Case 11-E-0593
Petition of Cricket Valley Energy Center, LLC for an Original Certificate of Public Convenience and Necessity and for an Order Providing for Lightened Regulation.

RESPONSE TO
STAFF OF THE DEPARTMENT OF PUBLIC SERVICE
INTERROGATORY/DOCUMENT REQUEST

Request No.:	DPS-8
Requested By:	Edward Schrom and Richard Quimby
Date of Request:	December 23, 2011
Reply Date:	January 2, 2012
Company contact:	
Subject:	Black start generators

Request:

1. Provide catalogue cut sheets and the technical specifications for the black start generators.

Response:

1. The diesel generator set comprises either an in-line or V-type multi-cylinder turbocharged diesel engine directly driving an electric generator at 1,800 revolutions per minute. Generator output is at 4,160 volts/60 Hertz. The engine is provided with a sealed jacket water system that is cooled by an air-cooled radiator, which also cools the turbocharger aftercooler and the engine lube oil cooler. The engines' exhausts are equipped with SCR for the control and reduction of NOx emissions.

Attached is the anticipated vendor equipment cut sheet and technical specifications for the diesel generator. Final design engineering will verify the generator's design for the project's black start requirements and air emissions compliance.

Name of Person
Preparing Response: Jeffrey Ahrens Date: January 11, 2012

DIESEL GENERATOR SET

Image shown may not reflect actual package

Standby
3000 ekW 3750 kVA
60 Hz 1800 rpm
4160 Volts

Caterpillar®is leading the power generation market place with power solutions engineered to deliver unmatched performance, reliability, durability and cost-effectiveness.

FEATURES

EMISSIONS / FUEL STRATEGY
- EPA Tier 2

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

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

SINGLE SOURCE SUPPLIER
- Fully prototype tested with field validation

WORLDWIDE PRODUCT SUPPORT
- Caterpillar® dealers provide extensive post-sale support including maintenance and repair agreements
- Caterpillar dealers have over 1,600 dealer branch stores operating in 200 countries
- CAT SOS^{SM} program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

CAT C175-16 DIESEL ENGINE
- Reliable and durable
- Four-stroke diesel engine combines superior performance with excellent fuel economy
- Advanced electronic engine control
- Low installation and operating cost

CAT SR5 GENERATOR
- Designed to match performance and output characteristics of Caterpillar diesel engines
- Industry leading mechanical and electrical design
- Industry leading motor starting capabilities
- High efficiency

CAT EMCP3 CONTROL PANELS
- Simple user friendly interface and navigation
- Scalable system to meet a wide range of customer needs
- Integrated Control System and Communications Gateway

Factory Installed Standard & Optional Equipment

System	Standard	Optional
Air Inlet	• Air cleaner; 4 x single element canister with service indicator(s) • Plug group for air inlet shut-off	• Air cleaner; 4 x dual element with service indicator(s) • Air inlet adapters
Control Panel	• EMCP 3.1 (set mounted)	• EMCP 3.2 or 3.3 • Local & remote annunciator modules • Discrete I/O module • Generator temperature monitoring & protection • Remote monitoring • Load share module
Cooling	• SCAC cooling • Jacket water and AC inlet / outlet flanges	• Remote horizontal SCAC radiator • Remote fuel cooler • Low coolant level sensor (for remote radiators)
Exhaust	• Dry exhaust manifold • Bolted flange (ANSI 6" & DIN 150) with bellow for each turbo (qty 4)	• Engine Exhaust Temperature Module • Mufflers (15dBA, 25dBA, or 40dBA) • 20" vertical exhaust collector • Weld flange ANSI 20"
Fuel	• Primary fuel filter with water separator • Secondary/ tertiary fuel filters (engine mounted)	
Generator	• SR5 generator - 3 phase brushless, salient pole - IEC platinum stator RTDs - Cat Digital Voltage Regulator (CDVR)	• Space heater kit • Oversized generators • Power connection arrangement
Governor	• ADEM™ A4	• Redundant shutdown
Lubrication	• Lubricating oil • Oil filter, filler and dipstick • Oil drain line with valves • Fumes disposal • Gear type lube oil pump • Integral lube oil cooler	• Electric prelube pump
Mounting	• Rails-engine / generator • Rubber anti-vibration mounts (shipped loose)	• Spring type linear vibration isolators • IBC vibration isolators
Starting / Charging	• Dual 24 volt electric starting motors • Batteries with rack and cables • Battery disconnect switch	• Oversized battery set • 75 amp charging alternator • Battery chargers (20 amp) • Jacket water heater • Ether starting aid
Crankcase Systems	• Open crankcase ventilation	• Crankcase explosion relief valve
Circuit Breakers		(No set mounted circuit breakers available on medium or high voltage packages)
General	• RH service (Except LH Service Oil Filter) • SAE standard rotation • Paint - Caterpillar yellow with high gloss black rails • Flywheel and flywheel housing - SAE N0. 00	• Barring group- manual or air powered • Factory test reports

CAT C175 ENGINE

Engine	C175	
Number of cylinders	16	
Cycle	Four stroke	
Cooling	Water	
Bore	175 mm	6.89 inches
Stroke	220 mm	8.66 inches
Displacement	84.67 L	5166.63 in^3
Compression ratio	15.3:1	
Aspiration	TA	
Cooling type	SCAC	
Fuel system	Common Rail	
Governor type	ADEM™ A4	

CAT SR5 GENERATOR

Frame	1846
Insulation class (UL1446 recognized)	H
Temperature rise @ 40C ambient	150 ^oC
Winding type	Form
Winding connection	Star (wye)
Winding pitch	0.6667
Excitation	PM
Motor starting capability @30% voltage dip and 0.4 pf (skVA)	8350 skVA
Number of poles	4
Number of bearings	2
Number of leads	6
Number of phases	3
IP rating	IP23
Overspeed capability - % of rated	125%
Wave form deviation	Less than 3%
Telephone Influence Factor (TIF)	Less than 50
Harmonic distortion	Less than 5%
Heat rejection to atmosphere	125.0 kW

CAT CDVR VOLTAGE REGULATOR

Caterpillar Digital Voltage Regulator (CDVR)	
Microprocessor based	
VAR/PF control	
RFI suppression	
Minimum / maximum excitation limiter	
Exciter diode monitor	
Direct 3 phase sensing with selectable volts/Hz	
Communicates with EMCP3	
Programmable operating characteristics	
Compatible with SE, PM and IE excitation	
Voltage regulation steady state	less than +/- 0.25%

CATERPILLAR EMCP 3 CONTROLS

Features	EMCP3.1 (Standard)	EMCP 3.2 (Optional)	EMCP 3.3 (Optional)
• 12-24 Volt (nominal) DC control	X	X	X
• Run/Auto/stop control	X	X	X
• Display size (mm)	24x95	24x95	28x100
• Display size (pixels)	33 x132	33 x132	64x240
• Display available in any of 26 languages with text translation capability	X	X	X
• Temperature operating range -40˚C to 70˚C (-40˚F to 158˚F), (display to -20˚C/-4˚F)	X	X	X
• Designed for mounting on generator set package (vibration tested to 4.3G sinusoidal and 15G shock)	X	X	X
• 3-phase, true RMS metering	X	X	X
• Generator metering accuracy (+/- X%)	2	1	1
• Metering - L-L volts, L-N Volts, phase Amps, Hz	X	X	X
• Digital indications for RPM, operating hours, oil pressure, coolant temperature and system DC voltage	X	X	X
• Two LED indicators for common warning/shutdown alarms (i.e. low oil pressure, high coolant temperature, low coolant level, over-speed, emergency stop, failure to start due to over crank, etc.)	X	X	X
• Reset all events function	X	X	X
• Voltage adjust when CDVR is on J1939 data-link	X	X	X
• Integrates with ADEM engine governor for engine monitoring, alarms, and control	X	X	X
• Integrates with Caterpillar Digital Voltage Regulator (CDVR) for alarms and control	X	X	X
• Compatible with Caterpillar ET service tool for enhanced serviceability including data capturing from event log, data logging, set point programming and troubleshooting	X	X	X
• Field re-flashable software ensures the customers get the latest updated software	X	X	X
• Programmable switch inputs	4	6	6
• Programmable relay outputs (2A continuous DC)	4	6	6
• Integration with programmable annunciator module - local/remote (NFPA 99-110) (optional)		Maximum 4	Maximum 4
• Integration with programmable discrete I/O (DIO) module (optional)		Maximum 4	Maximum 4
• Programmable discrete outputs		1	2
• Additional configurable Input (0-2 kOhm resistive sender)		1	1
• Programmable protective relaying functions - under/over voltage, under/over frequency and phase over-current		X	X
• Programmable kW level relay		X	X
• Power metering - ekW, kVA, kVAR, kWhr, %kW, PF		X	X
• Built in Modbus isolated data link (RS –485 half-duplex) that supports serial communication at data rate up to 57.6 kbaud and functions as a communications gateway to the customer's SCADA system or device, providing all generator set data for remote monitoring, automatically generated monthly reports, trending/graphing, storing events history, etc.		X	X
• Free Modbus RTU / remote monitoring PC software		X	X
• Engine crank attempt counter		X	X
• Engine successful start counter		X	X
• Service maintenance interval (engine hrs & real-time)		X	X
• Engine oil temperature in ºC or ºF (optional)		X	X
• Real time clock		X	X
• Programmable cycle timer		X	X
• Programmable protective relaying function - reverse power			X
• Enhanced engine monitoring - intake/exhaust manifold, SCAC inlet, oil and fuel temperatures; fuel, crankcase and intake manifold pressures; oil, fuel and air filter restrictions; instant and total fuel consumption - where supported by Engine Control Module (ECM)			X
• Integration with RTD module for generator temperature monitoring (optional)			Maximum 1
• Integration with thermocouple module(s) for generator temperature monitoring (optional)			Maximum 2

TECHNICAL DATA

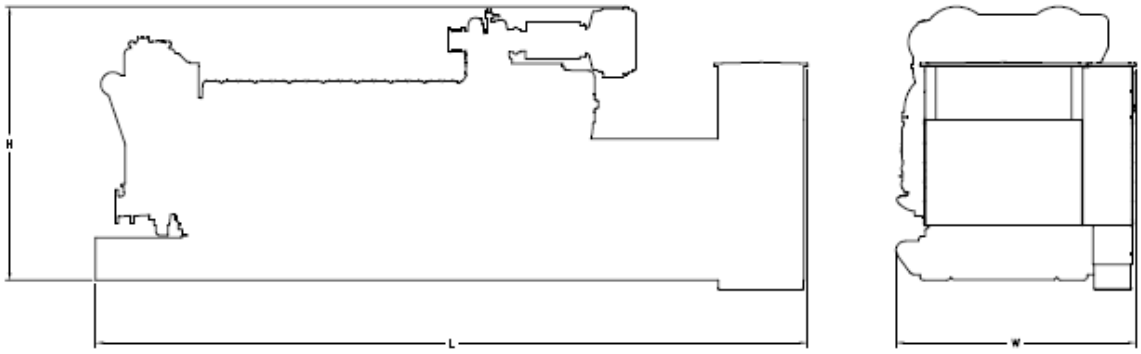
EPA Tier 2		
Generator Set Package Performance	**Units**	
Generator set power rating @ 0.8 pf	3750 kVA	
Generator set power rating with fan *	3000 ekW	
Generator set rated voltage	4160 Volts	
Generator set rated current @0.8 pf (Amps)	520.5 Amps	
Air Inlet		
Combustion air inlet flow rate	264.9 m3/min	9356 cfm
Cooling System		
Coolant to aftercooler temp max	46°C at 30°C ambient	115°F at 86°F ambient
Emissions (Nominal[1]**)**		
NOx+ HC		5.19 g/bhp-hr
CO		0.63 g/bhp-hr
HC		0.1 g/bhp-hr
PM		0.03 g/bhp-hr
Exhaust System		
Exhaust stack gas temperature	473.7°C	884.6°F
Exhaust gas flow rate (Wet)	695.6 m3/min	24,565.7 cfm
Exhaust system backpressure (max. allowable)	6.7 kPA	26.9 in water
Exhaust flange size (internal diameter)	150 mm	6 inches
Fuel Consumption		
100% Load with fan	807.4 L/hr	213.3 Gal/hr
75% Load with fan	616.3 L/hr	162.8 Gal/hr
50% Load with fan	489.1 L/hr	129.2 Gal/hr
Heat Rejection		
Heat rejection to coolant (total)	1,377.8 kW	78,423.0 Btu/min
Heat rejection to exhaust (total)	3,107.6 kW	176,885.0 Btu/min
Heat rejection to aftercooler (Stage 2)	494.2 kW	28,128.0 Btu/min
Heat rejection to atmosphere from engine	275.8 kW	15,698.0 Btu/min
Heat rejection to atmosphere from generator	125.0 kW	7,115.0 Btu/min
Lube System		
Sump refill with filter	540 L	142.6 Gal

* The generator set package is not offered with an engine driven radiator. The addition of an engine driven fan will not reduce the output below the nameplate rating.

1. Emissions data measurement procedures are consistent with those described in EPA CFR 40 Part 89, Subpart D & E and ISO8178-1 for 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.

Package Dimensions and Weights

Length	6,464.7 mm	254.51 in
Width	2,089.4 mm	82.26 in
Height	2,211.1 mm	87.05 in
Approx. Package Weight- Dry	18,510 kg	40,800 lbs



RATING DEFINITIONS AND CONDITIONS

Ratings are based on SAE J1995 standard conditions. These ratings also apply at ISO3046 standard conditions.

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. Standby ambients shown indicate ambient temperature at 100% load which results in a coolant top tank temperature just below the shutdown temperature.

Additional Ratings may be available for specific customer requirements. Consult your Caterpillar representative for details.

Meets or Exceeds International Specifications:· AS1359, CSA, IEC60034, ISO3046, ISO8528, NEMA MG 1-33, UL508A, 98/37/EC

Fuel Rates are based on fuel oil of 35º API (16º C or 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.).

Emissions Data measurement procedures are consistent with those described in EPA CFR 40 Part 89, subpart D and E, and ISO8178-1 for measuring HC, CO, PM and NOx. Data shown is based on steady state operating conditions of 77ºF, 28.42 in HG and number 2 diesel fuel with 35º 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 EPA regulations which use values based on a weighted cycle.

Performance Number: DM8448
Feature Code: 175DE11
Generator Arrangement: 252-3974
U.S Sourced
December 2008

www.CAT-ElectricPower.com

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