



2031 Adams Road
Sedalia, Missouri 65301

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Noviembre, 01 de 2009

Sres. ENELVEN

Atn. Ing. Francisco Quintero

Estimado Ingeniero,

Ante todo quisiera agradecer en nombre de nuestra representada la oportunidad de permitarnos llevar ante ustedes la presente disponibilidad de equipos para generación eléctrica.

A continuación podrán observar un cuadro con data correspondiente a los equipos ofrecidos en nuestra propuesta con fecha primero de Noviembre del año en curso:

Modelo	Potencia (MW)	Heat Rate (BTU/kWe-Hr)	Combustible	Condicion	Disponibilidad	Ubicacion
Centaur40	3.5	9,125	Gas / Liq. Fuel	Reacondicionada	Inmediata	USA
Mars100	11	10,320	Gas / Liq. Fuel	Nueva	Inmediata	USA
Titan130	15	9,695	Gas / Liq. Fuel	Nueva	Inmediata	USA
TM2500	22	9,550	Gas / Liq. Fuel	*	60 Dias**	Africa
FT4	54	11,800	Liq. Fuel	Reacondicionada	Inmediata	USA
LM2500	22	9,450	Gas / Liq. Fuel	Reacondicionada	30	USA
LM6000	50	8,400	Gas / Liq. Fuel	Reacondicionada	60	USA
Trend	58	8,592	Gas / Liq. Fuel	Nueva	Inmediata	USA

*** Esta unidad debe ser reacondicionada**

**** A partir del primer pago**

Anexo podrán encontrar hojas con data de cada una de las unidades arriba mencionadas.

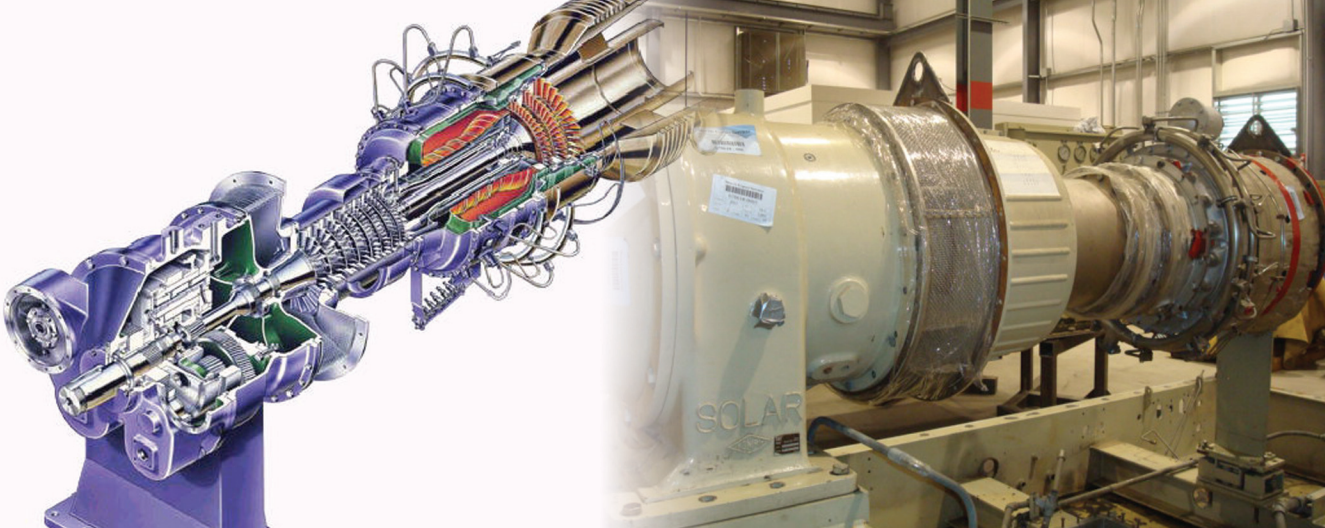
Quedo a sus órdenes para suministrar cualquier información adicional que su representada pueda a bien requerir.

Atentamente,

Omar Petit
Gerente Regional de Ventas
Latino America
opetit@proenergyservices.com
Cell: +1 (660) 281-8588
Oficina: +1 (660) 829-5100

DATA SHEET

EQUIPOS EN CONSIDERACION



SOLAR TURBINE FACT SHEET

General Specifications

Centaur® 40 Gas Turbine

Industrial, Two-Shaft

Axial Compressor

- 11-Stage
- Variable Inlet Guide Vanes
- Compression Ratio: 10.3:1
- Inlet Airflow: 18.7 kg/sec (41.3 lb/sec)
- Max. Speed: 15,000 rpm

Combustion Chamber

- Annular-Type
- Conventional or Lean-Premixed Dry, Low Emission (SoLoNOx™)
- 10 Fuel Injectors (Conventional)
- 12 Fuel Injectors (SoLoNOx™)
- Torch Ignitor System

Gas Producer Turbine

- 2-Stage, Reaction
- Max. Speed: 14,965 rpm

Power Turbine

- 1-Stage, Reaction
- Max. Speed: 15,500 rpm

Bearings

- Journal: Tilting-Pad
- Thrust: Fixed Tapered Land

Coatings

- Compressor: Inorganic Aluminum
- Turbine and Nozzle Blades: Precious Metal Diffusion Aluminide

Velocity Vibration Transducer

Key Package Features

Driver Skid with Drip Pans

Driven Equipment Skid

- Compressor
- Compressor Auxiliary Systems

316L Stainless Steel Piping ≤4" dia

Compression-Type Tube Fittings

Electrical System Options

- NEC, Class I, Group D, Div 1
- CENELEC, Zone 1

Turbotronic™ Microprocessor Control System

- Freestanding Control Console
- Color Video Display
- Vibration Monitoring

Control Options

- 24-VDC Control Battery/Charger System
- Package Temperature Monitoring
- Serial Link Supervisory Interface
- Turbine Performance Map
- Compressor Performance Map
- Historical Displays

- Printer/Logger
- Predictive Emissions Monitoring
- Process Controls
- Compressor Anti-Surge Control
- Field Programming

Start Systems

- Pneumatic
- Direct-Drive AC

Fuel Systems

- Natural Gas
- Alternate Fuels

Integrated Lube Oil System

- Turbine-Driven Accessories

Oil System Options

- Oil Cooler
- Oil Heater
- Tank Vent Separator
- Flame Trap

Axial Compressor Cleaning Systems

- On-Crank
- On-Crank/On-Line
- Stationary Cleaning Tank

- Portable Cleaning Tank Gearbox (if applicable)
- Speed Increasers
- Speed Decreasers

Air Inlet and Exhaust System

Options

Enclosure and Associated

Options

Factory Testing of Turbine and Package

Documentation

- Drawings
- Quality Control Data Book
- Inspection and Test Plan
- Test Reports
- Operation and Maintenance Manuals

Missouri

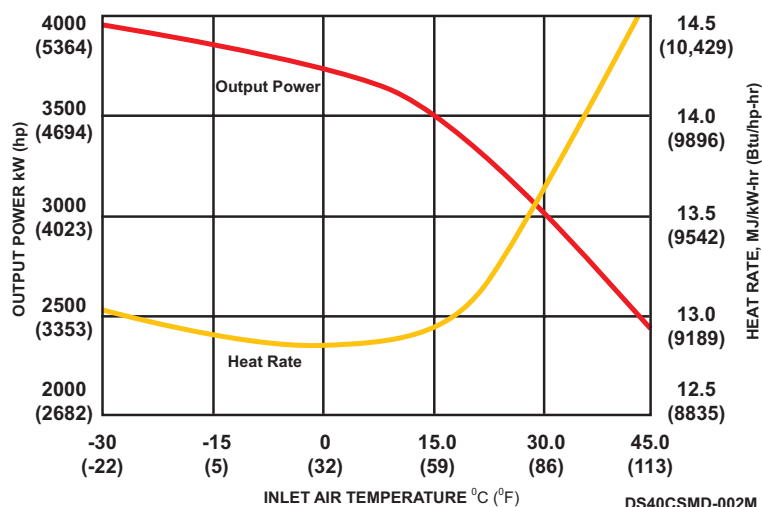
2001 Adams Road • Sedalia, MO 65301

tel 660.829.5100 • fax 660.829.1160 • www.proenergyservices.com



SOLAR TURBINE FACT SHEET

Available Power



Performance

Output Power	3500 kW (4700hp)
Heat Rate	12 905 kJ/KW-hr (9,125 Btu/hp-hr)
Exhaust Flow	68 185 kg/hr (150,320 lb/hr)
Exhaust Temp.	445°C (835°F)

Package Dimensions

Length:	8.9 m (23' 3")
Width:	2.4 m (8' 0")
Height:	2.7 m (8' 11")
Typical Weight:	24 950 kg (55,000 lb)

Nominal Rating – per ISO
At 15°C (59°F), at sea level

No inlet/exhaust losses

Relative humidity 60%

Natural gas fuel with
LHV = 35 MJ/nm³ (940 Btu/scf)

Optimum power turbine speed

AC-driven accessories

Engine efficiency: 27.9%

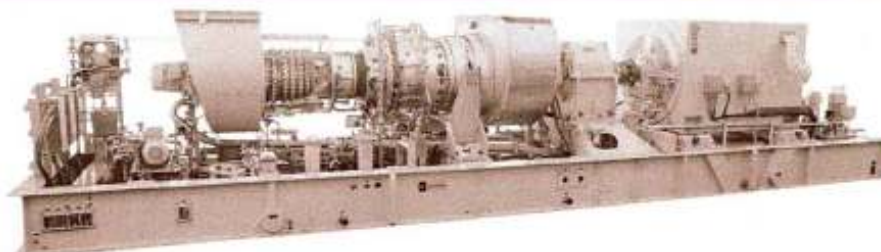
Solar Turbines

A Caterpillar Company

MARS 100

Gas Turbine Generator Set

Power Generation



General Specifications

Mars® 100 Gas Turbine

- Industrial, Two-Shaft
- Axial Compressor
 - 15-Stage
 - Variable Inlet Guide Vanes
 - Compression Ratio: 17.7:1
 - Inlet Airflow: 41.6 kg/sec (91.8 lb/sec)
 - Max. Speed: 11,170 rpm
 - Vertically Split Case
- Combustion Chamber
 - Standard: Annular-Type (Conventional)
 - Optional: Annular-Type, Lean-Premixed, Dry, Low Emission (SoLoVOx™)
 - 21 Fuel Injectors (Standard)
 - 14 Fuel Injectors (SoLoVOx)
 - Torch Ignitor System
- Gas Producer Turbine
 - 2-Stage, Reaction
 - Max. Speed: 11,170 rpm
- Power Turbine
 - 2-Stage, Reaction
 - Speed, 50-Hz Generator: 8625 rpm
 - Speed, 60-Hz Generator: 8568 rpm
- Bearings
 - Journal: Tilt-Pad
 - Thrust, Active: Tilt-Pad
 - Thrust, Inactive: Fixed Tapered Land
- Coatings
 - Compressor: Inorganic Aluminum
 - Turbine and Nozzle Blades: Platinum Aluminate
- Vibration Transducer Type
 - Proximity Probes
 - Velocity Pick-up

Main Reduction Drive

- Epicyclic Type
- 1500 or 1800 rpm

Generator

- Type: 4 Pole (Salient) Solid Rotor, 6-Wire, Wye Connection, Synchronous Generator with Brushless Exciter

- Construction Options
 - ODP (Open Drip Proof)
 - WP/II (Weather Protected II)
 - CACA/TEAAC (Closed Air, Cooling Air/Totally Enclosed, Air to Air Cooling)
 - CACW/TEWAC (Closed Air, Cooling Water/Totally Enclosed, Water to Air Cooling)
- Sleeve Bearings
- Voltage Regulation
 - Solid-State Regulation with Permanent Magnet Generator (PMG)
- Insulation/Temperature Rise
 - NEMA Class F w/VPI / Class B
 - NEMA Class F w/VPI / Class F
- Voltages: 3300 to 13,800 Volts
- Frequency: 50 or 60 Hz
- Package
 - Mechanical Construction
 - Steel Base Frame with Drip Pans
 - 316L Stainless Steel Piping
 - Compression-Type Tube Fittings
 - Suitable for 3-Point Mounting
 - FPSO Modifications (Option)
 - Electrical System
 - NEC, Class 1, Group D, Div 2
 - CENELEC/ATEX Zone 2
 - Conduit/Cable Tray Wiring
 - 120VDC Battery/Charger System
 - Direct-Drive AC Start System
 - Fuel Systems
 - Conventional Combustion or Dry Low Emission (SoLoVOx)
 - Fuel Types
 - Natural Gas or Dual (Gas/Distillate)
 - Integrated Lube Oil System
 - Turbine-Driven Main Pump
 - AC Motor-Driven Pre/Post Pump
 - DC (120V) Motor-Driven Backup Pump
 - Oil Cooler and Oil Heater (Options)
 - Tank Vent Separator and Flame Trap
 - Lube Oil Filter
 - On-Crank or On-Crank/On-Line Turbine Compressor Cleaning System (Options)
 - Portable Cleaning Tank (Option)
- Air Inlet and Exhaust System
 - Carbon Steel
 - Stainless Steel
 - Marine-Type Filters
- Enclosure (Driver Only or Complete)
 - Fire Detection and Suppression
- Factory Testing of Turbine and Package
- Documentation
 - Electrical Drawings
 - Mechanical Drawings
 - Quality Control Data Book
 - Inspection and Test Plan
 - Test Reports
 - Operation and Maintenance Manuals
- Digital Onskid Display Panel
- Turbotronic™ Control System
 - Onskid Control System (Optional Offskid System)
 - 24 VDC Control Power (120VDC Input)
 - Serial Link Supervisory Interface
 - Field Programmable
 - Vibration Monitoring
 - Turbine Bearings and Shaft
 - Gearbox
 - Generator Bearings
 - Temperature Monitoring
 - Turbine Combustion Process
 - Turbine Bearings and Lube Oil
 - Generator Bearings and Windings
 - Generator Control
 - Selectable Control Modes
 - Solid-State Voltage Regulation
 - Automatic Synchronization
 - Metering Panel with Manual Synchronization (Option)
 - KW Control (Option)
 - TT4000 Display and Monitoring System
 - Multiple Operator Display Screens
 - Data Collection and Playback
 - Turbine Performance Map (Option)
 - Printer/Logger (Option)
 - Predictive Emissions Monitoring (Option)

* Non-standard option

Solar Turbines

A Caterpillar Company

MARS 100

Gas Turbine Generator Set

Power Generation

Performance

Output Power	11 430 kW _e
Continuous Duty	
Heat Rate	10 885 kJ/kW _e -hr (10,320 Btu/kW _e -hr)
Exhaust Flow	152 080 kg/hr (335,275 lb/hr)
Exhaust Temp.	485°C (905 °F)

Nominal Rating – ISO
At 15°C (59°F), sea level

No inlet/exhaust losses

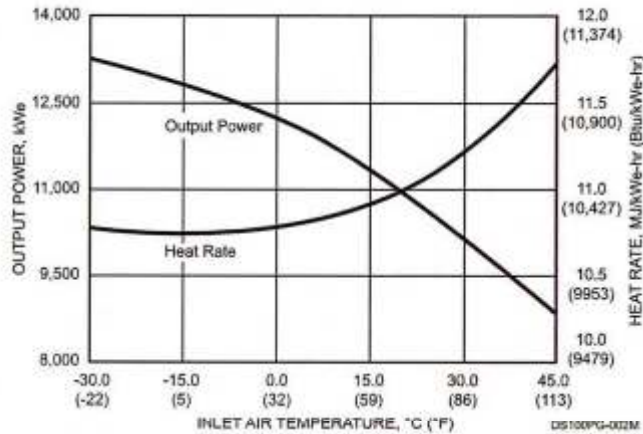
Relative humidity 60%

Natural gas fuel with
LHV = 35 MJ/m³ (940 Btu/scf)

No accessory losses

Engine efficiency: 33%
(measured at generator terminals)

Available Power



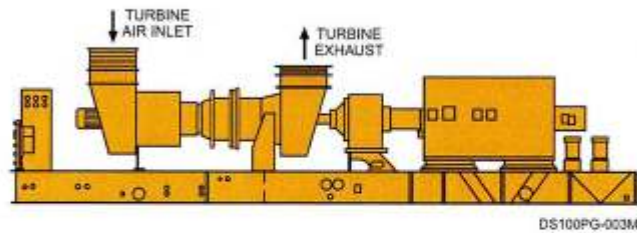
Package Dimensions

Length: 14.5 m (47' 8")

Width: 2.8 m (9' 2")

Height: 3.6 m (11' 8")

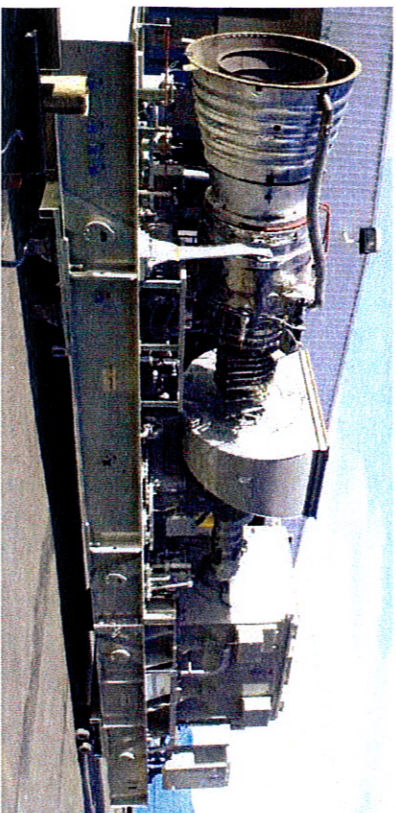
Typical Weight: 67 570 kg (160,000 lb)



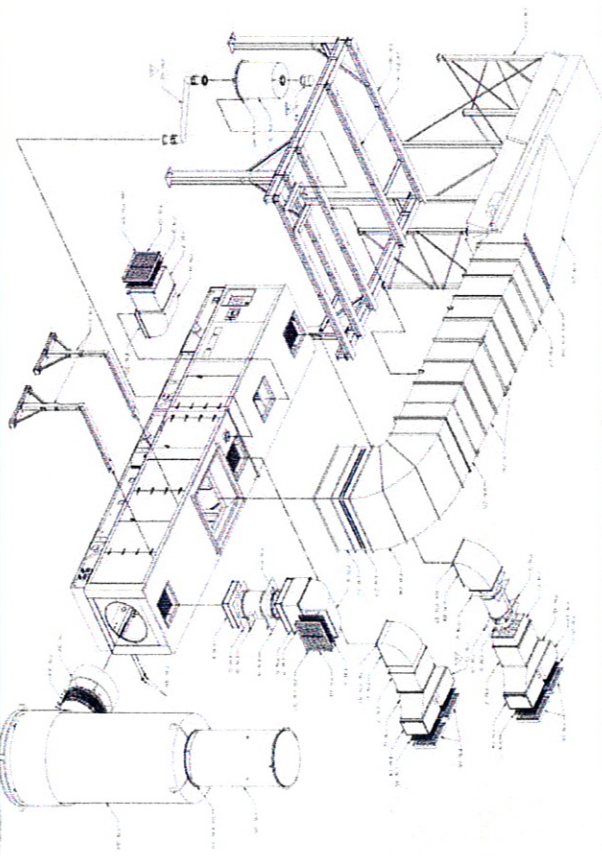
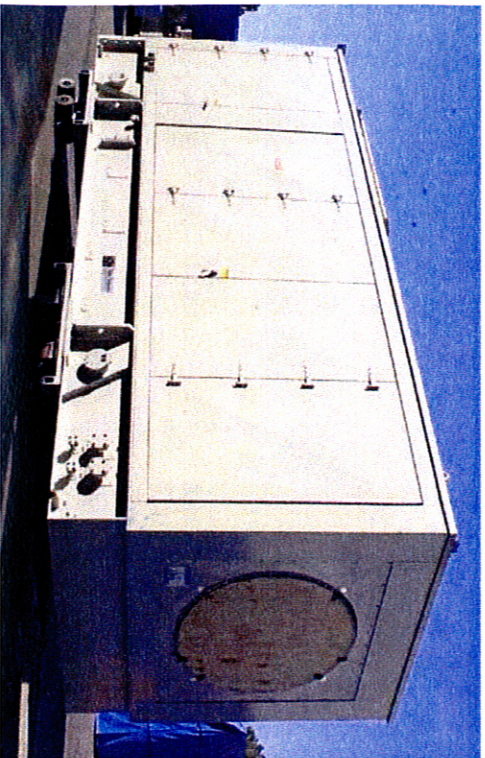
New Solar Titan 130 Turbine Genset

Specifications and Scope

- Mfg by Solar 2001
- Never placed into service
- So-Lo-NOx dry low NOx system
- Professionally stored; Inspected by Solar March 2008
- Config for 60hz; Can convert to 50 hz
- Includes inlet / exhaust equipment
- Includes all drawings & documentation



15,000 KW 9693 btu/kwh



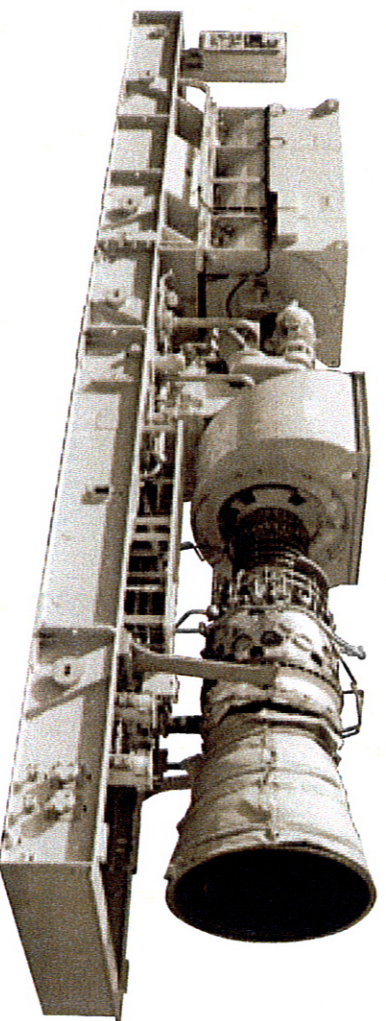
Solar Turbines

A Caterpillar Company

TITAN 130

Gas Turbine Generator Set

POWER GENERATION



General Specifications

Gas Turbine

- Titan™ 130 Industrial, Single-Shaft
- Axial Compressor
 - 14 Stages
 - Variable Geometry
 - Vertically Split Case
 - Compression Ratio: 16:1
 - Speed: 11,197/11,170 rpm (50/60 Hz)
- Annular Combustion Chamber
 - Conventional or Lean-Premixed, Dry, Low Emission (SoLoNO_x™)
 - 21 Fuel Injectors (Conventional)
 - 14 Fuel Injectors (SoLoNO_x)
- Proximity Probe Vibration Transducers
- Turbine
 - 3 Stage, Axial Flow
 - Speed: 11,197/11,170 rpm (50/60 Hz)

Main Reduction Drive

- Epicyclic
 - 1500 or 1800 rpm (50 or 60 Hz)
 - Acceleration Vibration Transducer

Generator

- Continuous Duty Rating
- Salient Pole, 3 Phase, 6 Wire, Wye Connected, Synchronous with Brushless Exciter
- Open Drip-Proof Construction
- Sleeve Bearings
- Velocity Vibration Transducers
- Permanent Magnet Generator
- NEMA Class F Insulation with F Rise

Package

- Steel Base Frame with Drip Pans
- Direct-Drive AC Start System
- Natural Gas Fuel System
- TurboTronic™ 4 Control System
 - ControlLogix Controller
 - Standard Display with Discrete Event Log, Strip Chart, Historical Trend, Maintenance Screen
 - Gas Turbine and Generator Control
 - Vibration and Temperature Monitoring
 - CGCM (Combination Generator Control Module) with Load Share, Auto Synchronization, Voltage Control, Reactive Power Control, kW Control
- Integrated Lube Oil System
 - Turbine-Driven Lube Pump
 - Pre/Post Lube Pump
 - Backup Lube Pump
 - Air/Oil Cooler
 - Integral Lube Oil Tank
 - Lube Oil Tank Heater
 - Oil Mist Eliminator
 - Simplex Lube Oil Filter
- Documentation
 - Drawings
 - Quality Control Data Book
 - Inspection and Test Plan
 - Test Reports
 - Operation and Maintenance Manuals
- Factory Testing of Turbine and Package

Optional Equipment

- Generator Options:
 - Standard Voltages: 11,000 V (50 Hz); 12,470, 13,200 or 13,800 V (60 Hz)
- Fuel Systems
 - Liquid
 - Dual (Gas/Liquid)
 - Alternate Fuels (such as naphtha, propane, low Btu gas)
- Lube Oil System
 - Water/Oil Lube Oil Cooler
 - Duplex Lube Oil Filters
 - Vent Flame Trap
- Control System
 - Auxiliary and Remote Display/Control Terminal
 - Heat Recovery Application Interface
 - Serial Link Supervisory Interface
 - Turbine Performance Map
 - Printer/Logger
 - Field Programming Terminal
 - Unfired Waste Heat Recovery System Control (Stand-Alone Panel)
 - Multi-Unit Applications: Load Shed Control (Stand-Alone Panel), Import/Export, kW/kVAR Control (Stand-Alone Panel)
- Accessory Equipment
 - 120-VDC Battery/Charger System
 - Turbine Cleaning System: On-Crank and On-Line
- Weatherproof Acoustic Enclosure
- Ancillary Equipment
 - Inlet and Exhaust Silencers
 - Self-Cleaning or Prefilter/Barrier Air Inlet Filter
 - Inlet Evaporative Cooler
 - Inlet Chiller Coils

Solar Turbines

A Caterpillar Company

TITAN 130

Gas Turbine Generator Set

POWER GENERATION

Nominal Performance

Output Power	15 000 kW _e
Heat Rate	10 230 kJ/kW _e -hr (9695 Btu/kW _e -hr)
Exhaust Flow	179 250 kg/hr (395, 180 lb/hr)
Exhaust Temp.	495°C (925°F)

Nominal rating – per ISO
At 15°C (59°F), at sea level

No inlet/exhaust losses

Relative humidity 60%

Natural gas fuel with

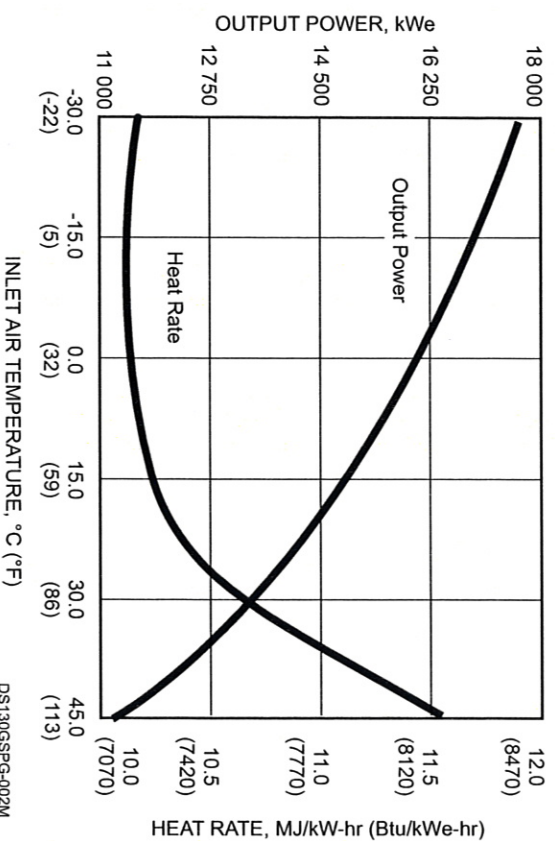
LHV = 35 MJ/m³ (940 Btu/scf)

No accessory losses

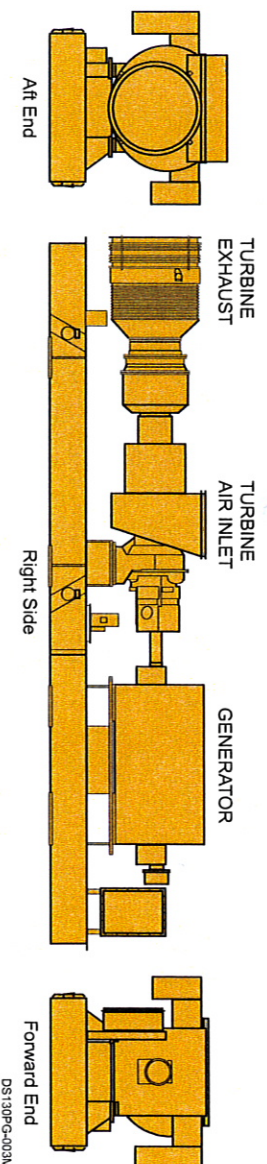
Engine efficiency: 35.2%

Standard and high ambient ratings available

Available Power



Typical Service Connections



Package Dimensions

Length:	14 021 mm (46' 0")
Width:	3327 mm (10' 11")
Height:	3302 mm (10' 10")

Approx.

Weight: 73 668 kg (162,409 lb)

* Unenclosed Dry Weight

- | | |
|---|---|
| Left Side <ul style="list-style-type: none"> • Lube Oil: Vent, Drain, Cooler • Generator Control Box, Power • Drip Pan Drain • Package Ground • DC Power - Electronic Actuator • Generator Monitor Box • AC Power - Starter Motor • Generator Terminal Box (line) • Turbine Control Box | Right Side <ul style="list-style-type: none"> • Combustor and Exhaust Diffuser Drain • Fuel: Inlet, Filter Drain, Vent • Package Air Supply • Liquid Fuel Atomizing – Self-Cleaning Filter • Solenoid Actuation • Turbine Cleaning Fluid Inlet • AC Power • Liquid Fuel Primary Pump • Lube Oil Tank Heater • Pre/Post Lube Oil Pump • Air Inlet Duct Drain • Package Ground |
|---|---|



STANDARD 60Hz TM2500 GENERATOR PACKAGE

Gas Turbine

16 Stage Axial Compressor

- 1st 6 stages have variable station
- Horizontal Split Casing
- 20:1 Compression Ratio
- 150 lb/s Nominal Inlet Mass Flow

Annular Combustor

- 30 Nozzles Gas Fuel, Water Injection for NOx Control

6 Stage Power Turbine

Generator

Continuous Duty 13.8kV, 0.85 PF

2 Pole, 3 Phase Brushless Exciter

WPII Weather Protected

Voltage Regulator/Neutral Side Protection CT's

NEMA Class F Insulation & B Temperature Rise

Package

24V and 125V DC Batteries

90dBA Near Field Design

Barrier Inlet Air Filters

Electro-Hydraulic Start System

Class I Div 2 Group D Class Electrical System

Digital Control System with a Human Machine Interface (HMI)

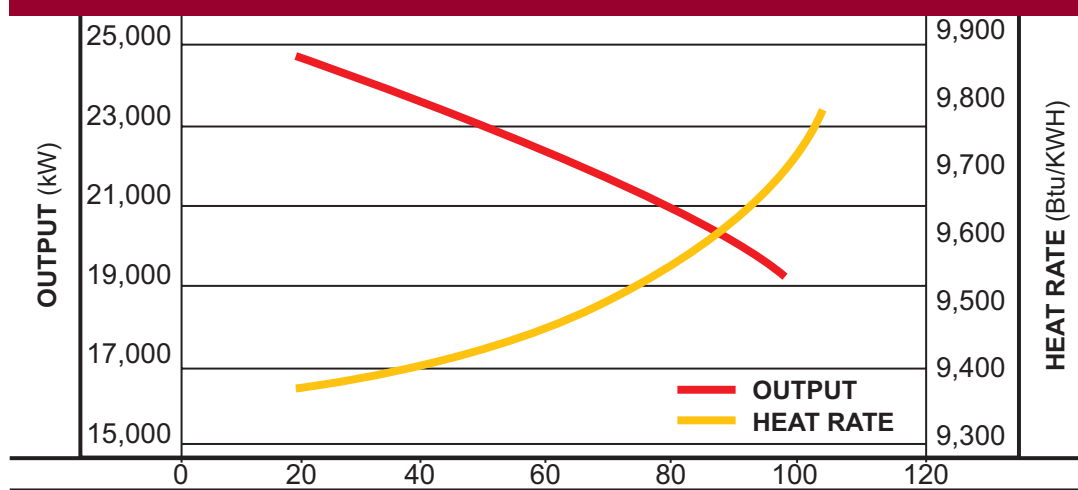
Turbine and Generator Lube Oil System with Simplex Shell and Tube Coolers

On/Off-line Water Wash



TM2500 FACT SHEET

TM2500 60Hz Output and Heat Rate



0 ft. 60% RH, 4/6 in H₂O inlet/exhaust loss on natural gas with water injection to 25ppmvd NO_x water inj.

AMBIENT(°F)

Turbine

	TM2500
Power Output (kWe)	18,400
Heat Rate LHV (Btu/kWe-Hr)	9,900
Exhaust Flow (lbs/sec)	143
Exhaust Temperature (°F)	860
Emissions (ppmvd)	NO _x /CO
Gas-DLE	25/25
Gas or Liquid-Water	25/75, 42/55
Gas-Steam	25/74
Power Turbine Speed (rpm)	3,600
No. of Compressor Stages	16
No. of Turbine Stages	6

Missouri
 2001 Adams Road • Sedalia, MO 65301
 tel 660.829.5100 • fax 660.829.1160 • www.proenergyservices.com



FT4 SCOPE OF SUPPLY

- Pratt & Whitney Dual Fuel FT-4 / Turbine Gen/Set
- Baseplate with supports for Gas Turbine, & Foundation Bolts
- Main Generator 13.8/11kv 60/50hz .85 P.F.
- PLC Turbine Controls
- Complete Local/Remote Control and Supervisory System for the Gas Turbine and Expander, including all necessary control switches and alarms
- The Generating Plant is Auto : Start, Synch & Parallel
- Water Injection for Power Boost & Exhaust Emissions Control
- Exhaust Silencer
- Exhaust Stack
- Intake Silencer /Screen
- Coupling between the Turbine and the Generator.
- Generator
- Generator is a Self Ventilated Turbo and designed for Open Air Cooling.
- Exciter is located at the Non-Driven End of the Generator.
- Inlet Suction Duct for the Gas Turbine
- Thermal and Acoustical Insulation

Governing And Lubricating Oil System

- Turbine comes with an Integral Governing and Lubricating Oil System which includes all necessary safety and supervisory devices.
- Generator has a separate lubricating system as well as the Load Governor and Over Speed Trip Mechanism.
- Oil is cooled by a radiator located at the side of the unit.
- Fan Cooled Radiator.
- DC Battery is supplied to provide power in case of an emergency and unit power is lost

Fuel System:

- Liquid Fuel/Gas Fuel
- Fuel Connections are located at the side of the unit

Vibration Supervisory System

- Noise Level: the noise level measured at 400 Ft will be 85db or lower

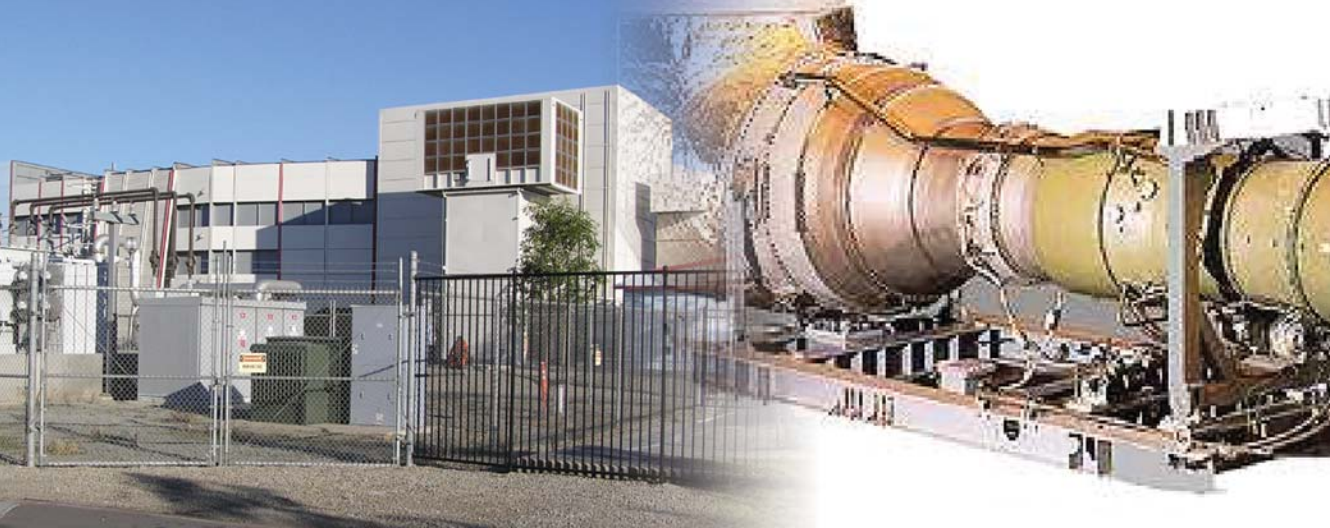
Georgia
1395 S. Marietta Pkwy
Suite 218
Marietta, Georgia 30067

Missouri
2001 Adams Road
Sedalia, MO 65301

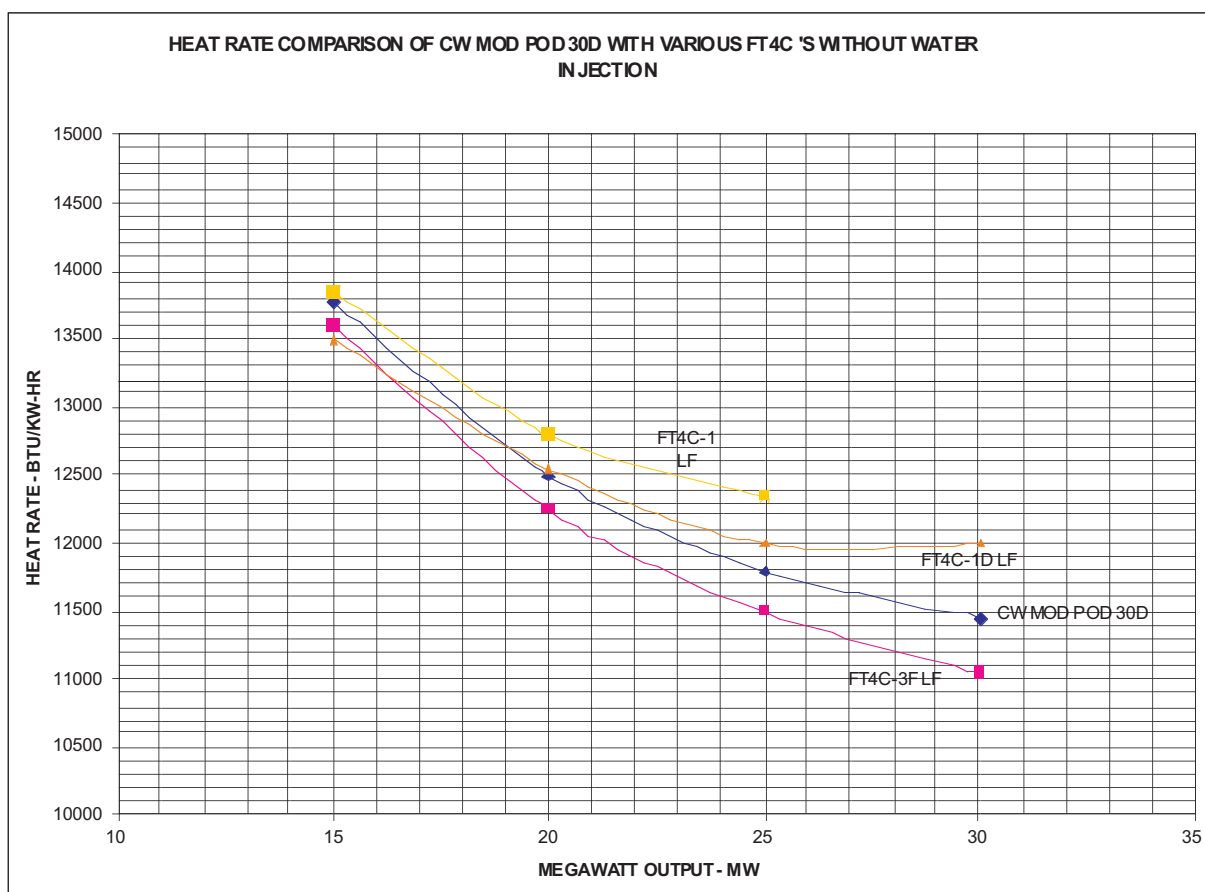
Texas
616 FM 1960 West
Suite 750
Houston, Texas 77090

ProEnergy Services de Venezuela C.A.
Urbanización Los Caobos, Paseo Colón,
Torre Polar Oeste, Piso 4, Oficina 4-C
Plaza Venezuela - Caracas
Venezuela





FT4 FACT SHEET



Turbine (Simple Cycle)

Generator Frequency	50 Hz	60 Hz
Generator Effy. Assumed / Gearbox Effy. Assumed	.980 / N/A	.980 / N/A
Output (kW)	24,300	29,400
Heat Rate (Btu/kWe-hr)	13,200	11,500
Power Turbine Speed (rpm)	3,600	3,600
Exhaust Temp. (deg. F)	570	690

Georgia
1395 S. Marietta Pkwy E,
Suite 218
Marietta, Georgia 30067

Missouri
2001 Adams Road
Sedalia, MO 65301

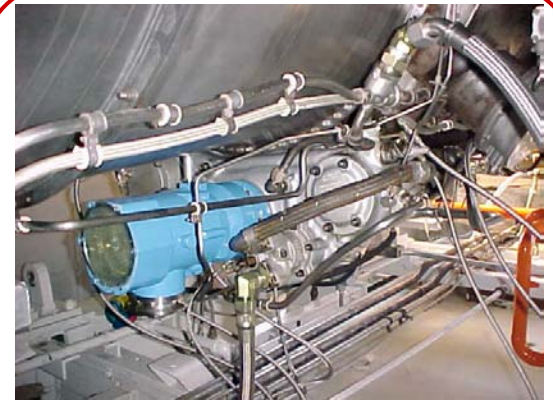
Texas
616 FM 1960 West
Suite 750
Houston, Texas 77090

ProEnergy Services de Venezuela C.A.
Urbanización Los Caobos, Paseo Colón,
Torre Polar Oeste, Piso 4, Oficina 4-C
Plaza Venezuela - Caracas
Venezuela



Power Generation Market

**For information on the following equipment
please call Joaquin Mavares at 713 992-1790
jmavares@proenergyservices.com**



Equipment Packaging



- All those FT-4 will be available in 90 Days

All of those were refurbished By the OEM

All of the FT-4's will carry OEM Warranty



Packages Available



- 2008 – Inventory Packages
- (2) FT4C Twin Pac's (50 MW ea)

UNIT – TP1 HISTORY



- Originally installed at Pacific Gas & Electric Company's Hunter's Point Plant in San Francisco, CA. Operational in June, 1976. Remove from service in 2006 with approximately 8000 running hours.
- Purchased during 2007
- Engine / Free Turbine In shop Inspections – 2008
 - Serial Numbers – 686625 / 686626 / 600538 / 600630
 - Rotor level inspection
 - Test cell acceptance
- BOP – Inspection / refurbishment – 2008
 - Controls Replacement (Allen Bradley Control Logic)
 - 60 HZ Package

TP 1 - GENERATOR SPECIFICATION



- The electric generator was built in 1976 by Electric Machinery Company. Name plate data is as follows:
- Serial number 73-2282-01
- KVA 62,000
- KW 56,250
- Power Factor 0.9
- RPM/HZ 3600/60
- Volts 12,000
- Amps 2007
- Temp Rise-stator 85°C
- -rotor 110°C
- Inlet air temp 59°F
- Altitude 0 ft
- Phase sequence 3-2-1
- Rotation CCW

UNIT – TP2 HISTORY



- Originally installed at Public Service Electric & Gas Company's – Linden Station in Linden, NJ. Operational in April, 1973. Remove from service in 2006 with approximately 8000 running hours.
- BOP purchased in 2008
- Engine / Free Turbine In shop Inspections – 2008
 - Serial Numbers – 686656 / 686663 / 600425 / 600497
 - Rotor level inspection
 - Test cell acceptance
- BOP – Inspection / refurbishment – 2008
 - Controls Replacement (Allen Bradley Control Logic)
 - 60 HZ Package

TP 2 - GENERATOR SPECIFICATION



- The electric generator was built in 1973 by Electric Machinery Company. Name plate data is as follows:

• Serial number	77-11957-01
• Exciter SN	168-162591
• KVA	63,000
• KW	56,700
• Power Factor	0.9
• RPM/HZ	3600/60

• Volts	13,800
• Amps	2640
• Temp Rise-stator	85°C
• -rotor	110°C
• Inlet air temp	59°F
• Altitude	0 ft
• Phase sequence	1-2-3
• Rotation	CW



STANDARD 60Hz LM2500 GENERATOR PACKAGE

Gas Turbine

The LM2500 engine is a split-shaft design with the gas generator separate from the power turbine. The gas generator is aerodynamically coupled to the power turbine. This design allows the power turbine to operate at a continuous speed of 3600 rpm, regardless of the gas generator speed. The gas generator consists of a sixteen-stage, axial-flow compressor, an annular combustor with 30 individual fuel nozzles and a two-stage, high-pressure turbine. The separate power turbine is a six-stage axial-flow turbine.

A/C Generator

The torque developed in the aerodynamically coupled power turbine is directly transferred to the rotor of the alternating current (AC) generator through a flexible diaphragm coupling. The Generator is a continuous duty, two pole, three phase with a brushless exciter. The generator is rated at 13.8 kV, 60Hz, and 0.85 PF.

Package

The package is weather protected and insulated which protects the gas turbine and generator. The package supplied will include an inlet filter house with inlet filters and an exhaust stack. The dimensions are 68'6" x 14'9" x 29'5".

A separate control house contains the following:

- Control system with HMI
- Voltage regulator/neutral side protection CT's
- Vibration system
- 24V and 125V DC batteries and battery chargers
- Electrical system up to the generator main breaker
- Generator main breaker

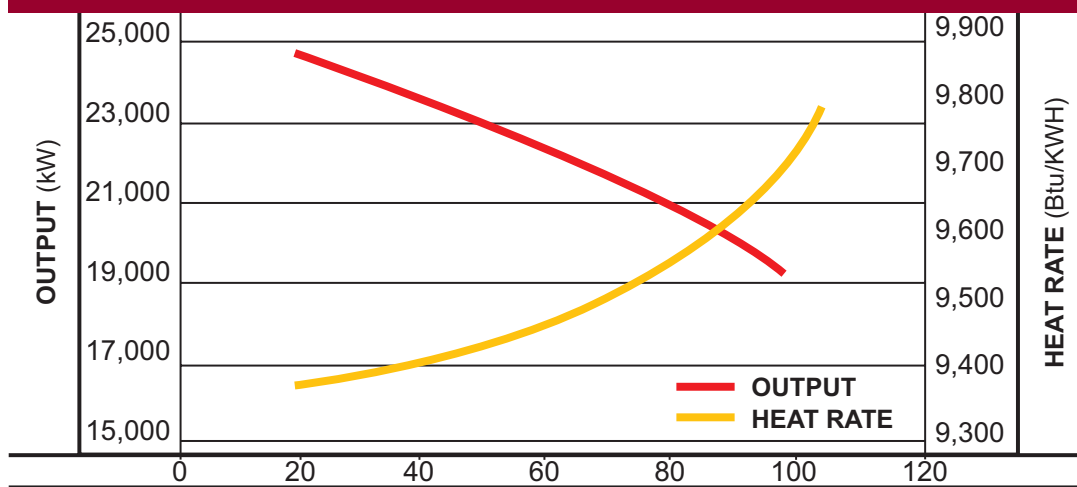
Skid Mounted Equipment:

- Electro-hydraulic start skid and system
- Lube oil skid and system
- On/off-line water wash skid and system
- Fuel oil skid and system (optional)



LM2500 FACT SHEET

LM2500 60Hz Output and Heat Rate



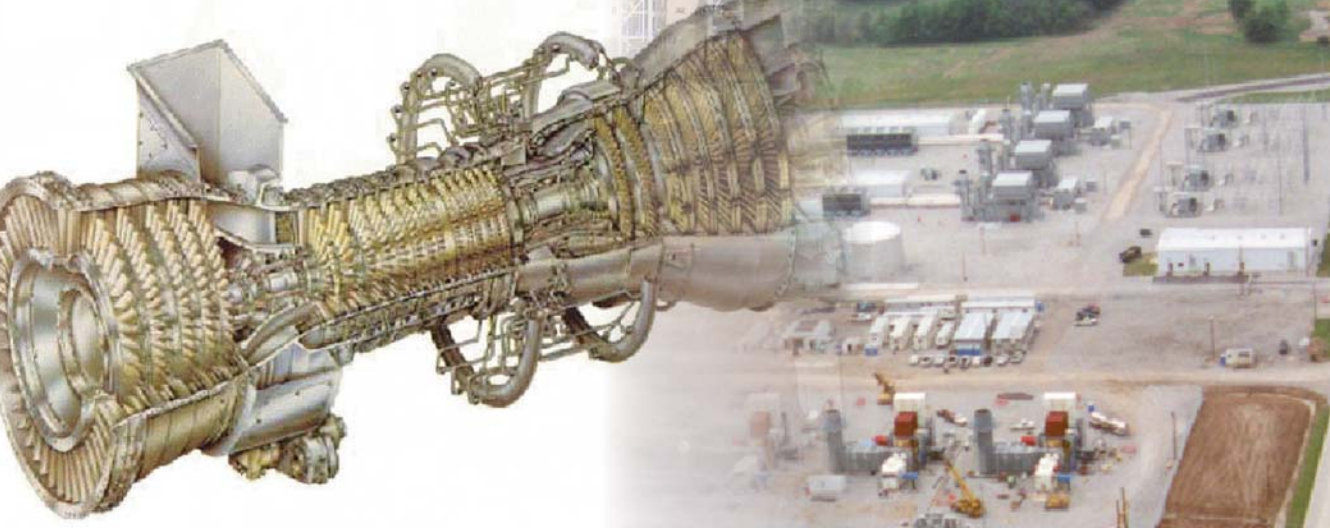
0 ft. 60% RH, 4/6 in H₂O inlet/exhaust loss on natural gas with water injection to 25ppmvd NO_x water inj.

AMBIENT (°F)

Turbine

	LM2500
Power Output (kWe)	22,000
Heat Rate LHV (Btu/kWe-Hr)	9,465
Exhaust Flow (lbs/sec)	149
Exhaust Temperature (°F)	990
Emissions (ppmvd)	NO _x /CO
Gas-DLE	25/25
Gas or Liquid-Water	25/50, 42/30
Gas-Steam	25/30
Power Turbine Speed (rpm)	3,600
No. of Compressor Stages	16
No. of Turbine Stages	6

Missouri
2001 Adams Road • Sedalia, MO 65301
tel 660.829.5100 • fax 660.829.1160 • www.proenergyservices.com



STANDARD 60Hz LM6000 GENERATOR PACKAGE

Gas Turbine

19 Stage Axial Compressor

- 5 stages low pressure and 14 stages high pressure
- Horizontal Split Casing
- 30:1 Compression Ratio
- 275 lb/s Nominal Inlet Mass Flow

Annular Combustor

- 30 Nozzles Gas Fuel, Water Injection for NOx Control

Turbine Stages

- 2 stage high pressure and 5 stage low pressure Power Turbine

Generator

13.8kV, 0.9PF Continuous Duty

2 Pole, 3 Phase, Brushless Exciter

WPII weather protected

Voltage Regulator/Neutral Side Protection CT's

NEMA Class F Insulation & B Temperature Rise

Integrated Protective Relay Panel

Package

24V and 125V DC Batteries

85dBA Near Field Design

Barrier Inlet Air Filters

10 Minute start capability

Electro-Hydraulic Start/Shutdown System

Class I Div 2 Group D Class Electrical System

Digital Control System with a Human Machine Interface (HMI)

Lube Oil System with Duplex Shell and Tube Coolers

On/Off-line Water Wash

Georgia
1395 S. Marietta Pkwy
Suite 218
Marietta, Georgia 30067

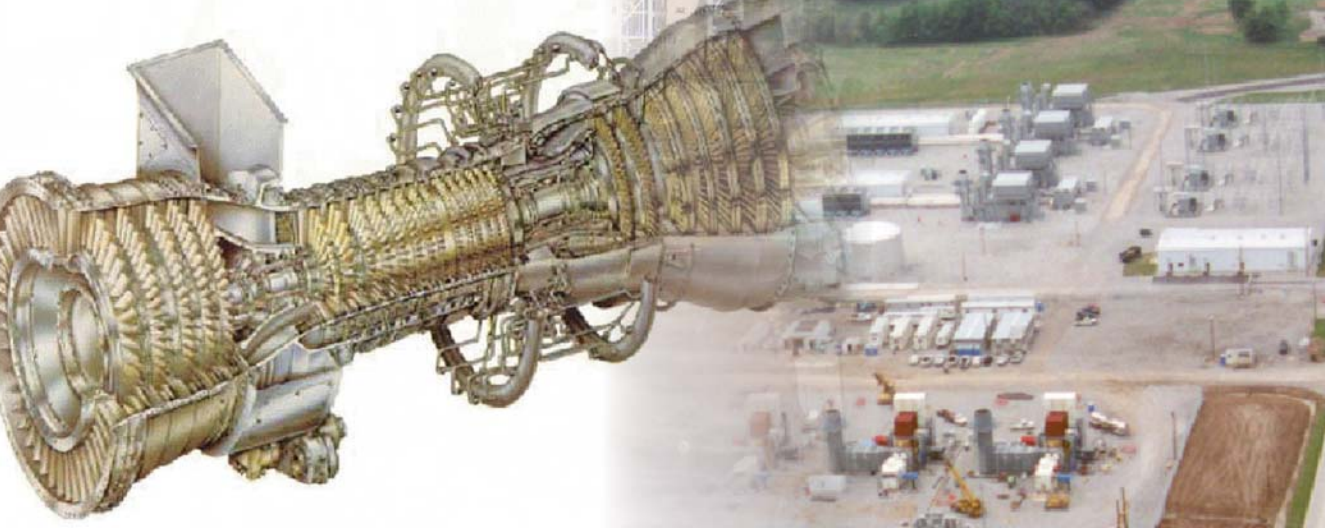
Missouri
2001 Adams Road
Sedalia, MO 65301

Texas
616 FM 1960 West
Suite 750
Houston, Texas 77090

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Torre Polar Oeste, Piso 4, Oficina 4-C
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Venezuela

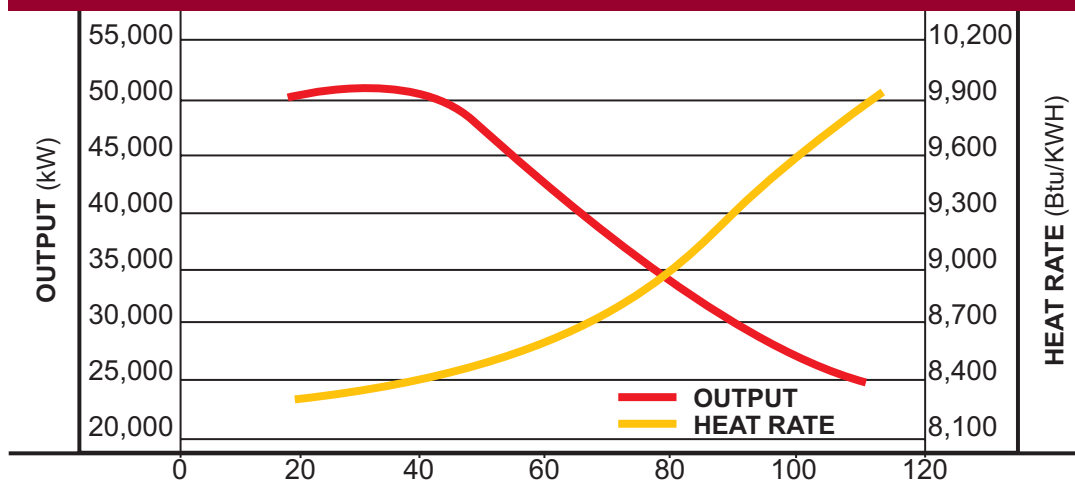
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SERVICES
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LM6000 FACT SHEET

LM6000 60Hz Output and Heat Rate



0 ft. 60% RH, 4/6 in H₂O inlet/exhaust loss on natural gas with water injection to 25ppmvd NOx water inj.

AMBIENT (°F)

Turbine

	LM6000-PC	Sprint
Power Output (KWe)	43,600	50,000
Heat Rate LHV (Btu/kWe-HR)	8,500	8,400
Exhaust Flow (lbs/sec)	284	295
Exhaust Temperature (°F)	792	826
Emissions (ppmvd)	NOx/CO	
Gas or Liquid-DLE (15 ppm)	15/50, 65/25	15/50, 65/25
Gas or Liquid-DLE (25 ppm)	25/25, 134/25	25/25, 104/25
Gas or Liquid-Water	25/26, 42/6	25/32, 42/6
Gas-Steam	25/21	25/25
Power Turbine Speed (rpm)	3,600	3,600
No. of Compressor Stages	19	19
No. of Turbine Stages	7	7

Georgia
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Suite 218
Marietta, Georgia 30067

Missouri
2001 Adams Road
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Plaza Venezuela - Caracas
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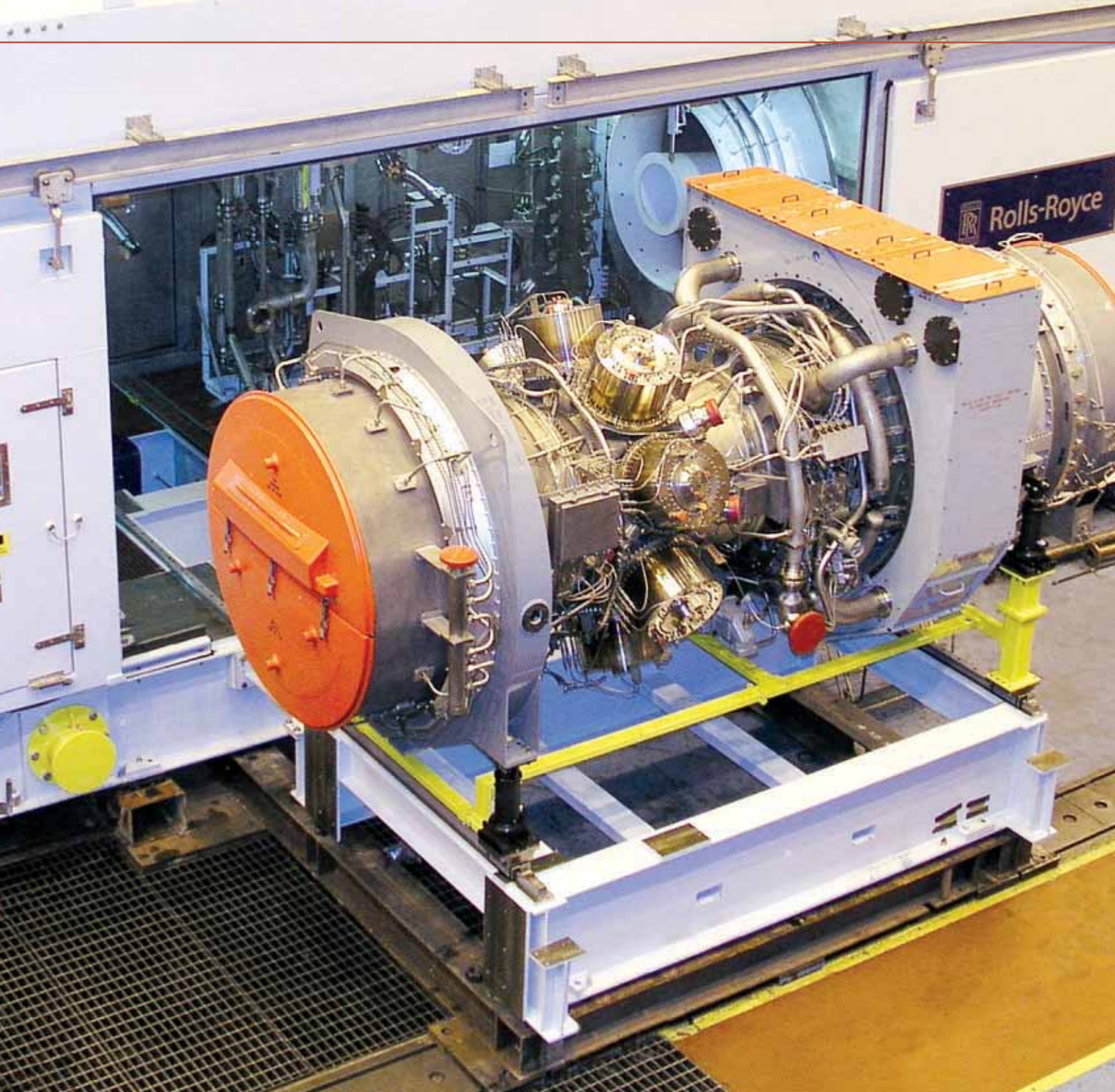
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Rolls-Royce

The Trent 60 Gas Turbine

For power generation and mechanical drives



Power generation

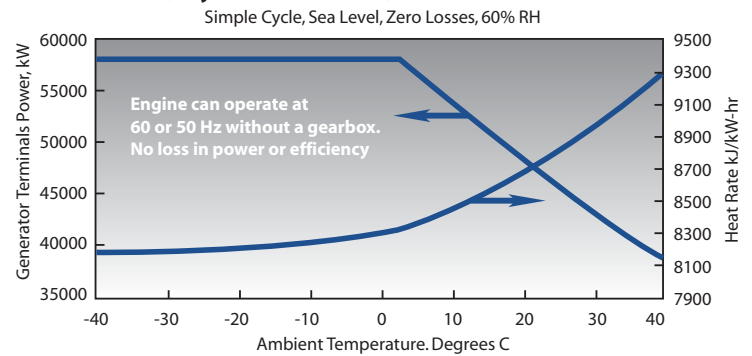
TRENT

The Rolls-Royce Trent 60 is the most advanced aeroderivative gas turbine available today. Delivering up to 58MW of electric power in simple cycle service, at 42 per cent efficiency, the Trent 60 has established a new benchmark for fuel economy and cost savings. It also offers operators fast delivery and installation times and beneficial environmental performance.

Key features

- Highest power aero derivative gas turbine
- Highest simple cycle efficiency gas turbine
- Efficient package for installation and maintenance
- Power generation at 50 or 60 Hz without a gear
- DLE or WLE systems available for 25 ppm NOx
- Small footprint and low weight
- Proven history from aircraft engine lineage
- Full load train starting with only 250 kW motor
- High cyclic life meets daily peaking market
- Cold start to full power in under 10 minutes

Trent 60 (Dry Low Emissions) Nominal Performance



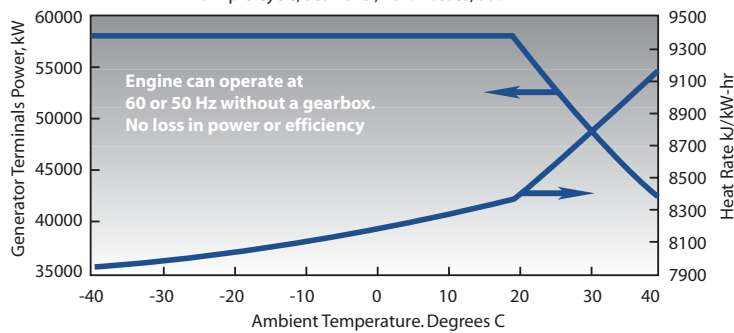
The Trent 60 package



Rolls-Royce

Trent 60 (Water Injected) Nominal Performance

Simple Cycle, Sea Level, Zero Losses, 60% RH



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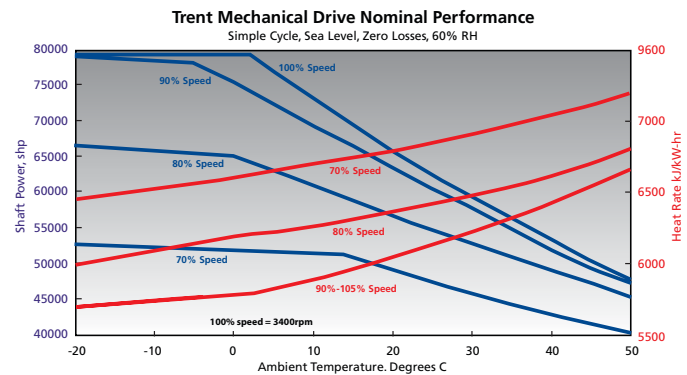
Trent 60 – Dry Low Emissions (DLE)

The Trent 60 DLE engine is designed to meet stringent environmental requirements. The use of an eight canular staged combustion system allows the successful operation of the engine in part load operation while still maintaining NOx and CO compliance. The engine is designed to produce 52MW of power at ISO conditions and is flat rated at 58MW power at temperatures below approximately 2°C.

Trent 60 – Wet Low Emissions (WLE)

The Trent 60 WLE uses the annular combustor system from the Trent aero engine with the introduction of water to reduce emissions and boost performance. Since the Trent 60 engine only uses water in the combustion chamber, water usage is kept to a minimum. At temperatures below 19°C. (varies due to site conditions) the engine is flat rated at 58MW. An online monitoring system allows for the reduction of water usage due to changes in power demand and ambient conditions while still maintaining compliant emission levels.

Mechanical drive



T R E N T

Onshore or offshore



The Trent 60 is ideally suited to meet the higher power, variable speed demands required by applications like natural gas liquefaction, gas transportation and gas Injection for oil recovery. The design flexibility of the Trent allows the same engine that serves the power generation market to meet the needs of mechanical drive service with no design changes. The Trent, due to its three independent shaft design, is capable of meeting driven equipment power demand at reduced speeds with a minimal drop off in efficiency. The Trent design also allows the starting of large trains with the same standard, low power, starting system that is employed for power generation.

Key features

- The engine is designed for a 100% speed of 3400 RPM
- Can be direct connected to driven equipment or use a gear
- Engine control system can be modified to support a variety of driven equipment
- Speed range of 70-105%.
- Low starting power requirement for large trains
- Identical engine and package for power generation and mechanical drive.
- Multiple daily starts with no extended wait time between starts.



Trent 60 engine on test, driving a centrifugal compressor at full load.



Rolls-Royce

The Trent 60 package

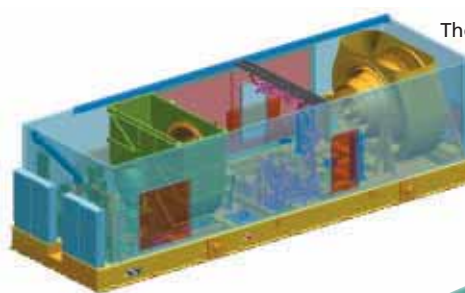
T R E N

Modular concept

The Trent 60 package is designed with a modular concept to not only allow for quick installation but also for ease of maintenance in the field.

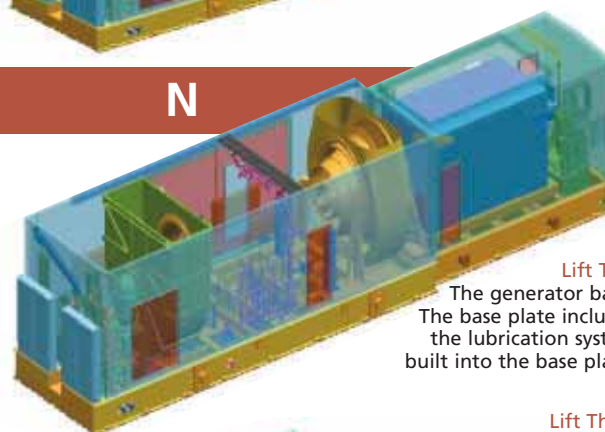
Each of the modules is fully assembled and tested before shipment to the field. Both the gas turbine and the generator base plates hold the required oil systems thus allowing installation, testing and flushing in a shop environment. This greatly reduces site installation time.

Not only are the mechanical systems located on the base plate but the control systems are located there as well. The control systems required for the operation of the Trent engine whether in mechanical drive or power generation service are pre-assembled and tested on the base plate before the unit ships to the field. All train control systems are then accessed by a Human Machine Interface (HMI) which can be located in the main control room.



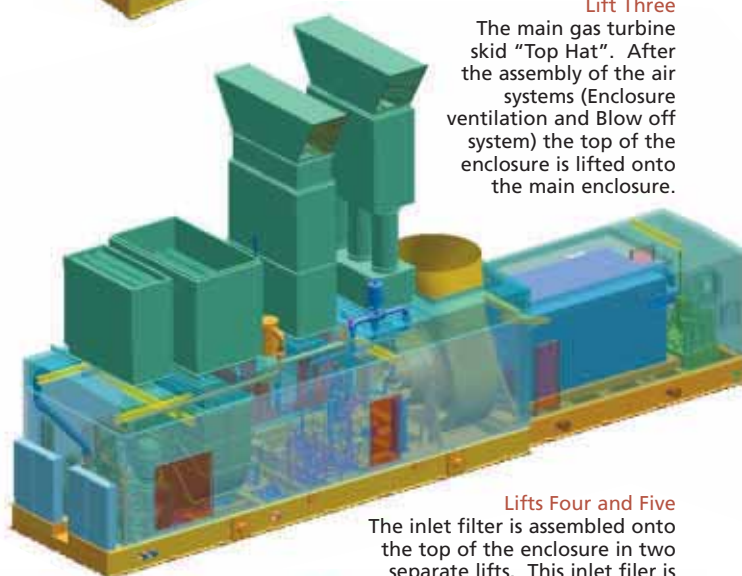
Lift One

The main gas turbine skid base plate. This base includes all required engine lubrication systems, fuel systems and the control panels.



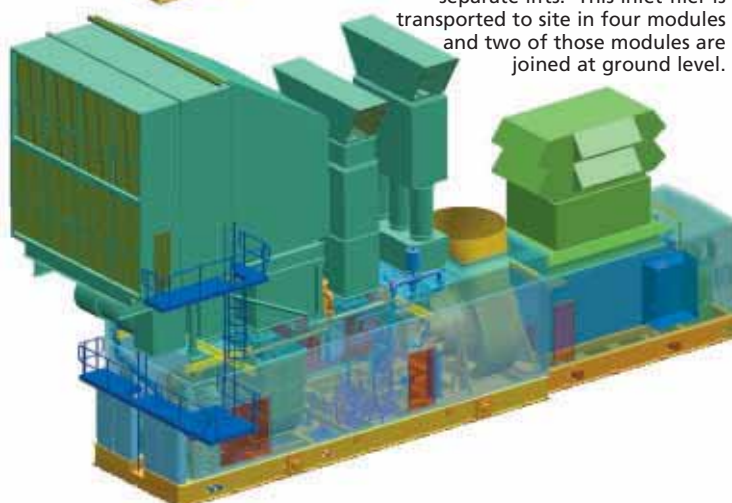
Lift Two

The generator base. The base plate includes the lubrication system built into the base plate.



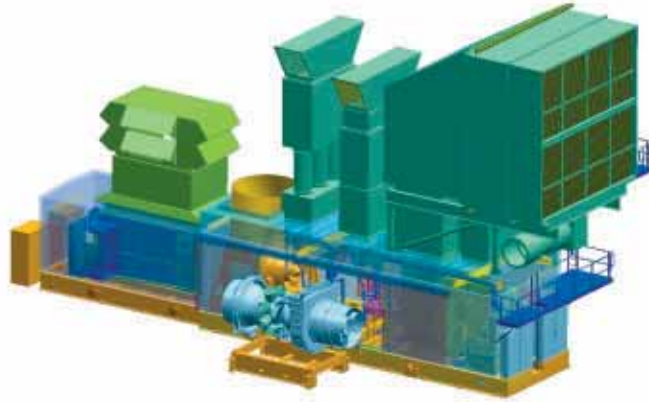
Lift Three

The main gas turbine skid "Top Hat". After the assembly of the air systems (Enclosure ventilation and Blow off system) the top of the enclosure is lifted onto the main enclosure.



Lifts Four and Five

The inlet filter is assembled onto the top of the enclosure in two separate lifts. This inlet filter is transported to site in four modules and two of those modules are joined at ground level.



Trent maintenance

T R E N T

Flexible design

Due to the Trent's aircraft engine lineage, maintenance of the engine can be accomplished quickly and easily. The Trent package is designed to facilitate engine change out in under 24 hours of working time.

Complete engine servicing can take place in a Rolls-Royce facility.

The Trent engine is also capable of being split into three interchangeable modules:

1. Low pressure compressor
2. Intermediate and high pressure compressors and turbines
3. Low pressure turbine

It is possible to swap these engine modules at the site in under 72 working hours. This reduces overall transport and costs associated with inventory of a spare engine. Rolls-Royce can also offer access to a lease engine or module program.

This program reduces the need for a spare engine and allows significant flexibility in maintenance.



The engine is installed and removed from the side of the package. The use of sliding doors allows full access to the engine and is designed for a complete engine change out in 24 working hours.

Customer service business

Long Term Service Agreements
 Engineered products
 Refurbished power systems
 Repair and overhaul
 Control system upgrades
 Service exchange and lease engines
 Spare parts
 Technical support
 Field service
 Customer training
 Complete installation and commissioning service

T R E N T

Experience holds the key to success

In today's evolving and demanding energy market, Trent gas turbine based packages offer distinct advantages to the power generation and oil and gas industries. This competitive advantage is complemented by an innovative and diverse suite of service solutions tailored to customers' specific needs.

Our ability to keep you operational where others might fail is a direct result of our policy to develop integrated solutions. Our Long Term Service Agreements (LTSA's) create partnerships designed to control operators' maintenance budget while increasing the availability of the equipment.

The equipment upgrades we provide as part of our suite of engineered products rely on the

comprehensive system history and key performance indicators established in our technical support networks.

By diligently monitoring the performance of your installed plant we can plan when major components will need to be removed for repair or overhaul. We are continually increasing the range and scope of our customer service solutions. Our own online community at www.enegymanager-online.com provides Rolls-Royce users with quick, up to date, easy to access information.



LP Turbine

HP/IP
Core

LP
Compressor

Engine Handling

Due to the Trent's aircraft lineage it is possible for the engine to be split into three modules at the site. This reduces transportation costs and saves on inventory requirements.



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