


APPENDIX G

GE LMS100



TURBINE GEN SET PERFORMANCE
FOR
Basin Electric Capacity Addition

GUARANTEED PARAMETERS		JOBSITE LOCATION: GROTON, SD	
Btu/kW-hr, LHV 8370 (kJ/kW-hr, LHV) 8830	AT	NET PLANT KW 94289	NOx EMISSIONS 25 PPMVD AT 15 % O2
<u>Degradation Not to Exceed 1,000hrs of Operation</u> 1.0% Degradation for Power 0.5% Degradation for Heat Rate NOT VALID WITHOUT STAMP		<div style="border: 1px solid black; padding: 5px;"> GUARANTEE  Kenneth Lloyd Date: 06/07/04 </div>	<u>GE SUPPLIED CO CATALYST</u> CO EMISSIONS 28 PPMVD AT 15 % O2 VOC EMISSIONS 5 PPMVD AT 15 % O2


BASIS OF GUARANTEE:	BASE LOAD, GAS FUEL NOZZLE SYSTEM NO BLEED OR EXTRACTED POWER
ENGINE:	(1) GE LMS100PA GAS TURBINE
FUEL:	21404 Btu/lb / (49786 kJ/kg) LHV, GAS FUEL (#900-791)
FUEL TEMP:	50°F (28°C) above dew point, @ GEAEP BASEPLATE Fuel Temperature 360°F (182.2°C)
GENERATOR OUTPUT:	13.8 kV, 60 Hz
POWER FACTOR:	≥ .9
AMBIENT TEMP:	78.2°F / (25.7°C)
AMBIENT RH:	53.0%
INLET CONDITIONING:	EVAP TO 67.6°F / (19.8°C)
ALTITUDE:	1300.0 ft/ (396.2 m)
AMBIENT PRESSURE:	14.019 PSIA (96.656 kPA)
INLET FILTER LOSS:	≤ 4.50 inH ₂ O/ (114.3 mmH ₂ O)
EXHAUST LOSS:	≤ 12.00 inH ₂ O/ (304.8 mmH ₂ O)
NOX CONTROL:	WATER
INJECTION RATE:	32168 PPH/ (14591 KG/hr) ±20% FLOW
INJECTION TEMP:	100 °F/ (37.8 °C) @ GEAEP BASEPLATE
ENGINE CONDITION:	NEW AND CLEAN ≤ 200 SITE FIRED HOURS
FIELD TEST METHODS PERFORMANCE:	GE AERO ENERGY SGTGPTM
NOX:	EPA METHOD 20
CO:	EPA METHOD 10
VOC:	EPA Method 25/18

** SI values are for reference purposes only

THIS GUARANTEE SUPERSEDES ANY
PREVIOUS GUARANTEES PRESENTED



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<p>GUARANTEED PARAMETERS</p> <p>Far Field Noise: 65 dba at 400ft from any near point of the scope of supply equipment as measured 5ft. Above grade over a flat hard ground plane.</p>	<p>JOBSITE LOCATION: GROTON, SD</p> <p>Near Field Noise: 85 dba average around the package (Vertical Distance of 5ft. above grade at a horizontal distance of 3ft. from the exterior plane of equipment or if equipment enclosed, its enclosure)</p>
<p>GUARANTEE</p>  <p>Kenneth Lloyd Date: 06/07/04</p>	
<p>NOT VALID WITHOUT STAMP</p>	

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ENGINE CONDITION:	NEW AND CLEAN ≤ 200 SITE FIRED HOURS
FIELD TEST METHODS	
PERFORMANCE:	GE AERO ENERGY SGTGPTM
NEAR FIELD NOISE:	ANSI / ASME PTC - 36
FAR FIELD:	ANSI B 133.8

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PREVIOUS GUARANTEES PRESENTED



Estimated Average Engine Performance NOT FOR GUARANTEE

GE Aero Energy

A GE Power Systems Business

Performance By: **Kenneth Lloyd**
Project Info: **Basin Electric Capacity Addition - Guar Basis R4**
CMS# 401509

Engine: **LMS100 PA**
Deck Info: **G0179C - 87o.scp**
Generator: **BDAX 82-445ER 60Hz, 13.8kV, 0.9PF (35404)**
Fuel: **Site Gas Fuel#900-791, 21404 Btu/lb,LHV**

Date: **04/27/2004**
Time: **5:38:51 PM**
Version: **3.0.44**

Case # 100

Ambient Conditions

Dry Bulb, °F 78.2
Wet Bulb, °F 65.8
RH, % 53.0
Altitude, ft 1300.0
Ambient Pressure, psia 14.019

Engine Inlet

Comp Inlet Temp, °F 67.6
RH, % 91.1
Conditioning EVAP
Tons or kBtu 0

Pressure Losses

Inlet Loss, inH2O 4.50
Exhaust Loss, inH2O 12.00

kW, Gen Terms 97624

94289

Est. Btu/kW-hr, LHV 7841

8370

Guar. Btu/kW-hr, LHV 8084

AUX LOADS 3335

Fuel Flow

MMBtu/hr, LHV 765.5
lb/hr 35765

NOx Control Water

Water Injection

lb/hr 32168
Temperature, °F 100.0

Dry Water-

Intercooler Air

Spray Mist Cooler OFF
IC Heat Extraction, btu/s 26082
KOD Water Extraction, lb/s 0.7

Control Parameters

HP Speed, RPM 9362
LP Speed, RPM 5285
PT Speed, RPM 3600
PS3 - CDP, psia 538.5
T23 - Intcr Inlet Temp, °F 342.7
T25 - HPC Inlet Temp, °F 100.0
T3 - CDT, °F 723.2
T48, °R 2031

Exhaust Parameters

Temperature, °F 791.4
lb/sec 442.2
lb/hr 1592034
Energy, Btu/s- ref 0 °R 143903
Cp, Btu/lb-R 0.2774

Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)

REF @ 15% O2 15
NOx ppmvd Ref 15% O2 25
NOx as NO2, lb/hr 77
CO ppmvd Ref 15% O2 129
CO, lb/hr 241.57
HC ppmvd Ref 15% O2 6
HC, lb/hr 6.00



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Fuel: **Site Gas Fuel#900-791, 21404 Btu/lb,LHV**

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Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	1.2184
N2	71.4389
O2	13.0065
CO2	6.2303
H2O	8.0870
SO2	0.0000
CO	0.0152
HC	0.0004
NOX	0.0033

Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.9746
N2	81.4906
O2	12.9893
CO2	4.5239
H2O	0.0000
SO2	0.0000
CO	0.0173
HC	0.0008
NOX	0.0034

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

AR	0.8524
N2	71.2674
O2	11.3598
CO2	3.9564
H2O	12.5453
SO2	0.0000
CO	0.0151
HC	0.0007
NOX	0.0029

Aero Energy Fuel Number 900-791 (Basin Electric 360F)

	Volume %	Weight %		
Hydrogen	0.4990	0.0593	Btu/lb, LHV	21404
Methane	95.9180	90.7531	Btu/scf, LHV	959
Ethane	2.1490	3.8110	Btu/scf, HHV	1062
Ethylene	0.0000	0.0000	Btu/lb, HHV	23708
Propane	0.4330	1.1261	Fuel Temp, °F	360.0
Propylene	0.0000	0.0000	NOx Scalar	1.167
Butane	0.3440	1.1792	Specific Gravity	0.59
Butylene	0.0000	0.0000		
Butadiene	0.0000	0.0000		
Pentane	0.3300	1.4042		
Cyclopentane	0.0000	0.0000		
Hexane	0.3280	1.6670		
Heptane	0.0000	0.0000		
Carbon Monoxide	0.0000	0.0000		
Carbon Dioxide	0.0000	0.0000		
Nitrogen	0.0000	0.0000		
Water Vapor	0.0000	0.0000		
Oxygen	0.0000	0.0000		
Hydrogen Sulfide	0.0000	0.0000		
Ammonia	0.0000	0.0000		



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Case # 100

Ambient Conditions

Dry Bulb, °C 25.7
Wet Bulb, °C 18.8
RH, % 53.0
Altitude, m 396.2
Ambient Pressure, kPa 96.656

Engine Inlet

Comp Inlet Temp, °C 19.8
RH, % 91.1
Conditioning EVAP
Tons or kBtu 0

Pressure Losses

Inlet Loss, mmH2O 114.30
Exhaust Loss, mmH2O 304.80

kW, Gen Terms 97624

94289

Est. kJ/kWh, LHV 8273

8830

Guar. kJ/kWh, LHV 8529

AUX LOADS 3335

Fuel Flow

GJ/hr, LHV 807.6
kg/hr 16223

NOx Control Water

Water Injection

kg/hr 14591
Temperature, °C 37.8

Dry Water-

Intercooler Air

Spray Mist Cooler OFF
IC Heat Extraction, kJ/s 27518
KOD Water Extraction, kg/s 0.3

Control Parameters

HP Speed, RPM 9362
LP Speed, RPM 5285
PT Speed, RPM 3600
PS3 - CDP, kPa 3712.5
T23 - Intcr Inlet Temp, °C 172.6
T25 - HPC Inlet Temp, °C 37.8
T3 - CDT, °C 384.0
T48, °K 1129

Exhaust Parameters

Temperature, °C 421.9
kg/sec 200.6
kg/hr 722142
Energy, J/s- ref 0 °K 151825904
Kj/kg-R 1.1612

Emissions (NOT FOR USE IN ENVIRONMENTAL PERMITS)

REF @ 15% O2 15
NOx mg/Nm3 Ref 15% O2 51
NOx as NO2, kg/hr 35
CO mg/Nm3 Ref 15% O2 161
CO, kg/hr 109.58
HC mg/Nm3 Ref 15% O2 4
HC, kg/hr 2.72



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Date: 04/27/2004
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Exh Wght % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

Table with 2 columns: Component (AR, N2, O2, CO2, H2O, SO2, CO, HC, NOX) and Weight % (1.2184, 71.4389, 13.0065, 6.2303, 8.0870, 0.0000, 0.0152, 0.0004, 0.0033)

Exh Mole % Dry (NOT FOR USE IN ENVIRONMENTAL PERMITS)

Table with 2 columns: Component (AR, N2, O2, CO2, H2O, SO2, CO, HC, NOX) and Mole % (0.9746, 81.4906, 12.9893, 4.5239, 0.0000, 0.0000, 0.0173, 0.0008, 0.0034)

Exh Mole % Wet (NOT FOR USE IN ENVIRONMENTAL PERMITS)

Table with 2 columns: Component (AR, N2, O2, CO2, H2O, SO2, CO, HC, NOX) and Mole % (0.8524, 71.2674, 11.3598, 3.9564, 12.5453, 0.0000, 0.0151, 0.0007, 0.0029)

Aero Energy Fuel Number 900-791 (Basin Electric 360F)

Table with 4 columns: Fuel Name, Volume %, Weight %, and Property/Value. Lists various hydrocarbons and their properties like LHV, HHV, Fuel Temp, NOx Scalar, and Specific Gravity.