Note	1)						
,		Reverse Os	mosis Treatment	Mixed Bed Ion-	Exchange Treatment		
Constituents / Concentrations	Expected concentrations in the	Design Basis of Single Stage	Expected concentrations of the	Design Basis of Polishing	Expected concentrations of	Regulatory limits of the	Vendor specifications for the concentrations o
	input reclaimed water (avg)	RO Removal Efficiency (%)	inlet species in the Reverse	Demin Removal Efficiency	the inlet species in the	inlet concentrations for	contaminants in the combustion turbine
			Osmosis product water (avg)	(%)	polishing demineralizer	the reclaimed water	injection water (Note 3)
					product water (avg)	supply	
Total Dissolved Solids (mg/l)	996 (monthly avg of 12/13					1100 (12-mo. Avg.)	
(salinity)	thru 1/14)	>98	<20	>99	0.08	1100 (12 1110: 7(48.)	
	1860 (sample date 4/15-16,					Not Specified	
Specific Cond. (µmhos/cm)	2014)	>98	<38	>99	<1.0	Not specified	TDS - 5 mg/L, max
Arsenic (μg/L)	4 (Est)	>98	<0.8	>99	< Method Detection Limit	Not Specified	TSS - 5 mg/L, max
Cadmium (μg/L)	<5	>98	<0.1	>99	< Method Detection Limit	Not Specified	Conductivity - μS/cm at 25 degC - <1.0
Hexavalent chromium	Not provided	N/A	N/A	>99	< Method Detection Limit	Not Specified	Sod + Potassium, ppm, max - 0.2
Chromium, total (µg/L)	<5	>98	<0.01	>99	< Method Detection Limit	Not Specified	Silica (SiO2), mg/L, max - 0.5
Copper (µg/L)	<3 (Est)	>98	<0.06	>99	< Method Detection Limit	Not Specified	Sulfates, mg/L, max - 0.5
Manganese (μg/L)	80	>98	<1.6	>99	< Method Detection Limit	Not Specified	
Mercury (μg/L)	<0.2	>98	<0.2	>99	< Method Detection Limit	Not Specified	
Selenium (μg/L)	<5	>98	<0.01	>99	< Method Detection Limit	Not Specified	7
Nickel (μg/L)	<3 (Est)	>98	<0.06	>99	< Method Detection Limit	Not Specified	
Lead (μg/L)	<5	>98	<0.01	>99	< Method Detection Limit	Not Specified	
Sulfates (mg/L)	221	>98	<5.0	>99	< Method Detection Limit	350 (12-mo. Avg.)	
	-	i e		i e e e e e e e e e e e e e e e e e e e			

>99

N/A

Method Detection Limit

5.4

Not Specified

6.5 - 8.5

<0.02

5.4

Notes (Table 3A):

July 2-3, 2013

Note: Sample Analysis provided by Carlsbad Recycling Facility dated

Fluorides (mg/L)

pH (SU)

Note 1: Source: Carlsbad Water Recycling Facility, WQ Data Base

0.81

6.5 to 8.4 (avg. 7.6)

Note 3: Source: Requirements for Water and Steam Purity for Injection in Aero Derivative Gas Turbines, General Electric Doc # MID-TD-0000-3, June 2010

>98

N/A

TABLE 3B							
Sea Water (Note 2)							
Constituents / Concentrations (avg)	Expected concentrations in the input seawater (avg)	Design Basis of Two Stage RO Removal Efficiency (%)	Expected concentrations of the inlet species in the reverse osmosis product water (avg)	Design Basis of Polishing Demin Removal Efficiency (%)	Expected concentrations of the inlet species in the polishing demineralizer product water (avg)	Regulatory limits of the inlet concentrations for the seawater supply	Vendor specifications for the concentrations of contaminants in the combustion turbine injection water (Note 3)
Total dissolved solids (mg/l)	33,500	>98	<670	>99	0.08		
Specific Cond (µmhos/cm)	50,033	>98	<1000	>99	<1.0		
Arsenic (μg/L)	1.3	>98	<0.03	>99	< Method Detection Limit		
Cadmium (µg/L)	0.021	>98	<mdl< td=""><td>>99</td><td>< Method Detection Limit</td><td></td><td></td></mdl<>	>99	< Method Detection Limit		
Hexavalent chromium	Not Provided	N/A	N/A	>99	< Method Detection Limit		TDS - 5 mg/L, max
Chromium, total (μg/L)	0.5	>98	<0.01	>99	< Method Detection Limit		TSS - 5 mg/L, max
Copper (µg/L)	0.38	>98	<0.008	>99	< Method Detection Limit		Conductivity - μS/cm at 25 degC - <1.0
Manganese (μg/L)	6.28	>98	<0.13	>99	< Method Detection Limit	Not Applicable	Sod + Potassium, ppm, max - 0.2
Mercury (μg/L)	0.079	>98	<0.002	>99	< Method Detection Limit		Silica (SiO2), mg/L, max - 0.5
Selenium (μg/L)	<mdl< td=""><td>>98</td><td><mdl< td=""><td>>99</td><td>< Method Detection Limit</td><td></td><td>Sulfates, mg/L, max - 0.5</td></mdl<></td></mdl<>	>98	<mdl< td=""><td>>99</td><td>< Method Detection Limit</td><td></td><td>Sulfates, mg/L, max - 0.5</td></mdl<>	>99	< Method Detection Limit		Sulfates, mg/L, max - 0.5
Nickel (μg/L)	0.26	>98	By AvanTech	>99	< Method Detection Limit		
Lead (μg/L)	0.071	>98	<0.0014	>99	< Method Detection Limit		
Sulfates (mg/L)	2572	>98	<133	>99	< Method Detection Limit		
Fluorides (Mg/L)	2.1	>98	<0.4	>99	< Method Detection Limit		
pH (SU)	7.6	N/A	5.4	N/A	5.4		

Notes (Table 3B):

Note 2: Source: Poseidon Resources Corp., Draft Scope Book for EPC of Carlsbad Seawater Dessalination Project, Appendix A, January 2006

Note 3: Source: Requirements for Water and Steam Purity for Injection in Aero Derivative Gas Turbines, General Electric Doc # MID-TD-0000-3, June 2010

ATTACHMENT 4 REVISED SCREENING LEVEL AIR QUALITY MODELING INPUTS/OUTPUTS

Table 3.1E-2 (Revised 6/24/14) CECP Amendment Screening Modeling Inputs (per Gas Turbine)

Case	Amb Temp	Stack height	Stack Height	Stack Diam	Stack Diam	Stack flow	Stack flow	Stack Vel	Stack Vel	Stack Temp	Stack Temp
	deg F	feet	meters	feet	meters	wacfm	m3/sec	ft/sec	m/sec	deg F	deg K
Cold 100% Load	44.5	90.0	27.43	13.5	4.11	1,012,885	478.09	117.94	35.95	763.7	679.65
Cold 25% Load	44.5	90.0	27.43	13.5	4.11	524,635	247.63	61.09	18.62	856.7	731.32
Hot 100% Load w/Evap.	96.0	90.0	27.43	13.5	4.11	985,287	465.07	114.72	34.97	813.1	707.09
Hot 100% load w/o Evap.	96.0	90.0	27.43	13.5	4.11	948,559	447.73	110.45	33.66	821.1	711.54
Hot 25% Load	96.0	90.0	27.43	13.5	4.11	499,004	235.53	58.10	17.71	920.2	766.59
Avg. 100% Load w/Evap.	60.3	90.0	27.43	13.5	4.11	1,023,515	483.11	119.18	36.32	779.1	688.21
Avg. 100% Load w/o Evap.	60.3	90.0	27.43	13.5	4.11	1,022,475	482.62	119.05	36.29	781.7	689.65
Avg. 25% Load	60.3	90.0	27.43	13.5	4.11	523,114	246.91	60.91	18.57	854.2	729.93
Commissioning		90.0	<u>27.43</u>	<u>13.5</u>	<u>4.11</u>	523,114	246.91	60.91	18.57	854.2	729.93
Startup/Shutdown/Startup		90.0	27.43	13.5	4.11	523,114	246.91	60.91	18.57	854.2	729.93
Cold 50% Load	44.5	90.0	27.43	13.5	4.11	692,949	327.08	80.69	24.59	800.5	700.09
Hot 50% Load	96.0	90.0	27.43	13.5	4.11	647,396	305.58	75.38	22.98	870.1	738.76
Avg. 50% Load	60.3	90.0	27.43	13.5	4.11	689,606	325.50	80.30	24.47	800.0	699.82
Sync-Idle Load		90.0	27.43	13.5	4.11	256.837	121.23	29.91	9.12	982.3	801.09
	NOx	CO	PM10	SOx		NOx	СО	PM10	SOx		, , , , , ,
	lb/hr	lb/hr	lb/hr	lb/hr		g/sec	g/sec	g/sec	g/sec		
Cold 100% Load	8.90	8.60	3.50	2.04		1.121	1.084	0.441	0.257		
Cold 25% Load	3.40	3.40	3.50	0.79		0.428	0.428	0.441	0.100		
Hot 100% Load w/Evap.	8.30	8.10	3.50	1.91		1.046	1.021	0.441	0.241		
Hot 100% load w/o Evap.	8.10	7.80	3.50	1.85		1.021	0.983	0.441	0.234		
Hot 25% Load	3.20	3.10	3.50	0.74		0.403	0.391	0.441	0.093		
Avg. 100% Load w/Evap.	9.00	8.70	3.50	2.07		1.134	1.096	0.441	0.260		
Avg. 100% Load w/o Evap.	9.00	8.80	3.50	2.07		1.134	1.109	0.441	0.261		
Avg. 25% Load	3.50	3.40	3.50	0.79		0.441	0.428	0.441	0.100		
Commissioning	90.00	247.7	<u>3.5</u>	2.07		11.340	31.206	0.441	0.261		
Startup/Shutdown/Startup	28.24	17.3	3.5	2.07 2.07		3.558	2.181	0.441	0.261		
Cold 50% Load	5.30	5.2	3.5	1.22		0.668	0.655	0.441	0.154		
Hot 50% Load	4.90	4.8	3.5	1.13		0.617	0.605	0.441	0.142		
Avg. 50% Load	5.30	5.2 4.8 5.2	3.5 3.5 3.5 3.5 3.5 3.5	0.41 0.27		0.668	0.655	0.441	0.052		
Sync-Idle Load	47.08	<u>114.6</u>	3.5	0.27		5.933	14.438	0.441	0.034		

Table 3.1E-3 (Revised 6/24/14)
CECP Amendment
Screening Level Modeling Impacts
(Combined Impacts for Six Gas Turbines)

	Conc. (ug/m3) NO2	Conc. (ug/m3) SO2	Conc. (ug/m3) CO	Conc. (ug/m3) SO2	Conc. (ug/m3) CO	Conc. (ug/m3) SO2	Conc. (ug/m3) PM10	Conc. (ug/m3) NO2	Conc. (ug/m3) SO2	Conc. (ug/m3) PM10
Operating Mode	1-hr	1-hr	1-hr	3-hr	8-hr	24-hr	24-hr	Annual	Annual	Annual
Cold 100% Load	20.512	4.701	19.821	2.990	7.116	0.595	1.021	0.215	0.049	0.084
Cold 25% Load	11.794	2.754	11.794	1.526	3.927	0.324	1.430	0.110	0.026	0.113
Hot 100% Load w/Evap.	19.106	4.398	18.645	2.798	6.694	0.557	1.020	0.200	0.046	0.084
Hot 100% load w/o Evap.	19.037	4.358	18.332	2.759	6.574	0.551	1.039	0.199	0.046	0.086
Hot 25% Load	11.281	2.609	10.928	1.443	3.629	0.306	1.449	0.104	0.024	0.114
Avg. 100% Load w/Evap.	20.462	4.699	19.780	2.999	7.109	0.596	1.009	0.215	0.049	0.084
Avg. 100% Load w/o Evap.	20.453	4.706	19.999	3.003	7.188	0.597	1.009	0.215	0.049	0.084
Avg. 25% Load	12.184	2.764	11.836	1.531	3.939	0.325	1.434	0.113	0.026	0.113
Commissioning	313.296	7.208	862.144	3.993	286.896	0.848	<u>1.434</u>			
Startup/Shutdown/Startup	98.291	7.208	60.264	3.993	20.054	0.848	1.434			
Cold 50% Load	15.223	3.515	14.935	2.077	4.902	0.409	1.168			
Hot 50% Load	14.381	3.319	14.088	1.937	4.622	0.388	1.202			
Avg. 50% Load	15.279	1.180	14.991	0.696	4.920	0.137	1.174			
Sync-Idle Load	250.687	1.436	610.079	0.885	217.020	0.178	2.309			

ATTACHMENT 5 REVISED REFINED COMMISSIONING AIR QUALITY MODELING RESULTS

TABLE 5.1-32 (Revised 6/24/14)

Modeled Maximum Proposed Project Impacts (Commissioning Period)

Pollutant	Averaging Time	Maximum Project Impact ^d (μg/m³)	Background (μg/m³)	Total Impact (μg/m³)	State Standard (μg/m³)	Federal Standard (μg/m³)
NO_2	1-hour	176.9	152.4	329	339	_
	98 th percentile	137.6	105.3ª	152	_	188
SO ₂	1-hour	7.6	34.1	42	655	_
	99 th percentile	7.6	35.8 ^c	43	_	196
	24-hour	1.0	7.9	9	105	_
со	1-hour	868.9	5,040	5,909	23,000	40,000
	8-hour	8-hour 297.6		4,536	10,000	10,000
PM ₁₀	24-hour	2.0 <u>2.8</u>	43	45 <u>46</u>	50	150
PM _{2.5}	24-hour	2.0 <u>2.8</u>	26 ^b	28 <u>29</u>	_	35

 $^{^{\}mathrm{a}}$ 1-hour NO $_{\mathrm{2}}$ background concentration is shown as the 98th percentile as that is the basis of the federal standard.

^b24-hr PM_{2.5} background concentration reflects 3-year average of the 98th percentile values based on form of standard.

c1-hr SO₂ background concentration reflects 3-year average of the 99th percentile values based on form of standard.

 $^{^{\}rm d} Includes \, {\rm impacts} \, {\rm from} \, {\rm existing} \, {\rm EPS} \, {\rm units}.$

ATTACHMENT 6 REVISED ACUTE IMPACT MODELING RESULTS

TABLE 5.9-4 (Revised 6/24/14)

Summary of Potential Health Risks

Receptor	Carcinogenic Risk ^a (per million)	Cancer Burden	Acute Health Hazard Index	Chronic Health Hazard Index								
New Equipment Normal Operation (gas turbines/emergency engines)												
Maximally Exposed Individual (MEI) at PMI	2.9		2.7 x 10 ⁻²	1.5 x 10 ⁻³								
MEI at PMI Shoreline Fumigation	_N/A	•	4.4 x 10 ⁻²	N/A								
MEI at PMI Fumigation	N/A	•	1.4 x 10- ²	N/A								
Maximally Exposed Individual Resident (MEIR)	7.8 x 10 ⁻²	0	1.6 x 10 ⁻²	4.7 x 10 ⁻⁴								
Maximally Exposed Individual Worker b (MEIW)	4.5 x 10 ⁻¹	•	2.7 x 10 ⁻²	_								
Gas Turbine Startups/Shutdowns												
MEI (acute impact only)	N/A	N/A	9.0 x 10 ⁻²	N/A								
MEI (acute impact only) Shoreline Fumigation	<u>N/A</u>	N/A	1.6 x 10 ⁻¹	N/A								
MEI (acute impact only) Fumigation	<u>N/A</u>	N/A	2.1 x 10 ⁻²	N/A								
Gas Turbine Commissioning Period (includes impa	cts for existing Encina un	nits)										
MEI (acute impact only)	N/A	N/A	7.8 x 10 ⁻²	N/A								
MEI (acute impact only) Shoreline Fumigation	<u>N/A</u>	<u>N/A</u>	1.4 x 10 ⁻¹	<u>N/A</u>								
MEI (acute impact only) Fumigation	<u>N/A</u>	N/A	1.9 x 10 ⁻²	<u>N/A</u>								
Gas Turbine Long-Term Commissioning Case												
MEI (cancer risk/chronic impacts only)	7.4 x 10 ⁻³	0	n/a	9.0 x 10 ⁻⁵								
Significance Level	10	1.0	1.0	1.0								

^a Based on High Point Method which results in the maximum cancer risk.

^b The worker is assumed to be exposed at the work location 8 hours per day, instead of 24, 245 days per year, instead of 365, and for 40 years, instead of 70.

ATTACHMENT 7 REVISED HOURLY EMISSION CALCULATIONS FOR EMERGENCY ENGINES

Table 5.1B-7 (Revised 6/24/14) CECP Amendment Emergency Firepump Engine

Rating (bhp) =	327				
Fuel =	Diesel				
Fuel Consumption (gal/hr) =	14.8				
Exhaust Temperature (F) =	842				
Exhaust Diameter (inches) =	6				
Exhaust Flow Rate (acfm) =	1,867				
Exhaust Velocity (ft/sec) =	158				
	NOx	CO	VOC	PM10	SOx
Emission Factor (g/bhp-hr) =	2.83	0.67	0.07	0.10	0.00
Hourly Emissions (lbs/hr)(1) =	1.02E+00	2.42E-01	2.69E-02	3.49E-02	1.77E-03

Notes:

(1) Assumes testing at 50% load.

Table 5.1B-8 (Revised 6/24/14) CECP Amendment Emergency Generator Engine

Rating (bhp) =	779				
Fuel =	Diesel				
Fuel Consumption (gal/hr) =	35.9				
Exhaust Temperature (F) =	1263				
Exhaust Diameter (inches) =	5.5				
Exhaust Flow Rate (acfm) =	3,185				
Exhaust Velocity (ft/sec) =	322				
	NOx	СО	VOC	PM10	SOx
Emission Factor (g/bhp-hr) =	2.24	0.67	0.07	0.05	0.00
Hourly Emissions (lbs/hr)(1) =	1.92E+00	5.76E-01	6.40E-02	4.48E-02	4.21E-03

Notes:

(1) Assumes testing at 50% load.

Rating Specific Emissions Data - John Deere Power Systems



Nameplate Rating Information

Clarke Model
Power Rating (BHP / kW)
Certified Speed (RPM)

JW6H-UFADF0
327 / 244
1760

Rating Data

Rating	j	6090HFC47A					
Certified Power (kW)			315				
Rated Speed			1760				
Vehicle Model Number			Clarke Fire Pump				
Units	g/kW-h	r	g/hp-hr				
NOx	3.5		2.6				
HC	0.1		0.1				
NOx + HC	3.7		2.7				
Pm	0.14		0.11				
СО	0.9		0.7				

Certificate Data

Engine Model Year	2014
EPA Family Name	EJDXL09.0114
EPA JD Name	450HAB
EPA Certificate Number	EJDXL09.0114-013
CARB Executive Order	Not Applicable
Parent of Family	6090HFG84A

Units	g/kW-hr
NOx	3.8
HC	0.1
NOx + HC	3.9
Pm	0.13
CO	0.9

^{*} The emission data listed is measured from a laboratory test engine according to the test procedures of 40 CFR 89 or 40 CFR 1039, as applicable. The test engine is intended to represent nominal production hardware, and we do not guarantee that every production engine will have identical test results. The family parent data represents multiple ratings and this data may have been collected at a different engine speed and load. Emission results may vary due to engine manufacturing tolerances, engine operating conditions, fuels used, or other conditions beyond our control.

This information is property of Deere & Company. It is provided solely for the purpose of obtaining certification or permits of Deere powered equipment. Unauthorized distribution of this information is prohibited

ENGINE_FAMILY MANUFACTURER

ECPXL15.2HZA CATERPILLAR (CPX)

CERTIFICATE_NUMBER ISSUE_DATE COMMERCE_INTRODUCTION_DATE APPLICABLE_TIER

ECPXL15.2HZA-015 30-SEP-2013 01-DEC-2013

I = Interim Tier 4

Steady State NMHC 0.10

Steady State NOX 3.00

Steady State NMHC+NOX Steady State CO Steady State PM

0.9

ENGINE_MODEL 0.07

ATTACHMENT 8

REVISED DAILY AND ANNUAL EMISSION LEVELS FOR EMERGENCY ENGINES

Table 5.1B-13 (Revised 6/24/14) CECP Amendment Daily Emissions

Daily Emission Rates, lbs/day	(Commissioni	ng Period)											
	Operating	Hourly Emis	sion Rate (lb	s/hr)				Daily Emissions (lbs/day)					
	Hours	NOx	CO	VOC	PM10	SOx	NH3	NOx	CO	VOC	PM10	SOx	NH3
GT Normal Operation	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GT Startups	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GT Shutdowns	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
GT Commissioning	various	various	various	various	various	various	various	1,080.0	2,971.0	181.0	84.0	49.7	160.8
Single GT Total =								1,080.0	2,971.0	181.0	84.0	49.7	160.8
Six GT Total =								6,480.0	17,826.0	1,086.0	504.0	298.2	964.8
Emergency Firepump Engine	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Emergency Generator Engine	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Natural Gas Compressors	24									0.3			
	•			•	•				•				
Total New Equipment =								6,480.0	17,826.0	1,086.3	504.0	298.2	964.8
Total Emergency Engines =								0.0	0.0	0.0	0.0	0.0	0.0

Daily Emission Rates, lbs/day	(Non-Commis	sioning Perio	od)											
	Operating	Hourly Emis	Hourly Emission Rate (lbs/hr)						Daily Emissions (lbs/day)					
	Hours	NOx	CO	VOC	PM10	SOx(1)	NH3(1)	NOx	CO	VOC	PM10	SOx	NH3	
GT Normal Operation	16	9.00	8.80	2.50	3.50	2.07	6.70	144.0	140.8	40.0	56.0	33.1	107.2	
GT Startups	4	19.95	12.53	3.46	3.50	2.07	6.70	79.8	50.1	13.8	14.0	8.3	26.8	
GT Shutdowns	4	7.65	10.29	4.36	3.50	2.07	6.70	30.6	41.2	17.4	14.0	8.3	26.8	
Single GT Total =								254.4	232.1	71.3	84.0	49.7	160.8	
Six GT Total =								1,526.4	1,392.6	427.6	504.0	298.2	964.8	
Emergency Firepump Engine	1	1.02	0.24	0.03	0.03	0.00		1.0	0.2	0.0	0.0	0.0		
Emergency Generator Engine	1	1.92	0.58	0.06	0.04	0.00		1.9	0.6	0.1	0.0	0.0		
Natural Gas Compressors	24									0.3				
Total New Equipment = Total Emergency Engines =								1,529.3 2.9	1,393.5 0.8	428.0 0.1	504.1 0.1	298.2 0.0	964.8	

Notes

(1) Set startup/shutdown hourly emission rate to 100% load normal emission level to determine worst case daily emissions for AQ modeling purposes.

Table 5.1B-15 (Revised 6/24/14)
CECP Amendment
Annual Emissions - Non-Commissioning Year

	Hours	NOx	CO	VOC	PM10	SOx(1)	NH3(1)	NOx	CO	VOC	PM10	SOx	NH3
	per	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/year)	(lbs/year)	(lbs/year)	(lbs/year)	(lbs/year)	(lbs/year)
	Year												
Single GT Start-Up	400	19.95	12.53	3.46	3.50	0.69	2.60	7,980	5,013	1,383	1,400	276	1,040
Single GT Normal Operation	1,900	9.00	8.80	2.50	3.50	0.69	6.70	17,100	16,720	4,750	6,650	1,311	12,730
Single GT Shutdown	400	7.65	10.29	4.36	3.50	0.69	2.60	3,060	4,117	1,743	1,400	276	1,040
Single GT Total =	2,700							28,140	25,851	7,877	9,450	1,864	14,810
Six GT Total =								168,840	155,104	47,260	56,700	11,181	88,860
Emergency Firepump Engine	200	1.02	0.24	0.03	0.03	0.00		204	48	5	7	0	
Emergency Generator Engine	200	1.92	0.58	0.06	0.04	0.00		384	115	13	9	1	
Natural Gas Compressors										103			
Total New Equipment Annual	Emissions (lb/year) =						169,428	155,268	47,381	56,716	11,182	88,860
Total New Equipment Annual Emissions (tons/year) =								84.7	77.6	23.7	28.4	5.6	44.4
Total Gas Turbines Annual Emissions (tons/year) =								84.4	77.6	23.6	28.4	5.6	44.4
Total Emergency Engines Annual Emissions (tons/year) =								0.3	0.1	0.0	0.0	0.0	
Total Gas Compressors Annual Emissions (tons/year) =										0.1			

Notes:

(1) Set hourly startup/shutdown emission rate to 100% load normal emission level to determine worst case annual emissions for AQ modeling purposes.

Table 5.1B-15 (Revised 6/24/14)
CECP Amendment
Annual Emissions - Non-Commissioning Year

	Hours	NOx	CO	VOC	PM10	SOx(1)	NH3(1)	NOx	CO	VOC	PM10	SOx	NH3
	per	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/hr)	(lbs/year)	(lbs/year)	(lbs/year)	(lbs/year)	(lbs/year)	(lbs/year)
	Year												
Single GT Start-Up	400	19.95	12.53	3.46	3.50	0.69	2.60	7,980	5,013	1,383	1,400	276	1,040
Single GT Normal Operation	1,900	9.00	8.80	2.50	3.50	0.69	6.70	17,100	16,720	4,750	6,650	1,311	12,730
Single GT Shutdown	400	7.65	10.29	4.36	3.50	0.69	2.60	3,060	4,117	1,743	1,400	276	1,040
Single GT Total =	2,700							28,140	25,851	7,877	9,450	1,864	14,810
Six GT Total =								168,840	155,104	47,260	56,700	11,181	88,860
Emergency Firepump Engine	50	1.02	0.24	0.03	0.03	0.00		51	12	1	2	0	
Emergency Generator Engine	50	1.92	0.58	0.06	0.04	0.00		96	29	3	2	0	
Natural Gas Compressors										103			
Total New Equipment Annual Emissions (lb/year) =								168,987	155,145	47,367	56,704	11,181	88,860
Total New Equipment Annual Emissions (tons/year) =								84.5	77.6	23.7	28.4	5.6	44.4
Total Gas Turbines Annual Emissions (tons/year) =								84.4	77.6	23.6	28.4	5.6	44.4
Total Emergency Engines Annual Emissions (tons/year) =								0.1	0.0	0.0	0.0	0.0	
Total Gas Compressors Annual Emissions (tons/year) =										0.1			

Notes:

(1) Set hourly startup/shutdown emission rate to 100% load normal emission level to determine worst case annual emissions for AQ modeling purposes.

ATTACHMENT 9 SUMMARY OF HEAT RATES FOR SIMPLE-CYCLE GAS TURBINES

.				
Project	Turbine Make/Model	Heat Rate (HHV)	Reference	Document Link
Sentinel Energy Project	Eight GE LMS 100 simple cycle units	8,876Btu/kWh	Sentinel Energy Project, Amendment to Permit to Construct/Permit to Operate, GE performance runs, Case 100, guaranteed heat rate, October 30, 2009.	http://docketpublic.energy.ca.gov/PublicDocuments/Regulatory/Non %20Active%20AFC's/07-AFC- 3%20Sentinel/2009/October/TN%2054001%2010-30- 09%20Applicant's%20Air%20Permit%20Application%20Amendment% 20to%20SCAQMD.pdf
TID Almond 2 Power Plant	Three GE LM6000 simple cycle units	9,835 Btu/kWh	TID Almond 2 CEC staff assessment, page 4.1-65, April 2010, CEC Document CEC-700- 2010-011-REV	http://www.energy.ca.gov/2010publications/CEC-700-2010-011/CEC-700-2010-011.PDF
Walnut Creek Energy Project	Five GE LMS 100 simple cycle units	9,000 Btu/kWh	Walnut Creek Energy Park, Application for Certification Section 8.01, 11/2005	http://www.energy.ca.gov/sitingcases/walnutcreek/documents/applicant/afc/Section%208.01%20Air%20Quality.pdf
Amended CECP	Six GE LMS 100 simple cycle units	8,770 Btu/kWh	Amended CECP PTA, Air Quality Appendix 5.1B, April 2014, operating case 100	