Scope of Supply
50 MW LM6000 PC Sprint Turbine Packages
With Warranty

Options Available
*Rent to Own – Lease – Outright Purchase – Financing*
### SPRINT™ 50-Hz Generator Sets

- **Base Plate Length**: 64’ 7” (19.69 m)
- **Base Plate Width**: 13’ 6” (4.11 m)
- **Enclosure Height**: 14’ 6” (4.42 m)
- **Overall Length**: 64’ 10” (19.76 m)
- **Overall Width**: 49’ 3” (15.01 m)
- **Overall Height**: 37’ 11” (11.56 m)
- **Base Plate Foundation Load**: 522,000 lb (234,900 kg)

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### SPRINT™ 60-Hz Generator Sets

- **Base Plate Length**: 56’ 6” (17.22 m)
- **Base Plate Width**: 13’ 6” (4.11 m)
- **Enclosure Height**: 14’ 6” (4.42 m)
- **Overall Length**: 56’ 9” (17.30 m)
- **Overall Width**: 49’ 9” (15.16 m)
- **Overall Height**: 36’ 2” (11.02 m)
- **Base Plate Foundation Load**: 476,000 lb (214,200 kg)

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SCOPE OF SUPPLY

Combustion Turbine
- The gas turbine model LM6000 is a two-shaft/two-spool engine consisting of a five-stage low pressure compressor, a fourteen-stage high pressure compressor, a two-stage high pressure turbine, and a five-stage low pressure turbine.
- The engine is equipped with a stainless steel mesh screen in the inlet air stream for "last chance" protection against foreign object damage.
- The engine is shock mounted and shipped in position, with the exception of the coupling spacer, which is removed and shipped in a separate container.

Generator
- Open air cooled, 2-pole generator operating at 13.8 kV, 60 Hz (or 11.5 kV, 50 Hz). Generator is capable of handling customer power requirement throughout a wide ambient temperature range. The generator includes a brushless excitation system with permanent magnet generator. Neutral and line side cubicles are included.

Unit Enclosure
- The package is supplied with weatherproof, acoustic enclosures. The enclosures are designed to achieve noise abatement to an average of 85 dB(A) at 3 ft. (1.0 m) away and 5 ft. (1.5 m) above grade during full load operations. The enclosures are completely assembled and mounted over the equipment prior to testing and shipment. Both turbine and generator compartments are fully ventilated with redundant fans (one running, one stand-by).
- Explosion-proof lighting is provided in both compartments.

Gas Turbine / Generator Baseplate
- The package is supplied with the support structures for the gas turbine generator set consisting of a two-piece skid assembly, which is sectioned between the gas turbine and the generator. The full depth, bolted section is designed to provide the full structural properties of the wide flange I-beams. Full depth cross members are utilized to provide for a rigid design that is suitable for installation in earthquake areas (IBC2000) as well as providing a convenient structure for transportation.

Air Inlet System
- The package is supplied with a modular, multi-stage filtration system consisting of inlet screens, a pre-filter and a final barrier filter. All air for ventilation systems is filtered to the same level as turbine combustion air.
- An anti-ice, an evaporative cooling, a combustion air heating or a chilling system is available as an option.
- Filtered air is silenced before entering the turbine plenum. This design results in a compact arrangement and eliminates the need for customer supplied inlet ducting when the standard design is utilized.
- Internal lighting of the filter house is provided to facilitate inspection and service. Package is also supplied with platforms and ladders to service the inlet filter.
Turbine Exhaust
- The package is supplied with a circular, axial exhaust outlet with connection flange to facilitate in-line mounting of an HRSG or simple cycle exhaust stack.

Simple Cycle Exhaust Stacks
- Each package includes one (1) Simple Cycle Exhaust Stack. The Exhaust Stack is forty-five (45) feet tall rated at 85 dBA sound pressure at one (1) meter.

SPRINT® Power Augmentation
- SPRINT® boosts engine performance up to 50.0 MW (ISO conditions) using a spray intercooling design that increases the mass flow by cooling the air during the compression process. The system is based on an atomized water spray injected through spray nozzles placed at two locations, one between the high pressure and low pressure compressors, and the second at inlet bellmouth. Water is atomized using high pressure air taken off of the eighth stage bleed. The water flow rate is metered, using the appropriate engine control schedules at the inlet bellmouth. Bellmouth and inter-stage portions on SPRINT® alternate operation based on turbine inlet temperature. Customer supplies 22 gpm (83 lpm) of demineralized water to the connection on the unit.
- Water must meet GE specification MID-TD-0000-3.

Fuel System
- The package is supplied with a natural gas fuel system that utilizes an electronically controlled fuel-metering valve. For full-load operation, the gaseous fuel must be supplied to the baseplate at 675 psig±20 (4,654 ±138 kPag).
- Gas fuel must meet General Electric specification MID-TD-0000-1.

Lube Oil Systems
- The package is supplied with two separate lube oil systems: one synthetic for the gas turbine and one mineral for the generator. The oil reservoirs and piping are all stainless steel, and the lube oil system valves have stainless steel trim. The turbine coolers, oil reservoir, and filters are mounted on the auxiliary equipment module. The mineral lube coolers, reservoir and filters are located on the main skid baseplate. The auxiliary equipment module provides simplified piping connections and reduces customer’s installation time and costs.
- Customer must supply cooling water to the shell and tube coolers.
- Turbine lube oil must meet MID-TD-0000-6.

Electro-Hydraulic Start System
- The package is supplied with an electric motor driven hydraulic pump assembly, filters, cooler and controls, mounted on the auxiliary equipment module. A hydraulic motor is also mounted on the gas turbine accessory gearbox. Hydraulic hoses are furnished to connect the auxiliary equipment module and the main baseplate.

Fire Protection System
- The package is supplied with a factory installed fire protection system complete with optical flame detection, hydrocarbon sensing and thermal detectors, piping and nozzles in both the generator and the turbine compartments. The fire protection system includes cylinders containing CO2 mounted on a separate skid. A 24 V DC battery and charger to power the fire protection system is also included. All alarms and shutdowns are annunciated at the turbine control panel (TCP). An alarm sounds at the turbine if the gas detectors detect high gas levels, or if the system is preparing to release the CO2. When the system is activated, the package shuts down, the primary CO2 cylinders are discharged into the turbine and generator compartments via multiple nozzles and the ventilation dampers automatically close. After a time delay and if required, the reserve supply of CO2 is discharged.
**Digital Control System**
- The package is supplied with a free-standing control panel suitable for mounting in an indoor, non-hazardous area. The control system includes vibration monitoring, digital meter, digital generator protective relay module and an HMI (human machine interface) display of key discrete and analog data. Alarm and shutdown events are displayed on the HMI automatically. An Ethernet TCP/IP EGD or RS485 Modbus Port is provided to transmit unit conditions (status, pressures, temperature, etc.) to the customer’s distributed control system.
- Power for the control panel is provided by a dedicated 24V DC battery system with dual 100% capacity chargers, which are shipped separately for installation by others.

**Generator Protective Relays**
- The package is supplied with a microprocessor-based generator protective relay module, mounted in the Turbine Control Panel. The protective relay system includes functions are necessary for protection of the generator.

**Soak Wash System**
- The package is supplied with a turbine cleaning system, which allows customers to clean the compressor section of the turbine during full power operation. The same system reservoir and piping are utilized for offline soak washing. Auxiliary skid connections are provided for customer supplied purified water at a maximum of 50 psig (345 kPag) and air at 100 – 120 psig (689 – 827 kPag).
- Customer is required to provide water meeting MID-TD-0000-4, detergent meeting MID-TD-0000-5, and air filtered to ISA 57.3 standards.

**ENGINE REFURBISHMENT**
- The overhaul/refurbishment process is typically based on the borescope inspection of each LM6000 CTG in conjunction with the total engine hours, the factored fired hours since the last repair and/or overhaul, and other applicable engine history.
- The following scope is planned for execution in order to return the engine to operations for this specific project:

**Receive CTG into Depot and Disassemble into Engine Modular Units**
- Incoming inspection and photograph of CTG arrival
- Report of missing and damaged external hardware
- Disassemble into Engine Modular Units, clean, and inspect as required
  - Low Pressure Compressor
  - High Pressure Compressor
  - Combustor Module
  - High Pressure Turbine
  - Low Pressure Turbine

**Condition Based Overhaul of Accessories and SB Implementation**
- Lube and Scavenge pump with applicable SB implementation
- Hydraulic Control Unit, Variable Geometry pump, and Starter Motor
- Engine actuators and implement applicable SB
Bearing Overhaul or Replacement with new including Associated Work and SB implementation

- Disassembly of the Compressor Front Frame, Compressor Rear Frame, Turbine Rear Frame, Accessory Gear Box, and Inlet Gear Box
- Overhaul or Replacement with new of all engine bearings
- As required overhaul of cold end Teflon seals (# 1 bearing and # 3 bearing)
- Inspect, clean and as required re-coat of Air Collector
- Implement all applicable SB’s
- Reassembly with new consumables
- Inspect and as required overhaul of #1 Bearing Stationary air seal or replacement with new condition

Variable inlet Guide Vane (VIGV), Low Pressure Compressor Rotor (LPCR), and Low Pressure Compressor Stator (LPCS) Repair

- Condition based VIGV disassembly, strip, and recoat
- Condition based LPCR disassembly and disk/shaft overhaul
- Condition based LPCS disassembly and stage 3 shroud overhaul
- Labor and consumables to reassemble the VIGV and LPC
- Removal and as required repair of Passive Cooling Clearance (PCC) system

Hot Section Overhaul and SB Implementation

- Complete overhaul of all airfoils, stage 1 and 2 blades and nozzles or Replacement with New Chromalloy Single Crystal Extended Life hardware
- Hot Section Overhaul may Include but not limited to the following SB:

<table>
<thead>
<tr>
<th>Service Bulletin No.</th>
<th>Title</th>
<th>Compliance Category</th>
<th>Compliance Level</th>
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<tr>
<td>162</td>
<td>HPT Stator Interstage Stationary Air Seal Replacement</td>
<td>C</td>
<td>F/D</td>
<td>26-Jun-01</td>
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<td>173</td>
<td>Introduction of Improved HPT Leaf Seal Retention Pin and Spring</td>
<td>R</td>
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<td>15-Jan-02</td>
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<td>185</td>
<td>HPT Stg 2 Shroud Coating Change</td>
<td>C</td>
<td>F/D</td>
<td>14-Aug-03</td>
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<td>216</td>
<td>HPT Rotor Diffuser Vane Ring</td>
<td>C</td>
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<td>238</td>
<td>HPT Stage 2 Nozzle Outer Platform Cooling</td>
<td>C</td>
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Overhaul of the Combustion Chamber

- Complete overhaul of Single-annular Combustor (SAC)
- Clean, flow check and as needed overhaul all 30 Fuel Nozzles
- Clean, flow and recertify 30 Fuel Nozzles

HPC repair and SB implementation

- As required Overhaul of HPC Rotor spools and Stator cases
- As required Overhaul of all damaged blades and vanes or Replacement with new or Serviceable condition hardware
- Applicable SB implementation
Assembly of the engine
- Labour and consumables required to reassemble engine
- Applicable SB implementation

As Required Acceptance Test of Completed Engine

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<tr>
<th>Service Bulletin No.</th>
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<td>Balance Piston Replacement</td>
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<td>128</td>
<td>No. 4 Bearing Rotating Air, Seal Inspection</td>
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<td>Introduction of Improved, No. 1 Bearing Stationary and Rotating Air/Oil Seals</td>
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<td>172</td>
<td>Introduction of Improved Inlet Gearbox Spanner Nut</td>
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<td>178</td>
<td>Lube and Scavenge Oil Manifold Nipple Replacement</td>
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<td>229</td>
<td>Stage 3 through 5 High Pressure Compressor Rotor Blades</td>
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<td>232</td>
<td>PX 36 Sensor Electrical connection Relocation</td>
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<td>237</td>
<td>VBV clevis bolt length increase</td>
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<td>239</td>
<td>Improved LPT coupling Nut</td>
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<td>240</td>
<td>Improved Forward Fan shaft Coupling Nut</td>
<td>C</td>
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CTG Package
Contractor will provide a new package including the following items and services:
- Inspect the generator, conduct megger and low resistance checks. Inspect the bearings, windings, coatings, connections and coupling.
- Overhaul/Rebuild the generator as necessary.
- Required new mechanical systems
- Required new electrical systems
- Required new control systems

DOCUMENTATION
- Included is the required drawings, manuals and records for the package
WARRANTY
- A one (1) year warranty on the package and the generator set is included.
- Warranty period will expire upon the earlier of either one (1) year from the Commercial Operation Date (COD) or eighteen (18) months from delivery of the equipment.

EXCLUSIONS
- Crating and Packing
- Cartage and Transportation
- Engineering and Design integrating the package to customers site
- Installation & Commissioning

ASSUMPTIONS
- Pricing includes the equipment scope limited by the description in this proposal.

PRICING
- All pricing quoted is in USD
- Pricing excludes taxes

DELIVERY
- The generator package is available with an estimated lead time of 90 – 120 days from order confirmation.
- Equipment is subject to being offered for sale on open market and prior sale elsewhere

TERMS & CONDITIONS
- This scope of supply is valid for ninety (90) days from date of submission to client
- This scope of supply does not constitute a contract for sale and purchase or installation
- Any sale remains subject to formal contract terms and conditions and documentation
- Any offer for installation remains subject to site inspection and validation