DOCKETED

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RESPONSE TO CEC STAFF DATA REQUEST SET NO. 3 (65-68)

In support of the

PETITION TO AMEND

for the

PALMDALE ENERGY PROJECT

(08-AFC-09C)

Submitted to the:

California Energy Commission

Submitted by:

PALMDALE ENERGY, LLC

Prepared by:

DAYZEN LLC

FEBRUARY 2016

DAYZEN LLC

February 5, 2016

Eric Veerkamp
Compliance Project Manager
Siting, Transmission and Environmental Protection Division
California Energy Commission
1516 Ninth Street, MS-2000
Sacramento, CA 95814-5512

Subject: **PALMDALE ENERGY LLC'S RESPONSE TO CEC STAFF DATA REQUEST SET NO. 3 (65-68)**
PALMDALE ENERGY PROJECT (08-AFC-09C)

Dear Mr. Veerkamp,

On behalf of Palmdale Energy, LLC, enclosed for filing with the California Energy Commission is the electronic version of **PALMDALE ENERGY, LLC'S RESPONSE TO CEC STAFF DATA REQUEST SET NO.3 (65-68)**, for the Palmdale Energy Project (08-AFC-9C).

Sincerely,

Scott A. Galati
Counsel to Palmdale Energy, LLC

INTRODUCTION

Attached are Palmdale Energy, LLC's responses to California Energy Commission Staff (Staff) Data Request Set No. 3 (65-68) for the Palmdale Energy Project (PEP) Petition For Amendment. The Staff issued Data Request Set No. 3 (65-68) to Palmdale Energy LLC on January 15, 2016.

For context the text of the Background and Data Requests precede the Data Responses.

AIR QUALITY (65-68)

BACKGROUND: EXHAUST PARAMETERS OF THE EMERGENCY GENERATOR

Appendix Table 4.1A-5 shows that the emergency generator engine stack would have exhaust temperature of 759°F (677.04 Kelvin) and exhaust volume flow rate of 10,908.7 actual cubic feet per minute (ACFM). Appendix Table 4.1A-5 also shows that the stack diameter of the emergency generator would be 0.6667 feet (ft), and the exhaust velocity would be 521 ft/s (158.76 m/s), which is exceptionally high. The applicant used these parameters in the impacts modeling analysis of the emergency generator engine.

Modeling analysis using high exhaust temperatures and velocities would normally lessen ground-level impacts. Staff would like to understand how the modeled parameters were derived. Staff would like to have corresponding vendor data to verify the modeling parameters.

Data Request 65

Please provide detailed calculations to show how the modeled parameters for the emergency generator engine stack were derived, or otherwise describe how these data were selected and justify their use.

Response to Data Request 65

The emergency generator stack data were based on the Caterpillar data sheet for the 3512C diesel engine (included in Appendix DR-65 and provided to the CEC in the previous data response as Table 4.1A-5). Specifically, on page 4 of the technical data sheet, the exhaust stack temperature is 759.0 degrees F with the exhaust flow rate of 10,908.7 cubic feet per minute. The stack diameter was set to eight (8) inches as per the data sheet. This data was input into the spreadsheet also included in Appendix DR-65 for use in dispersion modeling analyses.

Data Request 66

Please provide vendor data to verify the modeling parameters.

Response to Data Request 66

The Caterpillar 3512C data sheet is included in Appendix DR-65.

Data Request 67

Please update the modeling analysis if any of the exhaust parameters need to be changed.

Response to Data Request 67

No modeling updates are needed.

TESTING OF THE EMERGENCY GENERATOR AND FIRE PUMP: BACKGROUND

The applicant's modeling analysis for 1-hour impacts was based on the assumption that testing of the fire pump and emergency generator engines would not take place during the same hour or during startup of the combustion turbines.

Data Request 68

Please propose language for a condition of certification that would prevent readiness testing of the fire pump and emergency generator during the same hour or during a combustion turbine startup.

Response to Data Request 68

The Antelope Valley Air Quality Management District (AVAQMD) has the following proposed permit conditions in the Preliminary Determination of Compliance:

Emergency Generator Authority to Construct Conditions

[One 2011 hp emergency IC engine driving a generator, Application Number: AV2000000502]

4. This engine shall not be operated for testing purposes during CTG startup/shutdown periods or tested during the same hour as the fire pump.

Emergency Fire Suppression Water Pump Authority to Construct Conditions

[One 140 hp emergency IC engine driving a fire suppression water pump, Application Number: AV2000000501]

4. This engine shall not be operated for testing purposes during CTG startup/shutdown periods or tested during the same hour as the emergency generator.

APPENDIX DR-65

CATERPILLAR 3512C DATA SHEET & TABLE 4.1A-5 EMERGENCY GENERATOR SET EMISSIONS ESTIMATES

Diesel Generator Set

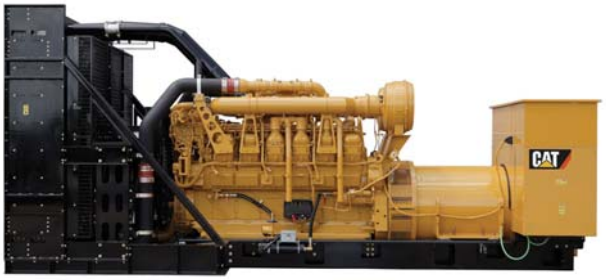

Image shown may not reflect actual package

Standby
1500 ekW 1875 kVA
60 Hz 1800 rpm 480 Volts

Caterpillar is leading the power generation Market place with Power Solutions engineered to deliver unmatched flexibility, expandability, reliability, and cost-effectiveness.

FUEL/EMISSIONS STRATEGY
- EPA Certified for Stationary Emergency Application (EPA Tier 2 emissions levels)

DESIGN CRITERIA
- The generator set accepts 100% rated load in one step per NFPA 110 and meets ISO 8528-5 transient response.

UL 2200
- UL 2200 packages available. Certain restrictions may apply. Consult with your Cat dealer.

FULL RANGE OF ATTACHMENTS
- Wide range of bolt-on system expansion attachments, factory designed and tested
- Flexible packaging options for easy and cost effective installation

SINGLE-SOURCE SUPPLIER
- Fully prototype tested with certified torsional vibration analysis available

WORLDWIDE PRODUCT SUPPORT
- Cat® dealers provide extensive post sale support including maintenance and repair agreements
- Cat dealers have over 1,800 dealer branch stores operating in 200 countries.
- The Cat® SOS℠ program effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by products.

CAT 3512C ATAAC DIESEL ENGINE
- Reliable, rugged, durable design
- Field proven in thousands of applications worldwide
- Four-stroke diesel engine combines consistent performance and excellent fuel economy with minimum weight

CAT GENERATOR
- Matched to the performance and output characteristics of Caterpillar engines
- Single point access to accessory connections
- UL 1446 Recognized Class H insulation

CAT EMCP 4 CONTROL PANELS
- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

STANDBY 1500 ekW 1875 kVA

60 Hz 1800 rpm 480 Volts

Factory Installed Standard & Optional Equipment

System	Standard	Optional
Air Inlet	• Single element canister type air cleaner with service indicator	[ ] Dual element air cleaners
Cooling	• Package mounted radiator	
Exhaust	• Exhaust flange outlet	[ ] Mufflers
Fuel	• Secondary fuel filters • Fuel cooler • Fuel priming pump	
Generator	• Matched to the performance and output characteristics of Cat engines	[ ] Oversize & premium generators [ ] Permanent magnet excitation (PMG) [ ] Internal excitation (IE) [ ] Winding temperature detectors [ ] Anti-condensation space heaters
Power Termination	• Bus bar	[ ] Circuit breakers, UL listed [ ] Bottom cable entry [ ] Right, left, and/or rear power termination
Governor	• ADEM™ A3	[ ] Load share module
Control Panel	• EMCP 4	[ ] EMCP 4.2 [ ] EMCP 4.3 [ ] EMCP 4.4 [ ] Local & remote annunciator modules [ ] Digital I/O Module [ ] Generator temperature monitoring & protection
Mounting		[ ] Spring type vibration isolator [ ] IBC 2006 seismic certification
Starting / Charging	• 24 volt starting motor(s) • Batteries with rack and cables • Battery disconnect switch	[ ] Battery chargers (10 & 20 Amp) [ ] 45A charging alternator [ ] Oversize batteries [ ] Ether starting aids [ ] Heavy duty starting motors [ ] Barring device (manual) [ ] Air starting motor with control & silencer [ ] Jacket water heater
General	• Paint – Caterpillar Yellow except rails and radiators gloss black	[ ] UL 2200 listed [ ] CSA Certification

STANDBY 1500 ekW 1875 kVA

60 Hz 1800 rpm 480 Volts

SPECIFICATIONS

CAT GENERATOR

Frame ……..…….. 1447
Excitation ……..……...PM
Pitch…….0.6667
Number of poles…….……4
Number of leads…….……6
Number of bearings ……..……Single Bearing
Insulation ……..Class H
IP rating ……..Drip proof IP23
Over speed capability - % of rated……125%
Wave form deviation……...2 %
Voltage regulator…… 3 phase sensing
Voltage regulation….Less than ±1/2% (steady state)
Less than ±1/2% (3% speed change)

CAT DIESEL ENGINE

3512C ATAAC, V-16, 4 stroke, water-cooled diesel

Bore ……..170.00 mm (6.69 in)
Stroke ……..190.00 mm (7.48in)
Displacement ……51.80 (3161.03 in^3)
Compression ratio……14.7:1
Aspiration……TA
Fuel system……Electronic unit injection
Governor Type…….. ADEM™ A3

CAT EMCP 4 CONTROL PANELS

EMCP 4 controls including:
- Run / Auto / Stop Control
- Speed & Voltage Adjust
- Engine Cycle Crank
- Emergency stop pushbutton

EMCP 4.2 controller features:
- 24-volt DC operation
- Environmental sealed front face
- Text alarm/event descriptions

Digital indication for:
- RPM
- DC volts
- Operating hours
- Oil pressure (psi, kPa or bar)
- Coolant temperature
- Volts (L-L & L-N), frequency (Hz)
- Amps (per phase & average)
- Power Factor (per phase & average)
- kW (per phase, average & percent)
- kVA (per phase, average & percent)
- kVAr (per phase, average & percent)
- kW-hr & kVAr-hr (total)

Warning/shutdown with common LED indication of shutdowns for:
- Low oil pressure
- High coolant temperature
- Overspeed
- Emergency stop
- Failure to start (overcrank)
- Low coolant temperature
- Low coolant level

Programmable protective relaying functions:
- Generator phase sequence
- Over/Under voltage (27/59)
- Over/Under Frequency (81 o/u)
- Reverse Power (kW) (32)
- Reverse Reactive Power (kVAr) (32RV)
- Overcurrent (50/51)

Communications
- Customer data link (Modbus RTU)
- Accessory module data link
- Serial annunciator module data link

- 6 programmable digital inputs
- 4 programmable relay outputs (Form A)
- 2 programmable relay outputs (Form C)
- 2 programmable digital outputs

Compatible with the following optional modules:
- Digital I/O module
- Local Annunciator
- Remote annunciator
- RTD module
- Thermocouple module

STANDBY 1500 ekW 1875 kVA

60 Hz 1800 rpm 480 Volts

Technical Data

Open Generator Set - 1800 rpm/60 Hz/480 Volts		
EPA Certified for Stationar Emergency Applications (EPA Tier 2 emissions levels)		
Generator Set Package Performance		
Genset Power rating @ 0.8 pf	1875 kVA	
Genset Power Rating with fan	1500 ekW	
Fuel Consumption		
100% Load with fan	396.0 L/hr	104.6 Gal/hr
75% Load with fan	310.5 L/hr	82.0 Gal/hr
50% Load with fan	219.8 L/hr	58.1 Gal/hr
Cooling System[1]		
Air flow restriction (system)	0.12 kPa	0.48 in. water
Air flow (max @ rated speed for radiator arrangement)	2075 m3/min	73278 cfm
Engine coolant capacity with radiator	390.8 L	103.2 gal
Engine coolant capacity	156.8 L	41.4 gal
Radiator coolant capacity	234.0 L	61.8 gal
Inlet Air		
Combustion air inlet flow rate	129.4 m^3/min	4569.7 cfm
Exhaust System		
Exhaust stack gas temperature (engine out)	403.9 °C	759.0 °F
Exhaust gas flow rate	308.9 mm^3/min	10908.7 cfm
Exhaust flange size (internal diameter)	203.2 mm	8.0 in
Exhaust system backpressure (maximum allowable)	6.7 kPa	26.9 in water
Heat Rejection		
Heat rejection to cooolant (total)	616 kW	35032 Btu/min
Heat rejection to exhaust (total)	1322 kW	75182 Btu/min
Heat rejection to aftercooler	481 kW	27354 Btu/min
Heat rejection to atmosphere from engine	124 kW	7052 Btu/min
Heat rejection to atmosphere from generator	74 kW	3141 Btu/min
Alternator[2]		
Motor starting capabiliy @30% voltage dip	4350 skVA	
Frame	1447	
Temperature Rise	150 °C	270 °F
Lube System		
Sump refil with filter	310.4 L	82 gal
Emissions (Nominal)[3]		
NOx g/hp-hr	4.08 g/hp-hr	
CO g/hp-hr	0.44 g/hp-hr	
HC g/hp-hr	0.11 g/hp-hr	
PM g/hp-hr	0.03 g/hp-hr	

[1] For ambient and altitude capabilities consult your Cat dealer. Air flow restriction (system) is added to existing restriction from factory.

[2] Generator temperature rise is basd on a 40 degree C ambient per NEMA MG1-32. UL2200 Listed ppackages may have oversized generators with a different temperature rise and motor starting characteristics.

[3] Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1for measuring HC, CO, PM, NOx. Data shown is based on steady state operating conditions of 77°F, 28.42 in HG and number 2 diesel fuel with 35° API and LHV of 18,390 btu/lb. The nominal emissions data shown is subject to instrumentation, measurement, facility and engine to engine variations. Emissions data is based on 100%load and thus cannot be used to compare to EPA regulations which use values based on a weighted cycle. Emissions values are tailpipe out with aftertreatment installed. Values shown as zero may be greater than zero but were below the detection level of the equipment used at the time of measurement.

STANDBY 1500 ekW 1875 kVA
60 Hz 1800 rpm 480 Volts

RATING DEFINITIONS AND CONDITIONS

Meets or Exceeds International Specifications: · AS1359, CSA, IEC60034-1, ISO3046, ISO8528, NEMA MG 1-22, NEMA MG 1-33, UL508A, 72/23/EEC, 98/37/EC, 2004/108/EC

Standby - Output available with varying load for the duration of the interruption of the normal source power. Average power output is 70% of the standby power rating. Typical operation is 200 hours per year, with maximum expected usage of 500 hours per year. Standby power in accordance with ISO8528. Fuel stop power in accordance with ISO3046.

Ratings are based on SAE J1349 standard conditions. These ratings also apply at ISO3046 standard conditions

Fuel Rates are based on fuel oil of 35º API [16º C (60º F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29º C (85º F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal.). Additional ratings may be available for specific customer requirements, contact your Cat representative for details. For information regarding Low Sulfur fuel and Biodiesel capability, please consult your Cat dealer.

DIMENSIONS

Package Dimensions		
Length	5943.6 mm	234.0 in
Width	2280.3 mm	89.8 in
Height	2791.1 mm	109.9 in

NOTE: For reference only - do not use for installation design. Please contact your local dealer for exact weight and dimensions.

www.Cat-EectricPower.com

Feature Code: 512DR7H

Gen. Arr. Number: 383-8418

Sourced: U.S. Sourced

EPD0174-A (07/13)

Table 4.1A-5 Emergency Gen Set Emissions Estimates

EXPECTED INTERNAL COMBUSTION ENGINE EMISSIONS

Liquid Fuel — # of Identical Engines: 1

Emergency Generator

Mfg:	Caterpillar 3512C or Similar Engine					Stack Data						
Engine #:	2015 Family FCPXL78.1NZS					Height:	20	Ft.(1)	6.096	meters		
kWe:	1500					Diameter:	0.6667	Ft.	0.2032	meters		
BHP:	2011					Temp:	759	deg F	677.04	Kelvins		
RPM:	1800					ACFM:	10908.7		158.76	m/s		
Fuel:	#2 Diesel					input the mfg ACFM or calculate per Exhaust sheet)						
Fuel Use:	104.6	gal/hr				Area:	0.349	Sq.Ft.				
FuelHHV:	139000	Btu/gal				Velocity:	521	Ft/Sec				
mmbtu/hr:	14.54	HHV			Max Daily Op Hrs/Emission Calcs Only:			1				
						Max Annual Op Hrs:		26				
Fuel Wt:	6.87	lbs/gal										
Fuel S:	0.0015	% wt.				If the engines will operate less than an hour for purposes						
Fuel S:	0.10305	lbs/1000 gal				of testing, the modeled emissions rates adjusted below accordingly.						
SO2:	0.2061	lbs/1000 gal										
SO2:	9.779	equiv.g/hr										

		--- for 60 mins/hour ---		Single Engine				*All Engines*			
Emissions	**EF(g/hp-hr)**	**g/hr**	**g/s**	**Lb/Hr**	**Lb/Day**	**Lbs/Yr**	**Tons/Yr**	***Lb/Hr***	***Lb/Day***	***Lbs/Yr***	***Tons/Yr***
NOx	3.78	7601.58	2.112	16.758	16.758	435.7	0.218	*16.758*	*16.758*	*435.7*	*0.218*
CO	0.67	1347.37	0.374	2.970	2.970	77.2	0.039	*2.970*	*2.970*	*77.2*	*0.039*
HC	0.19	382.09	0.106	0.842	0.842	21.9	0.011	*0.842*	*0.842*	*21.9*	*0.011*
PM (2)	0.09	180.99	0.050	0.399	0.399	10.4	0.005	*0.399*	*0.399*	*10.4*	*0.005*
SOx (3)	NA	9.779	0.003	0.022	0.0216	0.56	0.0003	*0.0216*	*0.0216*	*0.56*	*0.0003*

Notes:

(1) Stack height set equal to 3.5' above structure height

(2) PM10/PM2.5 equals PM, used in HRA for DPM emissions

(3) Based on ultralow (15 ppm) sulfur fuel

(4) Based on 1.3409 bhp per kWe

Modeled Emission Rates	**g/s**	
1-hr NOx	1.056	
Ann NOx	6.267E-3	*and 1-hr NO2 NAAQS*
1-hr CO	0.187	
8-hr CO	0.023	
1-hr SO2	1.358E-3	
3-hr SO2	4.527E-4	
24-hr SO2	5.659E-5	
24-hr PM	1.047E-3	
Ann PM	1.492E-4	

0.5 hr/test

1 test/day