171MW GE 7FA Gas Turbine Generators for Sale

60Hz. Never Installed Two Set Available Immediately

Equipment Details

Unit 1

General Electric PG7241FA
Dry Low NOx

Gas Turbine-298202

Natural Gas
Starting: Static Start
Air Filtration: Two Stage Static
Exhaust System Axial Exhaust
Emission Control Gas-Dry Low Nox
Outdoor Enclosure Turbine and Accessory Compartments
Off-Base Acoustic Enclosure Turbine and Accessory Compartments
Off-Base Acoustic Enclosure Turbine Compartment

Generator-337X245

Model 7FH2
Cooling Hydrogen
Frequency 60 Hz
Power Factor (PF) 0.85 Lagging
Terminal /Voltage 18.0 KV
Generator Excitation EX2000P-Static Bus Fed
Outdoor Enclosure Load Compartment
On-Base Lagging Accessory Base

Control Systems

Turbine-Generator SPEEDTRONIC mark VI

- **All auxiliary equipment for Unit 1 is stored in US**

For more information Contact milt@rmaglobal.com www.PowerPlantsOnline.com

Unit 2

General Electric PG7241FA
Dry Low NOx

Gas Turbine-298389

Natural Gas
Starting: Static Start
Air Filtration: Two Stage Static
Exhaust System Axial Exhaust
Emission Control Gas-Dry Low Nox
Outdoor Enclosure Turbine and Accessory Compartments
Off-Base Acoustic Enclosure Turbine and Accessory Compartments
Off-Base Acoustic Enclosure Turbine Compartment

Generator-338X530

Model 7FH2
Cooling Hydrogen
Frequency 60 Hz
Power Factor (PF) 0.85 Lagging
Terminal /Voltage 18.0 KV
Generator Excitation EX2000P-Static Bus Fed
Outdoor Enclosure Load Compartment
On-Base Lagging Accessory Base

Control Systems

Turbine-Generator SPEEDTRONIC mark VI

- **All auxiliary equipment for Unit 2 is stored.**

The information below is generic for both units and is intended as information only.

5.1 Gas Turbine Systems

5.1.1 Gas Turbine

Base-mounted PG7241 (FA) 60 Hz gas turbine including:

- Modulating IGV

5.1.2 Combustion System

- Dry Low NOx combustion system
- Combustion system features
  - Thermal barrier coated liners
  - Nimonic transition pieces
  - Reuter Stokes SiC flame detectors
  - With compressor inlet heating

5.1.3 Fuel Systems

5.1.3.1 Gas Fuel System

- Natural gas only
- Stainless steel gas piping
- Orifice type gas flow measurement system
- Single gas strainer
- Gas fuel temperature supplied per GEI-41040F- Heater by Owner
- Gas fuel valves on accessory base
- Gas fuel cleaning equipment
  - Fuel gas scrubber, Duplex

5.1.4 Lubricating and Hydraulic Systems

5.1.4.1 Pumps

- AC motor driven dual lube oil pumps
- AC motor driven dual hydraulic pumps
  - Used for jacking oil also
- DC motor driven, emergency lube oil pump
- AC/DC motor driven auxiliary generator seal oil pump

5.1.4.2 Filters and Coolers

- Dual lube oil system filters
- Dual hydraulic oil filters
- Dual lube oil coolers
  - With 90-10 copper-nickel straight-tubes
- ASME code stamp

- Lube oil coolers
- Lube oil filters

5.1.4.3 Lube Oil Piping

- 304L stainless steel lube oil feed pipe
- Carbon steel lube oil drain pipe
- Lube system valve stainless steel trim

5.1.4.4 Mist Elimination

- Lube vent demister

5.1.4.5 Oil Reservoir

- With heater for -20°F

5.1.4.6 Instrumentation

- Delta pressure switches for lubrication and hydraulic oil filters
- Lubrication oil header pressure transmitter
- Lubrication oil tank level transmitter
- Lubrication oil filter differential pressure transmitter
- Hydraulic oil supply pressure transmitter

5.1.5 Inlet System

- Inlet system arrangement
  - Up and forward inlet system arrangement
  - Inlet compartment supports straddle ductline
- Inlet filtration
  - Two-stage static filter; prefilter and high efficiency filter
  - Filter media (high humidity)
  - 50 micron moisture separator
  - Weather protection on inlet filter compartment
  - Inlet system differential pressure indicator
  - Inlet system differential pressure alarm
  - Inlet filter compartment support steel
  - Caged ladder access to inlet filter compartment
  - Left hand access to inlet filter compartment
  - Inlet filter compartment interior lighting
- Inlet heating
  - Bleed heat manifold located in duct
  - DLN premix turndown inlet bleed heat control
  - Compressor pressure ratio operating limit bleed heat control
  - Inlet bleed heat control valve(s)
- Inlet ducting
  - Inlet silencing
  - Inlet expansion joint

. Inlet 90 degree elbow
. Inlet transition piece
. Inlet ducting support steel
. Diluent injection instrumentation
. Compressor inlet humidity sensor
. Compressor inlet temperature thermocouple

- Inlet system atmospheric protection
  . Zinc rich paint inside and outside of inlet filter compartment
  . Epoxy overcoat inside and outside inlet filter compartment
  . Galvanized inlet filter compartment support steel
  . Zinc rich paint inside and outside of inlet ducting with epoxy top coat
  inside ducting
  . Epoxy top coat outside of inlet ducting
  . Stainless steel inlet silencing perforated sheet
  . Galvanized inlet ducting support steel

5.1.6 Exhaust System

5.1.6.1 Arrangement

- Exhaust diffuser with an axial exit
- Exhaust expansion joint

5.1.7 Couplings

- Rigid load coupling
- Load coupling guard

5.1.8 Gas Turbine Packaging

- Lagging and enclosures
  . On-base accessory compartment lagging
  . Off-base acoustic enclosure for turbine only
  . Off-base load coupling compartment enclosure
  . Acoustic barrier wall around exhaust diffuser
- Compartment ventilation, pressurization and heating
  . Dual turbine compartment vent fans
  . Dual accessory compartment vent fans
  . Dual load compartment vent fans
  . Heated turbine and accessory compartments for humidity control
- Plant arrangement
  . Turbine designed for installation outdoors
  . Right hand accessory module
  . Exterior unit walkways by customer, mounting pads by GE
  . Interior unit walkways
- Turbine and accessory base painting
  . Standard primer only
- UBC Seismic Zone 4 (except for inlet and exhaust)

- UBC Seismic Zone 2A for inlet and exhaust
- Hazardous area classification
  - NEC Class1, Group D, Division 2
  - Turbine compartment
  - Natural gas fuel compartment
- Special features
  - Dual (metric-English) indicators and gauges

5.1.9 Fire Protection System

- Fire detection system
  - Turbine and accessory compartments
- Smoke detection system
  - Control cab/PEECC
- Compartment warning signs
- CO2 supply system
  - One low pressure CO2 tank per unit
  - Tank suitable for 0-120°F (-18 to 49°C)
- Fire protection piping
  - Turbine and accessory enclosures
- Hazardous atmosphere detectors in turbine and gas fuel compartments
  - CHx detectors - natural gas compartment
  - CHx detectors - turbine gas compartment
- Hazardous atmosphere detector readout
  - CHx

5.1.10 Cleaning Systems

- On base piping for on and offline compressor water wash system
- Water wash skid
  - Water storage tank
  - Skid enclosure
  - Single skid per site (1 skid per 3 units)

5.1.11 Cooling Water System

- Cooling system temperature regulating valve

5.1.12 Starting Systems

- Static start
  - Generator start with inverter/regulator
  - Static start isolation transformer
  - Oil filled
- Rotor turning systems
  - Turning gear and motor for rotor cooldown
  - Rotor indexing (borescope inspection)

5.1.13 Miscellaneous Systems

5.1.13.1 Special Systems

- Exhaust frame blowers on turbine compartment roof

5.2 Generator

5.2.1 General Information

- Hydrogen cooled generator with conventionally cooled armature
- Outdoor installation
- 60 Hz generator frequency
- Generator voltage 18.0 kV
- 0.85 power factor (lagging)
- Capability to 1.00 power factor (leading)
- Class .F. armature and rotor insulation
- Class .B. temperature rise, armature and rotor winding
- Generator bearings
  - End shield bearing support
  - Elliptical journal bearings
  - Roll out bearing capability without removing rotor
  - Insulated collector end bearing
  - Online bearing insulation check
  - Offline bearing insulation check with isolated rotor
- Monitoring Devices
  - Two (2) velocity vibration probes at turbine end, one)1) at collector end
  - Provisions for key phasor-generator
  - Provisions for permanent flux probe
  - Proximity vibration probes
  - . Two probes per bearing at 45° angle
- Generator Field
  - Direct cooled field
  - Two-pole field
  - Finger type amortissuers

5.2.2 Generator Gas Coolers

- Coolers shipped installed
- Generator gas cooler configuration
  - Five (5) horizontally mounted simplex coolers
  - Coolers located in generator base
  - Cooler piping connections on left side as viewed from collector end
  - ASME code stamp
  - Single wall cooler tubes
  - Victaulic cooler couplings
  - Plate fins

- Cooling water manifold and isolation valves

- Generator gas cooling system characteristics
  - Coolant temperature
  - Not defined
  - Generator capacity with one section out of service 80% with Class "F" rise
  - TEMA class C coolers
  - Maximum cooler pressure capability - 125 psi
  - Fouling factor 0.0005
- Generator gas cooler construction materials
  - 90-10 copper-nickel tubes
  - Carbon steel tube sheets
  - Carbon steel waterbox and coupling flanges with epoxy coating
  - Aluminum cooler tube fins

5.2.3 Generator Lube Oil Systems and Equipment

- Bearing lube oil system
  - Generator lube oil system integral with turbine
  - Sight flow indicator
- Bearing lift oil system
  - Stainless steel lift oil piping and tubing
  - Lift oil supplied from turbine oil system
- Lube oil system piping materials
  - Stainless steel lube oil feed pipe
  - Carbon steel lube oil drain pipe
  - Welded oil piping

5.2.4 Generator Grounding Equipment

- Neutral grounding equipment
  - Neutral ground transformer and secondary resistor
  - Mounted in terminal enclosure
  - Motor operated neutral disconnect switch

5.2.5 Generator Temperature Devices

- Stator winding temperature devices
  - 100 ohm platinum RTDs (resistance temperature detector)
  - Single element RTDs
  - Grounded RTDs
  - Nine (9) stator slot RTDs
- Gas path temperature devices
  - 100 ohm platinum gas path RTDs
  - Single element temperature sensors
  - Four (4) cold gas
  - Two (2) hot gas
  - GTG-2 (common cold gas)

- Bearing temperature devices
  - Chromel alumel (type K) thermocouples
  - Dual element temperature sensors
  - Two (2) bearing metal temperature sensors per bearing
- Collector temperature devices
  - 100 ohm platinum RTDs
  - Single element temperature sensors
  - Collector air inlet temperature sensor
  - Collector air outlet temperature sensor
- Lube oil system temperature devices
  - Chromel alumel (type K) thermocouples
  - Dual element temperature sensors
  - One (1) bearing drain temperature sensor per drain

5.2.6 Packaging, Enclosures, and Compartments

- Paint and preservation
  - Standard alkyd beige primer
- High voltage bushings
  - High voltage bushings shipped installed
  - Six (6) ambient air cooled, high voltage bushings
- Generator terminal enclosure (GTE)
- Line-side terminal enclosure
  - Terminal enclosure shipped separate
  - Isolated phase bus duct connection
  - Phase sequence R-C-L when looking at enclosure terminals
  - Outgoing power connection on right side when viewed from collector end
  - Lightning arresters
- Neutral terminal enclosure
  - Neutral terminals integral with line-side terminal enclosure
  - Neutral tie
- Collector compartment/enclosure
  - Collector compartment/enclosure shipped separate
  - Outdoor
  - Collector/brush holding rigging
- Compartment lighting and outlets
  - AC lighting
  - Collector compartment
- Foundation hardware
  - Generator shims
  - Generator alignment key(s) - collector end
  - Generator alignment key(s) - turbine end
  - Generator alignment key(s) - axial

5.2.7 Hydrogen Systems and Accessories

- Hydrogen gas manifolds
  - Auto purge gas purge control manifold
  - Hydrogen/CO2 control valve assembly
  - H2 Bottle manifold not provided
  - CO2 bottle manifold not provided
- Seal oil system
  - Control unit mounted in collector compartment
  - Stainless steel seal oil feed pipe
  - Carbon steel seal oil drain pipe

5.2.8 Electrical Equipment

- Motors
  - TEFC motors
  - Coated with antifungal material for protection in tropical areas
  - High ambient motor insulation
  - Motor heaters connected to ac power
  - Extra severe duty motors
  - Cast iron motor housings
- Heaters
  - Generator stator heaters
  - Generator collector heaters

5.2.9 Generator Excitation Systems, Static Components

- Bus fed static excitation with hot backup bridge

5.2.9.1 Excitation Module Features

- Control/monitor/display through TCP
  - Voltage matching in turbine control system
  - Power factor controller in turbine control system
  - Var controller in turbine control system
  - Selection of automatic or manual regulator
  - Raise-lower of the active regulator setpoint
  - Enter setpoint command
  - Display field amps
  - Display field volts
  - Display transfer volts
- Built-in diagnostic display panel
  - Automatic voltage regulator (AVR)
  - Manual voltage regulator (FVR)
  - Automatic and manual bi-directional tracking
  - Reactive current compensation (RCC)
  - Volts per hertz limiter (V/Hz LIM)
  - Volts per hertz protection (24EX) (Backup to 24G)
  - Over excitation limiter (OEL)

- Offline/online over excitation protection (76EX)
- Loss of excitation protection (40EX)
- Bridge ac phase unbalance protection (47EX)
- Under excitation limiter (UEL)
- Generator overvoltage protection (59EX)
- Generator field ground detector trip (64FT)
- VT failure detector (VTFD) (60EX)
- Field over-temperature alarm
- Field ground detector alarm (64FA)
- Exciter phrase voltage imbalance (47EX)
- Bridge over-temperature (26EX)

- Dual source internal bulk power supply
- Millivolt shunt for field
- Surge protection
  - VT disconnect and CT shorting switches
  - Two phase current sensing
  - Three phase voltage sensing
  - Single pole dc field contactor/bridge
- Thyristor bridge circuit filtering
- Shaft voltage suppressor circuit (mounted in panel)
  - Field de-excitation circuit (with field discharge inductor)
  - Bridge disconnect; ac no load

5.2.9.2 Performance

- 2.0 response ratio and 160% VFFL (100°C) ceiling @ Vt = 1.0pu

5.2.9.3 Excitation Enclosure Location

- Installed in LCI/EX compartment

5.2.9.4 LCI Features

- LCI located in LCI/EX compartment
- LCI disconnect switch (89SS)
  - Located in generator terminal enclosure
- LCI fuse
  - Located in compartment with LCI

5.2.9.5 PPT Features

- Freestanding oil-filled PPT for outdoor installation
- PPT fed from auxiliary bus

5.2.10 Generator Current Transformers and Potential Transformers

- Current transformers (CTs)
  - C400 current transformers (CTs)
  - Line side CTs

. CT 19A, C (excitation)
. CT 21, 22, 23 (generator differential relay)
. Neutral CTs
. CT1, CT2, CT3
. CT4, CT5, CT6
. CT7, CT8, CT9

- Potential transformers (PTs)
  . Fixed
  . VT2, generator line side

5.3 Gas Turbine-Generator Controls and Electric Auxiliaries

5.3.1 Control Cab/Packaged Electric and Electronic Control Compartment (PEECC)

- Weatherproof, climate controlled, base mounted enclosure
- Supplemental wall-mounted air conditioner

5.3.2 Gas Turbine Control System Panel Features

- Triple modular redundant (TMR)
- Skid mounted control panel
- Auto/manual synchronizing module with synchronizing check function
- Generator stator overtemperature alarm (49)
- Droop control
- Load limiter
- Purge cycle
- Customer alarm/trip contact for CRT display
- Vibration alarm readout and trip
- Electrical overspeed protection
- Constant settable droop
- Power factor calculation and display
- Power factor control
- VAR control
- Manual set point preselected load
- IRIG-B interface (time signal by others)

5.3.3 Local Operator Station

- Commercial grade personal computer
- Color monitor
  . Table top
  . 17 in. screen
- Mouse cursor control
- Table top AT 101 keyboard

- Printer
  - 24 pin dot matrix
- Display in English language
- RS232C two way serial link (MODBUS) via local HMI

5.3.4 Remote Control and Monitoring Systems

- RS232C two way serial link (MODBUS) via remote HMI
- Multi-unit remote HMI
  - One per site
- Commercial grade personal computer
- Color monitor
  - Table top
  - 20 in. screen
- Mouse cursor control
- Table top AT 101 keyboard
- Printer
  - Printer, color ink jet
- Power 120Vac 60 Hz

5.3.5 Rotor, Bearing and Performance Monitoring Systems

- Performance monitoring systems
  - Performance monitoring sensors wired to gas turbine control system
  - Performance calculations in <I>/HMI
- Vibration sensors
  - Velocity vibration sensors
  - Proximity vibration sensors
- Bently Nevada 3500 monitor
  - With local display panel
  - Relay outputs wired to gas turbine control panel
  - Mounted with generator control panel
- Bearing thermocouples
  - Bearing drain thermocouples
  - Bearing metal thermocouples
- Borescope access holes

5.3.6 Generator Control Panel

5.3.6.1 Generator Control Panel Hardware

- Mounted in PEECC
- Skid mounted with turbine panel
- DGP with test plug capability
- DGP without ModBus communication interface
- DGP with communication interface

- DGP with IRIG-B interface
- DGP with oscillography capture
- DGP with redundant internal power supply
- Generator breaker trip switch (52G/CS)
- Humidity sensor readout
- Hazardous atmosphere detector readout
- Bentley Nevada vibration monitor(s)

5.3.6.2 Digital Generator Protection System (DGP)

- Generator overexcitation (24)
- Generator undervoltage (27G)
- Reverse power/anti-motoring (32-1)
- Reverse power/anti-motoring (32-2)
- Loss of excitation (40-1,2)
- Current unbalance/negative phase sequence (46)
- System phase fault (51V)
- Generator overvoltage (59)
- Stator ground detection (64G1)/(59GN)
- Generator over/under frequency (81O-1, 81U-1)
- Generator differential (87G)
- Voltage transformer fuse failure (VTFF)

5.3.6.3 Generator Protection Discrete Relays

- Synchronizing undervoltage relay (27BS-1,2)
- Reverse/inadvertent energization protection relay (50RE/86RE)
- Generator differential lockout relay (86G-1)
- Second generator lockout relay (86G-2)

5.3.6.4 Features Integrated Into Gas Turbine Control System

- Gas turbine control system with speed matching, synchronization and
check
- Manual synchronization displayed on gas turbine control system <I> / HMI
- Auto/manual synchronizing module displayed on gas turbine control system
<I> / HMI
- Load control in gas turbine control system
- Temperature indication for generator RTDs
- Generator voltage matching (90VM)

5.3.6.5 Generator Control Panel Metering

- Generator digital multimeter
  . VM - Generator volts

. AM - Generator Amps: Phase 1,2,3 and Neutral
. MW - Generator MegaWatts
. MVAR - Generator MegaVARs
. FM - Generator frequency
. MVA - Generator MVA
. PF - Generator power factor

5.3.6.6 Generator Control Panel Transducers

- Generator watt/VAR transducer 4-20 mA output for input to TCP (96GG-1)
- Generator TCP/droop control transducer 4-20 mA output (96GW-1)
- Generator watt/VAR transducer 4-20mA output for customer (96GG-2)

5.3.7 Generator Protection

- Generator electrical protection equipment
  . Ground brush rigging

5.3.8 Batteries and Accessories

- Lead acid battery
- Single phase battery charger
- Second battery charger
- Battery and charger mounted in the PEECC

5.3.9 Motor Control Center

- MCC mounted in control cab/PEECC
- Tin-plated copper bus-work
- 65 kA bracing
- 480V 60 Hz auxiliary power

5.3.10 Motor Features

- TEFC motors less than or equal to 200 hp
- Coated with antifungal material for protection in tropical areas
- High ambient motor insulation
- Energy saver motors
- Extra severe duty motors
- Cast iron motor housings
- All redundant motors to be lead/lag
- Motor heaters

. Rated 110/120 volts, 50/60 Hz

- WP motors >200 hp

5.4 Services

- Technical advisory services: $1,750,000US credit available towards GE services.
- Documentation
  1 set of English language service manuals per Unit, including Operation, Maintenance and Parts volumes
- Turbine maintenance tools (1 set per site)
  - Guide pins (for removal or replacement of bearing caps, compressor casing and exhaust frame)
  - Fuel nozzle wrenches
  - Fuel nozzle test fixture
  - Spark plug electrode tool
  - Clearance tools
  - Fuel nozzle staking tool
  - Combustion liner tool
  - Bearing and coupling disassembly fixture
- Generator maintenance tools (1 set per site)
  - Rotor lifting slings
  - Rotor removal equipment including shoes, pans, pulling devices
  - Rotor jacking bolts
- Installation equipment
  - Trunions for generator
  - On permanent basis
  - Jacking bolts for generator
  - Foundation/installation washer and shim packs