

## Section 2.0 Scope of Work and Supply

The Scope of Work and Supply is comprised of the following outlined items:

### **Major Generation Equipment**

Installation of two (2) Owner Supplied GE LM6000 gas turbine generator packages, (one (1) LM6000 PC and one (1) LM6000 PD), complete with auxiliary skids, inlet filter and the one (1) Modular Control Building which is required with Turbine Control Panels, Generator Control Panels, GTG MCC, 24 VDC Batteries and Chargers and 125VDC Batteries and Charger.

GE Package interface points are as follows:

Equipment System	Limits of GE Package
<ul style="list-style-type: none"> <li>All supply piping, including Fuel Gas, Cooling Water, Demineralized Water, Lube Oil, Compressed Air, Instrument Air, Hydraulic Start Oil</li> </ul>	<ul style="list-style-type: none"> <li>Flanged or threaded connection on GE Package base plates.</li> </ul>
<ul style="list-style-type: none"> <li>Inlet Air-to-Filter</li> </ul>	<ul style="list-style-type: none"> <li>Atmosphere</li> </ul>
<ul style="list-style-type: none"> <li>Turbine/Generator Ventilation Air</li> </ul>	<ul style="list-style-type: none"> <li>Atmosphere</li> </ul>
<ul style="list-style-type: none"> <li>Turbine Exhaust</li> </ul>	<ul style="list-style-type: none"> <li>Flange &amp; Expansion Joint for connection to Exhaust Stack</li> </ul>
<ul style="list-style-type: none"> <li>Instruments on GE Package Base plate</li> </ul>	<ul style="list-style-type: none"> <li>Terminal box on base plate</li> </ul>
<ul style="list-style-type: none"> <li>Instrument wiring in Turbine Control Panel</li> </ul>	<ul style="list-style-type: none"> <li>Terminal in Turbine Control Panel</li> </ul>
<ul style="list-style-type: none"> <li>High Voltage Connections</li> </ul>	<ul style="list-style-type: none"> <li>Bus bar in GE Package generator line side cubicle</li> </ul>
<ul style="list-style-type: none"> <li>Generator Ground Connections</li> </ul>	<ul style="list-style-type: none"> <li>GE Package Neutral cubicle</li> </ul>
<ul style="list-style-type: none"> <li>Electric Motors</li> </ul>	<ul style="list-style-type: none"> <li>Terminal box on individual motors</li> </ul>
<ul style="list-style-type: none"> <li>Ladders and Platforms for Air Filter</li> </ul>	<ul style="list-style-type: none"> <li>Ladders and Platforms for Inlet Air Filter and Vent Fans</li> </ul>

.

## **2.0 Balance of Plant**

The contractor will design and install the facility as described in the following sections of this document. The design will include the necessary Structural, Mechanical, Electrical, Instrumentation, and Control System to install the above Major Equipment.

The Balance of Plant scope of supply will be comprised of the following:

- Contractor will provide complete design of the facility including civil, structural, buildings, mechanical, electrical, instrumentation and control system.
- Contractor will provide concrete foundations, plant gravel, fencing and security gate.
- Owner will provide the existing site at the Arrecife location which Contractor has visited and based its site layout on .
- Owner will provide access roads to the site.
- Contractor will provide Installation of the complete Power Plant with the inter-ties as described later in this document and including:
  - Mechanical installation of the various items of equipment with the associated inter-ties of raw water, demin water, firewater, natural gas and waste oil & water.
  - Electrical installation of the plant including feeds to 2 ea existing GSU Transformers, area lighting, grounding, lightning protection, and cathodic protection.
  - Installation of Instrumentation and Control System including plant instrumentation, metering, and Plant DCS.

### **2.1 BOP Major Mechanical Systems**

#### **2.1.1 Simple Cycle Exhaust Stack**

The Contractor will supply and install the exhaust stacks in accordance with the standards set out by GE for each LM6000 machine.

#### **2.1.2 Plant Fuel Gas System**

The Contractor will install the plant fuel gas system outlined as follows:

- Interconnect to Owner gas metering station above ground at gas regulating station adjacent to the Arrecife Power House.
- Install two (2) redundant coalescing filter separators on a common skid including redundant pressure regulators.
- Install a fuel gas compression plant to raise the available supply pressure of 230 psi. to the required 700 psi. for the gas turbines including sound attenuation for the (3) three compressors.
- Furnish and Install all plant fuel gas carbon steel piping, valves and fittings from plant inlet fuel gas interconnect to the fuel gas compressors and to each gas turbine fuel gas regulator filter.
- Provide and install stainless steel piping from the fuel gas filter to the gas turbine generator.

- Each supply line to the LM6000 turbines will have a gas meter with totalizer.
- Each LM6000 package is equipped with gas detectors.
- Signals to monitor and control the gas pressure are taken to the LM6000 central control room.

### **2.1.3 Plant Liquid Fuel System – Not Provided**

### **2.1.4 Water and Demineralized Water System**

Contractor will install a final water filtration system including EDI to treat the Owner furnished Demineralized water supply and sized to provide demin water to the LM6000 Plant.

### **2.1.5 Chiller System (Optional)**

Standard Chiller System – Contractor to furnish and install one (1) packaged 4,000 ton electric chiller system to supply chilled water to the two LM6000 GTG's. The design basis for the chiller system is based on ASHRAE 0.4% level for the area of 96°F dry bulb and 78°F wet bulb. The calculated chiller level is 1,896 tons for each turbine for a total of 3,792 tons. Note: This Chiller system would add an approximate 20 MW net power to the output of the plant at high ambient conditions.

- The chiller system will include:
  - 4,000 ton packaged Trane chillers
  - Galvanized Steel Cooling tower with UV resistant PVC
  - Cooling water circulating pumps
  - Chilled water circulating pumps
  - Complete electrical system including MCC's and interconnecting wiring.
  - Complete PLC based control system
  - Chemical injection skid for cooling tower
  - Insulated interconnecting piping between the chiller package and each GTG.

### **2.1.6 Oily Water Drain System**

The Contractor will furnish and install the oily water drain system as follows:

- Furnish and install below ground one (1) oily water separator with associated pumps and ancillaries.
- Furnish and install PVC or HDPE below ground piping and fittings from concrete oil containment units located at:
  - 1) All Transformers
  - 2) Gas Turbine Generator Auxiliary Skids
  - 3) Fuel Gas Compressors

Piping is to be routed to the oily water separator and then to the waste oil storage tank. The waste water is to be routed to the existing Plant Waste Water System. The Contractor will make provisions to pump the waste oil to the existing waste oil tank at the Arrecife Power House.

### **2.1.7 Plant Fire Water System**

The Contractor will furnish and install the Firewater System to be connected to the existing Main Plant Firewater System.

- Headers routed throughout the plant in accordance with NFPA Codes sized as 8" HDPE pipe.
- Monitors and Hydrants installed in accordance with NFPA Codes
- Portable fire extinguishers
- Building Fire Protection in accordance with Local Codes

### **2.1.8 Instrument and Service Air Systems**

The instrument and service air systems will be as follows:

- Contractor will install one (1) set of two (2) instrument and service air screw compressors with associated dryer and air storage tanks.
- Furnish and install stainless steel tubing with Swagelok fittings, valves, and instruments for instrument and service air systems from the air compressors to various required areas throughout plant for instrument air and service air. Furnish the appropriate quick connect connectors.

## **2.2 BOP Electrical Systems**

### **2.2.1 13.8 KV System**

The Contractor will perform the following work on the 13.8 KV system:

- Install two (2) 13.8 KV 3,000 amp generator circuit breakers with PTs and CTs, two (2) 13.8 KV Fused Disconnect switches for Aux. Power.
- Furnish and install all 13.8 KV cabling, bus work, duct bank, or hot dipped galvanized cable tray etc. from the generators to the generator circuit breakers and from generator breakers to the two Owner 69KV GSU Transformers.

### **2.2.2 13.8/4.16 KV System**

The Contractor to provide the following:

- Furnish and install one (1) 13.8KV / 4160V, 2000Kva auxiliary power transformer.
- Furnish and install one (1) 4160 V MCC to supply power to Gas Compressors

### **2.2.3 480V System**

The Contractor will provide the 480V system as follows:

- Install One (1) Owner Furnished 13.8KV / 480 volt 2.3 MVA auxiliary power transformer.
- Supply and install (1) 13.8 KV / 480 volt 2.0 MVA auxiliary power transformer.
- Furnish and install one (1) BOP 480V MCC
- Furnish and install cable tray / conduit with cabling from transformers to MCCs and from MCCs to plant 480V equipment and motors.
- Furnish and install underground conduit, duct banks, or overhead cable tray mounted on the pipe racks.

### **2.2.4 120/240 System**

The Contractor will provide the 120/240 system as follows:

- Furnish and install 480V/120/240V transformers, distribution panels and lighting panels as required with associated conduits, fittings and wire.

### **2.2.5 Plant Area Lighting**

The Contractor will provide the plant area lighting as follows:

- Furnish and install area lighting consisting of four (4) 25 ft galvanized metal poles with two (2) 400 watt metal halide floodlights on each pole sufficient to illuminate both GTG's and common areas.
- The lighting system will be connected to the black start generator
- 120 v power outlets will be furnished

### **2.2.6 Ground Grid**

The Contractor will provide the ground grid for the plant as follows:

- Contractor to tie the new ground grid into the existing utility ground grid.

### **2.2.7 Plant Electrical Cable Tray**

The Contractor will provide the plant electrical cable tray work as follows:

- Furnish and install hot dipped galvanized cable trays throughout plant. Cable trays to be mounted on pipe racks, cable trenches or within buildings for routing plant cabling. A separate cable tray will be installed for each of the 15/5 KV systems, 480V system, and instrumentation system cables.

### **2.2.8 Underground Conduit and Cable Systems**

The Contractor will provide the plant underground conduit and cable system as follows:

- Furnish and install rigid galvanized conduit or PVC encased in concrete for all underground power, control and instrumentation systems.

### **2.2.9 Lightning Protection**

The Contractor will provide lightning protection as follows:

- Furnish and install lightning protection on each gas turbine exhaust stack.

### **2.2.10 Batteries / Chargers / UPS Systems**

The Contractor will perform the following work on the batteries / chargers / UPS systems:

- Furnish and install BOP UPS system for DCS remote PLC associated equipment.

Note: 24 VDC batteries and chargers are to be supplied as part of the GE packaged control house.

## **2.3 Plant Instrument and Control Systems**

### **2.3.1 BOP Control System**

The Contractor will furnish and install a BOP control system to be located in the Central Control Room and consisting of:

- One (1) PLC DCS system sized for LM6000 and LM2500 Plants
- Three (3) PCs for human-machine interface (HMI).
- Two (2) printers.
- One (1) software package for plant DCS.

### **2.3.2 Plant Instrumentation Devices**

- Contractor to furnish and install instrument devices, both pneumatic and electric, consisting of meters, pressure, flow, temperature and level where required.

### **2.3.3 Electronic Wiring and Pneumatic Piping**

- Contractor to furnish and install necessary instrument wiring and pneumatic piping with associated Swagelok fittings, etc.

---

**2.4 69 KV Scope of Work****2.4.1 Generator Step-up Transformers (GSUs) Owner Furnished**

- Contractor to install two (2) 13.8KV feeds to Owner's generator step-up transformers.

**2.4.2 Protective Relaying**

- Contractor to supply and install Differential and overcurrent protection relays for transformers.

**2.5 Plant Communication System**

- Contractor to provide communication and public address system for the new plant.
- Contractor to furnish temporary telephones and email capability for construction communication purposes.
- The permanent communication system between the new plant and the TACOA plant will be provided by Owner.

**2.6 Plant Civil and Structural**

Contractor is responsible for the GEO TECH study, soil RESISTIVITY study, and HYDROLOGY to determine the creek levels for proper storm drainage, mud slides.

- Site preparation, rough grading, and finished grading to be furnished by Contractor based on an existing site with the required cut and fill to modify the site to accommodate both the LM6000 and LM2500 gas turbine generators.
- Contractor will furnish retaining walls and shotcrete stabilization of the embankments surrounding the plant site.
- Contractor to furnish and install all plant reinforced concrete foundations designed to IBC 2003. GSU foundation shall have 9" freeboard.
- Contractor to furnish and install concrete containment curbs and equipment foundations.
- Contractor to furnish and install plant gravel and asphalt paving as shown on the Plot Plans.
- Contractor to provide structural steel pipe racks to support overhead piping and cable trays. Pipe racks to be located as shown on Plot Plan drawings.

**2.7 Fencing**

Contractor to furnish and install perimeter fencing with razor wire 3 meters high. Also to include access gate



---

**2.8 Plant Buildings**

- Furnish and install a (30ft. x 40ft.) prefabricated metal insulated building for the Control / DCS/PLC room and offices and also auxiliary mechanical equipment. The Control / DCS/PLC room will be air conditioned and finished out as office space.
- Furnish and install a (30ft x 40ft.) prefabricated metal building for the demin water treatment, forwarding pumps, and instrument air compressors.
- Furnish and install (40ft. x 65ft.) prefabricated metal shed over gas compressors

**2.9 Plant Equipment Erection**

- Contractor to unload all Plant equipment delivered to site.
- Contractor will provide all cranes and support equipment and manpower as required to erect the gas turbine generators.
- Contractor to provide for erection of all Owner furnished and Contractor furnished BOP equipment.

**2.10 Cranes, Equipment and Tools**

Contractor to furnish or provide for all plant construction required cranes, fork lifts, back hoes, hydraulic lifts, welding machines, air compressors, generators, temporary lights, trucks, pick-ups, etc. All lifting equipment will be certified. Heavy equipment operators will be certified as trained and qualified for the equipment they are operating.

**2.11 Transportation**

Clover International will furnish transportation from US port to site all Contractor and Owner furnished equipment. Contractor will coordinate the schedule for delivery and offloading of the equipment at site to minimize delays.

**2.12 Lubricants and Chemicals**

- Contractor will supply and install all lubricants, lube oils and chemicals for furnished equipment.

**2.13 Spares**

- Contractor will make provision to supply, receive and store all commissioning spare parts furnished for equipment during start-up and commissioning.
- Contractor to provide Owner with recommended list of spare parts for Gas Turbine Generator and BOP equipment.

**2.14 Construction Offices and Storage Facilities**



- Contractor to provide construction offices for Contractor, Technical Representatives (3), and Owner (7 persons).
- Contractor to provide fenced storage and a lay down area and around the construction site during construction.
- Contractor to provide sanitation facilities for Contractor, & Owner personnel during construction.
- Contractor to provide communication facilities for construction.

## **2.15 Engineering and Project Management**

- Contractor to provide detailed engineering and specifications for all disciplines involved for the power plant including mechanical, electrical, instrumentation, DCS System, civil and concrete foundations.
- Contractor to provide project management complete with construction management, quality control / quality assurance, scheduling, administration, warehousing, and expediting including regular monthly reporting of all disciplines.
- Contractor to arrange for and provide fully qualified technical representatives during erection, testing, start-up, commissioning for the gas turbine generator units and Chillers.
- Contractor to provide startup, commissioning and testing of BOP associated systems.
- Contractor to provide operator and maintenance training for Power Plant on the Gas Turbine Generator Packages, Chillers, DCS, and Balance of Plant.
- Contractor to provide one (1) electronic and two (3) hard copies in English only for used equipment and in English and Spanish for new equipment of the O&M manuals, training manuals, engineering calculations, commissioning and start-up manuals, test manuals, as-built drawings, design specifications and warranty manuals for plant equipment.

## **2.16 Cathodic Protection**

Cathodic Protection will be provided for all steel underground piping.