March 12, 2013

Kansas Department of Health & Environment
1000 SW Jackson, Suite 310
Topeka, KS 66612

Attention: Ms. Ann Spitz

Re: Kansas Municipal Energy Agency
Jameson Energy Center
Air Permit
Project No. 13-0016, PER

SUBJECT: APPLICATION UPDATE

Dear Ms. Spitz:

On behalf of the Kansas Municipal Energy Agency (KMEA), Sega, Inc. (Sega) is submitting this update to the Jameson Energy Center air permit application. The content of this letter addresses questions asked by the Kansas Department of Health & Environment (KDHE) and revises the permit application with a larger black-start engine.

The new black-start engine will be a 1000-kW Caterpillar C32 ATAAC diesel engine. This engine will be operated only for testing and during emergencies, and will meet the required Environmental Protection Agency (EPA) Tier 2 emissions standards. This larger engine includes a 1000-gallon diesel fuel storage tank which sits at the base of the engine and is an insignificant emission source. Sega is attaching new emission calculations, a new engine form, and manufacturer specification sheets for this new engine and associated fuel tank.

KDHE requested clarification on the nameplate capacity of the combustion turbine generators (CTGs). Based on data provided by the turbine manufacturer that took into account site-specific conditions, the maximum CTG output will be 12.32 MW each. However, the nameplate capacity of the actual electrical generator portion of the CTG package is 14 MW.

KDHE requested clarification on how the STG-400 tracks dry low-NO_X emission (DLE) mode for compliance monitoring requirements in New Source Performance Standards (NSPS), Subpart KKKK. Based on a discussion with the CTG manufacturer, the turbines always operate in DLE mode and there is no DLE signal that is tracked by the unit. Because there is not a specific signal available for tracking as a continuous parameter monitoring method of compliance, KMEA proposes to meet the compliance monitoring requirements for Subpart KKKK by periodic stack testing. Based on 60.4340(a), annual

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stack testing will be performed to demonstrate NO_X emission limit compliance. If the performance test result is less than or equal to 75 percent of the NO_X emission limit, then stack testing may be reduced to once every 2 years (no more than 26 calendar months following the previous performance test).

If you have any questions or need any additional information, please contact either Brian Petermann (bpetermann@segainc.com) or Steven Babler (sbabler@segainc.com) by phone (913-681-2881) or email.

Sincerely,

SEGA, INC.

Steven Babler
Air Quality Engineer

SWB/kge

Enc. 4

c: Bob Poehling, KMEA
Max Sherman, Sega
Joe Bondank, Sega

Blackstart Engine

Size	1000	kW	
Size	1474	bhp	
Fuel	Diesel		
Ignition Type	CI		
Hours of Operation	500	Hour/year	
Fuel	71.9	gal/hr	
Diesel Heating Value	0.138	MMBtu/gal	GHG Rule
Diesel Density	6.943	lb/gal	
Sulfur Content	0.0015	%	
	4961.1	MMBtu/yr	
	737000	bhp-hr/yr	

Diesel Combustion GHG Emissions

Emission Factor Source	CO_2 EF	N_2O EF	CH_4 EF	CO_2e EF	Units	
GHG Reporting Rule	73.96	6.00E-04	3.00E-03	74.90	kg/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.18&idno=40
GHG Reporting Rule	163	1.3E-03	6.6E-03	165	lb/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.19&idno=40

Maximum Potential to Emit of Engine

Pollutant	EF	Units	Source	TPY	
NOx	4.93	g/hp-hr	Vendor	4.01	Appendx E
CO	0.13	g/hp-hr	Vendor	0.11	Appendx E
SO2	0.00075	lb/MMBtu	Fuel	0.00	
VOC	0.01	g/hp-hr	Vendor	0.01	Appendx E
PM	0.018	g/hp-hr	Vendor	0.01	Appendx E
CO2e	165	lb/MMBtu	GHG	410	

Natural Gas Combustion GHG Emissions

Emission Factor Source	CO_2 EF	N_2O EF	CH_4 EF	CO_2e EF	Units	
GHG Reporting Rule	53.02	1.00E-04	1.00E-03	53.33	kg/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.18&idno=40
GHG Reporting Rule	117	2.2E-04	2.2E-03	117.58	lb/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.19&idno=40

Natural Gas Heating Value

Design Basis	HHV	Units
Heating Value of Natural Gas	1,110	BTU/SCF

CO2E	Factor
CO2	1
CH4	21
N2O	310

CO2e Limit

100,000 tpy

Tons of CO_2e per MMSCF 65.24

Turbine Fuel Burned Limit	
MMSCF/Yr limit of Avoid PSD	**1,527**

Maximum Potential to Emit of Turbines

Pollutant	EF	Units	Source	TPY		
NOx	0.06623	lb/MMBtu	Vendor	56.1	Appendix D	
CO	0.02688	lb/MMBtu	Vendor	22.8	Appendix D	
SO2	0.0006	lb/MMBtu	Acid Rain	0.51	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=527feb3e4d1dea865d22bd2d1ee062b3&rgn=div9&view=text&node=40:17.0.1.1.4.8.1.7.9&idno=40	2.3.1.1 SO2 Emission Rate
VOC	0.042	lb/MMBtu	Vendor	35.74	Appendix D	
PM	0.007	lb/MMBtu	AP42	5.59	http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s01.pdf	
CO2e	117.58	lb/MMBtu	GHG	99,590		

Maximum Potential to Emit of Facility

Pollutant	TPY
NOx	60.1
CO	22.9
SO2	0.5
VOC	35.8
PM	5.6
CO2e	100,000

Kansas Department of Health and Environment
Division of Environment
Bureau of Air and Radiation

STATIONARY INTERNAL COMBUSTION ENGINES (EU-006)

1) Source ID Number : TBD

2) Company/Source Name: Jameson Energy Center

3) Type of Engine: Turbine __; Reciprocating X ; Other_____

4) Engine Manufacturer : Caterpillar
Model No.: CAT® ~~C15~~ C32 ATAAC Diesel Engine
Date of Manufacture: TBD
Serial No.: TBD

5) Use of Engine: Electric power generation _ ; Compressor ___ ; Pump_X_ ; Other – describe black start

6) Maximum Brake horsepower at continuous rating: ~~762~~ 1,474 BHP
Normal operating engine speed: 1,800 RPM
Rated Brake Horsepower at normal operating RPM: ~~762~~ 1,474 BHP
or
Maximum Generator Nameplate Capacity: ____kW
Maximum design heat input rate: ___ BTU/hr

7) Operating schedule: 500 hrs per year

8) Date of Installation: Fall 2013
Date of Last modification: _____

STATIONARY INTERNAL COMBUSTION ENGINES
(cont.)

RECIPROCATING ENGINES

14) Engine design details:

Number of cylinders ~~6~~12

Aspiration: Normal _____ ; Turbo charged_X

Ignition: Spark _____ ; Compression _X

Design class 2 cycle lean burn _____ ; 4 cycle lean burn_X_; 4 cycle rich burn _____

15) 2 or 4 cycle lean burn with combustion modification, increased air/fuel ratio and intercooling ?

Yes _____; No__X___

If yes, attach the guaranteed performance of the conversion supplier **or** the actual monitored performance, and the engine operating conditions for the guarantee of performance.

16) Type of integral emission control: Selective Catalytic Reduction _____ ;

Non Selective Catalytic Reduction _____ ; Combustion Reduction _____(Describe)___DLE_____; None X

17) Fuel(s): Gasoline _____ ; Diesel X_; Natural Gas _____ ; Dual fuel _____

18) Fuel Heating Value: Gasoline _____ BTU per gal; Diesel 138,000 BTU per gal;

Natural Gas _____ BTU per cu ft ; Dual fuel mix _ ____ % diesel _____ % natural gas

Sulfur content of diesel by weight 0.0015 %

APPLICABLE TO ALL STATIONARY INTERNAL COMBUSTION ENGINES

19) Enclose available engine manufacturers emissions data. Appendix E

20) For emission control equipment, use the appropriate CONTROL EQUIPMENT form and duplicate as needed. Be sure to indicate the emission unit that the control equipment is affecting.

DIESEL GENERATOR SET

Image shown may not reflect actual package.

STANDBY
1000 ekW 1250 kVA
60 Hz 1800 rpm 480 Volts

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

FEATURES

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 / CSA - Optional
- UL 2200 listed packages
- CSA Certified

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® S•O•S℠ program cost effectively detects internal engine component condition, even the presence of unwanted fluids and combustion by-products

CAT® C32 ATAAC DIESEL ENGINE
- Utilizes ACERT™ Technology
- Reliable, rugged, durable design
- Four-cycle diesel engine combines consistent performance and excellent fuel economy with minimum weight
- Electronic engine control

CAT GENERATOR
- Designed to match the performance and output characteristics of Cat diesel 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

SEISMIC CERTIFICATION
- Seismic Certification available
- Anchoring details are site specific, and are dependent on many factors such as generator set size, weight, and concrete strength.
  IBC Certification requires that the anchoring system used is reviewed and approved by a Professional Engineer
- Seismic Certification per Applicable Building Codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, CBC 2007
- Pre-approved by OSHPD and carries an OSP-0084-10 for use in healthcare projects in California

FACTORY INSTALLED STANDARD & OPTIONAL EQUIPMENT

System	Standard	Optional
Air Inlet	• Single element canister type air cleaner • Service indicator	[ ] Dual element air cleaners [ ] Air inlet adapters
Cooling	• Radiator with guard • Coolant drain line with valve • Fan and belt guards • Cat Extended Life Coolant • Coolant level sensors • Radiator duct flange	[ ] Jacket water heater
Exhaust	• Dry exhaust manifold • Flanged faced outlets	[ ] Stainless steel exhaust flex fittings [ ] Elbows, flanges, expanders & Y adapters
Fuel	• Primary fuel filter with water separator • Secondary fuel filter • Fuel priming pump • Flexible fuel lines • Fuel cooler	
Cat Generator	• Class H insulation • Cat Digital Voltage Regulator (CDVR) with kVAR/PF control, 3-phase sensing • Reactive droop	[ ] Oversize & premium generators [ ] Winding temperature detectors [ ] Anti-condensation heaters [ ] Bearing temperature detectors
Power Termination	• Bus bar (NEMA or IEC mechanical lug holes) • Top cable entry	[ ] Circuit breakers, UL listed, 3 pole with shunt trip, 100% rated, manual or electrically operated [ ] Circuit breakers, IEC compliant, 3 or 4 pole with shunt trip, manual or electrically operated [ ] Bottom cable entry [ ] Power terminations can be located on the right, left and/or rear as an option. Multiple circuit breaker options
Governor	• ADEM™ A4	[ ] Load Share Module
Control Panels	• EMCP 4.2 • User Interface panel (UIP) - rear mount • AC & DC customer wiring area (right side) • Emergency stop pushbutton	[ ] EMCP 4.3 ... [ ] EMCP 4.4 [ ] Option for right or left mount UIP [ ] Local & remote annunciator modules [ ] Digital I/O Module [ ] Generator temperature monitoring & protection [ ] Remote monitoring software
Lube	• Lubricating oil and filter • Oil drain line with valves • Fumes disposal • Gear type lube oil pump	
Mounting	• Rails - engine / generator / radiator mounting • Rubber anti-vibration mounts (shipped loose)	[ ] Spring-type vibration isolator [ ] IBC Isolators
Starting/Charging	• 24 volt starting motor(s) • Batteries with rack and cables • Battery disconnect	[ ] Battery chargers (10 amp) [ ] 45 amp charging alternator [ ] Oversize batteries [ ] Ether starting aid
General	• Right-hand service • Paint - Caterpillar Yellow (except rails and radiators that are gloss black) • SAE standard rotation • Flywheel and Flywheel housing - SAE No. 0	[ ] CSA certification [ ] EU Declaration of Incorporation [ ] EEC Declaration of Conformity [ ] Seismic Certification per Applicable Building Codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, CBC 2007

STANDBY 1000 ekW 1250 kVA

60 Hz 1800 rpm 480 Volts

SPECIFICATIONS

CAT GENERATOR

Frame size..... 1402
Excitation.....Internal Excitation
Pitch.....0.6667
Number of poles.....4
Number of bearings..... 2
Number of Leads.....006
Insulation..... UL 1446 Recognized Class H with tropicalization and antiabrasion
- Consult your Caterpillar dealer for available voltages

IP Rating.....IP23
Alignment.....Closed Coupled
Overspeed capability.....125
Wave form Deviation (Line to Line)..... 002.00
Voltage regulator.....3 Phase sensing with selectible volts/Hz
Voltage regulation.....Less than +/- 1/2% (steady state)
Less than +/- 1% (no load to full load)

CAT DIESEL ENGINE

C32 TA, V-12, 4-Stroke Water-cooled Diesel
Bore..... 145.00 mm (5.71 in)
Stroke..... 162.00 mm (6.38 in)
Displacement.....32.10 L (1958.86 in^3)
Compression Ratio..... 15.0:1
Aspiration.....TA
Fuel System.....MEUI
Governor Type.....ADEM™ A4

CAT EMCP 4 SERIES CONTROLS

EMCP 4 controls including:
- Run / Auto / Stop Control
- Speed and Voltage Adjust
- Engine Cycle Crank
- 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)
- ekW, kVA, kVAR, kW-hr, %kW, PF

Warning/shutdown with common LED indication of:
- 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:
- Six digital inputs (4.2 only)
- Four relay outputs (Form A)
- Two relay outputs (Form C)
- Two digital outputs
- Customer data link (Modbus RTU)
- Accessory module data link
- Serial annunciator module data link
- Emergency stop pushbutton

Compatible with the following:
- Digital I/O module
- Local Annunciator
- Remote CAN annunciator
- Remote serial annunciator

STANDBY 1000 ekW 1250 kVA

60 Hz 1800 rpm 480 Volts

TECHNICAL DATA

Open Generator Set - - 1800 rpm/60 Hz/480 Volts	DM9933	
EPA Certified for Stationary Emergency Application (EPA Tier 2 emissions levels)		
Generator Set Package Performance		
Genset Power rating @ 0.8 pf	1250 kVA	
Genset Power rating with fan	1000 ekW	
Fuel Consumption		
100% load with fan	272.1 L/hr	71.9 Gal/hr
75% load with fan	213.4 L/hr	56.4 Gal/hr
50% load with fan	144.7 L/hr	38.2 Gal/hr
Cooling System[1]		
Air flow restriction (system)	0.12 kPa	0.48 in. water
Engine coolant capacity	55.0 L	14.5 gal
Inlet Air		
Combustion air inlet flow rate	87.6 m^3/min	3093.6 cfm
Exhaust System		
Exhaust stack gas temperature	476.4 ° C	889.5 ° F
Exhaust gas flow rate	228.4 m^3/min	8065.9 cfm
Exhaust flange size (internal diameter)	203 mm	8 in
Exhaust system backpressure (maximum allowable)	10.0 kPa	40.2 in. water
Heat Rejection		
Heat rejection to coolant (total)	352 kW	20018 Btu/min
Heat rejection to exhaust (total)	1024 kW	58235 Btu/min
Heat rejection to aftercooler	288 kW	16379 Btu/min
Heat rejection to atmosphere from engine	127 kW	7222 Btu/min
Heat rejection to atmosphere from generator	62.7 kW	3565.7 Btu/min
Alternator[2]		
Motor starting capability @ 30% voltage dip	2734 skVA	
Frame	1402	
Temperature Rise	125 ° C	225 ° F
Lube System		
Sump refill with filter	99.0 L	26.2 gal
Emissions (Nominal)[3]		
NOx g/hp-hr	4.93 g/hp-hr	
CO g/hp-hr	.13 g/hp-hr	
HC g/hp-hr	.01 g/hp-hr	
PM g/hp-hr	.018 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] UL 2200 Listed packages may have oversized generators with a different temperature rise and motor starting characteristics. Generator temperature rise is based on a 40ºC ambient per NEMA MG1-32.
[3] 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 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 to EPA regulations which use values based on a weighted cycle.

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

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

Fuel rates are based on fuel oil of 35° API [16° C (60° F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29° C (85° 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	4474.2 mm	176.15 in
Width	2010.4 mm	79.15 in
Height	2173.7 mm	85.58 in

NOTE: For reference only - do not use for installation design. Please contact your local dealer for exact weight and dimensions. (General Dimension Drawing #).

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Image shown may not reflect actual package

C32 SUB BASE FUEL TANK

50 Hz & 60 Hz

Diesel Generator Set
910-1100 kVA 50 Hz
830-1000 kW 60 Hz

Dual Wall sub base fuel tanks offer an integrated fuel solution for your Cat diesel generator set.

FEATURES

- UL 142 (US) and ULC S601 (Canada) Listed
- NFPA 30, 37 and 110 installation compliant
- CSA C282-09 and B139-04 installation compliant
- Dual Wall, Secondary Containment (minimum of 110% of primary tank capacity)
- Tank design provides capacity for thermal expansion of fuel
- Direct reading fuel level gauge
- Fuel supply dip tube is positioned so as not to pick up fuel sediment
- Fuel return and supply dip tubes are separated by an internal baffle to prevent recirculation of heated return fuel
- Fuel fill – 101.6 mm (4 in), lockable flip top cap
- Primary tank level detection switch in containment basin
- Primary and secondary tanks are leak tested at 20.7 kPa (3 psi) minimum
- Interior tank surfaces coated with a solvent-based thin-film rust preventative
- Heavy gauge steel gussets suitable for lifting package
- Gloss Black polyester alkyd acrylic enamel exterior paint over epoxy based primer
- Primary tanks are equipped with customer connections for remote fuel transfer, return and vent
- 2” Atmospheric screened vent cap-raised
- Lockable 2" raised fuel fill
- 50% low fuel level switch
- Leak detection switch
- Port for access to containment tank
- Removable engine supply and return dip tubes
- Fittings for opt fuel levels or auxiliary fuel pump
- Stub-up access beneath circuit breaker (within fuel tank)
- Emergency vents on primary and secondary tanks are sized in accordance with NFPA 30
- Compatible with factory enclosures only
- The sub-base fuel tank mounts below the enclosure base
- Seismic certification per applicable building codes: IBC 2000, IBC 2003, IBC 2006, IBC 2009, CBC 2007
- Tested and analyzed in accordance with: ASCE 7-98, ASCE 7-02, ASCE 7-05, ICC-ES AC-156
- Anchoring details are site specific, and are dependent on many factors such as generator set size, weight, and concrete strength. IBC Certification requires that the anchoring system used is reviewed and approved by a Professional Engineer

ATTACHMENTS

Tank Capacity and Run Time

60 Hz							
Rating			Strategy	Performance Number	Run Time @ 100% Load (Hrs)		
ekW	kVA	SB/PP/CN			1000 gal / 3790 L	1500 gal / 5685 L	2000 gal / 7580 L
1000	1250	SB	Low BSFC	DM9939	14.4	21.6	28.8
910	1138	PP	Low BSFC	DM9940	15.7	23.6	31.4
830	1038	CN	Low BSFC	DM9941	17.4	26.1	34.7
1000	1250	SB	Tier 2 / ESE*	DM9933	13.9	20.8	27.8
910	1138	PP	Tier 2 / ESE*	DM9934	15.2	22.8	30.4
830	1038	CN	Tier 2 / ESE*	DM9935	16.4	24.5	32.7

* ESE - EPA Stationary Emergency Certified

50 Hz							
Rating			Strategy	Performance Number	Run Time @ 100% Load (Hrs)		
ekW	kVA	SB/PP/CN			1000 gal / 3790 L	1500 gal / 5685 L	2000 gal / 7580 L
880	1100	SB	Low BSFC	DM9951	16.7	25.1	33.4
800	1000	PP	Low BSFC	DM9952	18.3	27.5	36.6
728	910	CN	Low BSFC	DM9953	20.0	29.9	39.9
880	1100	SB	Low Emissions	DM9945	15.6	23.4	31.2
800	1000	PP	Low Emissions	DM9946	16.9	25.3	33.8
728	910	CN	Low Emissions	DM9947	18.7	28.0	37.3

Tank Dimensions

Fuel Capacity		Length		Width		Height		Weight	
Gallons	Liters	(mm)	(in)	(mm)	(in)	(mm)	(in)	kg	lbs
1000	3790	8387	330	2028	80	403	16	2375	5236
1500	5685	8387	330	2074	82	595	23	2783	6135
2000	7580	8387	330	2074	82	796	31	3223	7105

Note: For reference only – do not use for installation design. Please contact your dealer for exact weights and dimensions.

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Ann Spitz

From: Steven Babler [sbabler@segainc.com]
Sent: Monday, March 25, 2013 10:48 AM
To: Ann Spitz
Cc: Brian Petermann; Max Sherman; Joe Bondank; Kim English; Gerald McIntyre
Subject: KMEA Jameson Energy Center Emission Calculation Revision
Attachments: KDHE KMEA Calculations V2.xlsx

Ann,

As you discussed with Brian Petermann last friday here is the revised KMEA emission calculations. All changes are highlighted in yellow. The error in the GWP calculation has been fixed. Also the spreadsheet has been updated based on the Proposed Revisions to the Greenhouse Gas Mandatory Reporting Rule. These changes include:

- Updating the GWP of CH4 from 21 to 25
- Updating the GWP of N2O from 310 to 298
- Updated the Natural Gas CO2 emission factor from 53.02 to 53.06

These changes result in a very slight increase in the maximum allowable gas firing by the CTGs (1,527 to 1,533 MMSCF/yr).

If you have any questions or need any additional information, please contact either Brian Petermann (bpetermann@segainc.com) or me (sbabler@segainc.com) by phone (913-681-2881) or email.

Thanks,

Steven Babler
Air Quality Engineer
Sega, Inc
913-681-2881

Blackstart Engine

Size	1000	kW	
Size	1474	bhp	
Fuel	Diesel		
Ignition Type	CI		
Hours of Operation	500	Hour/year	
Fuel	71.9	gal/hr	
Diesel Heating Value	0.138	MMBtu/gal	GHG Rule
Diesel Density	6.943	lb/gal	
Sulfur Content	0.0015	%	
	4961.1	MMBtu/yr	
	737000	bhp-hr/yr	

Diesel Combustion GHG Emissions

Emission Factor Source	CO_2 EF	N_2O EF	CH_4 EF	CO_2e EF	Units	
GHG Reporting Rule	73.96	6.00E-04	3.00E-03	74.21	kg/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.18&idno=40
GHG Reporting Rule	163	1.3E-03	6.6E-03	164	lb/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.19&idno=40

Maximum Potential to Emit of Engine

Pollutant	EF	Units	Source	TPY	
NOx	4.93	g/hp-hr	Vendor	4.01	Appendx E
CO	0.13	g/hp-hr	Vendor	0.11	Appendx E
SO2	0.00075	lb/MMBtu	Fuel	0.00	
VOC	0.01	g/hp-hr	Vendor	0.01	Appendx E
PM	0.018	g/hp-hr	Vendor	0.01	Appendx E
CO2e	164	lb/MMBtu	GHG	406	

Natural Gas Combustion GHG Emissions

Emission Factor Source	CO_2 EF	N_2O EF	CH_4 EF	CO_2e EF	Units	
GHG Reporting Rule	53.06	1.00E-04	1.00E-03	53.11	kg/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.18&idno=40
GHG Reporting Rule	117	2.2E-04	2.2E-03	117.10	lb/MMBtu	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=de2cf55f482ba32f22b667bbcc7a305c&rgn=div9&view=text&node=40:22.0.1.1.3.3.1.10.19&idno=40

Natural Gas CO2 EF Updated based on propsed revision to 40 CFR Part 98 from 53.02 kg/MMBtu to 53.06 kg/MMBtu

Natural Gas Heating Value

Design Basis	HHV	Units
Heating Value of Natural Gas	1,110	BTU/SCF

CO2E	Factor
CO2	1
CH4	25
N2O	298

GWP Updated based on proposed revision to 40 CFR Part 98 from 21 to 25
GWP Updated based on proposed revision to 40 CFR Part 98 from 310 to 298

CO2e Limit

100,000 tpy

Tons of CO_2e per MMSCF 64.97

Turbine Fuel Burned Limit	
MMSCF/Yr limit of Avoid PSD	**1,533**

Maximum Potential to Emit of Turbines

Pollutant	EF	Units	Source	TPY		
NOx	0.06623	lb/MMBtu	Vendor	56.3	Appendix D	
CO	0.02688	lb/MMBtu	Vendor	22.9	Appendix D	
SO2	0.0006	lb/MMBtu	Acid Rain	0.51	http://www.ecfr.gov/cgi-bin/text-idx?c=ecfr&SID=527feb3e4d1dea865d22bd2d1ee062b3&rgn=div9&view=text&node=40:17.0.1.1.4.8.1.7.9&idno=40	2.3.1.1 SO2 Emission Rate
VOC	0.042	lb/MMBtu	Vendor	35.89	Appendix D	
PM	0.007	lb/MMBtu	AP42	5.61	http://www.epa.gov/ttn/chief/ap42/ch03/final/c03s01.pdf	
CO2e	117.10	lb/MMBtu	GHG	99,594		

Maximum Potential to Emit of Facility

Pollutant	TPY
NOx	60.3
CO	23.0
SO2	0.5
VOC	35.9
PM	5.6
CO2e	100,000