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THE FOLLOWING NEW GE FRAME 9E GAS TURBINE GENERATOR SET IS AVAILABLE FOR SALE WITH US WITH IMMEDIATE DELIVERY:

1 No. – 134 MW, NEW GE Frame 9E Gas Turbine Generator Set, having the Following Technical Specifications:

7.1 GAS TURBINE GENERATOR UNIT:

7.1.1 The Gas Turbine Package Consisting Of:

7.1.1 The Gas Turbine Compartment:

- Multi-stages, axial flow compressor
- Modulated inlet guide vanes
- Three-stages turbine
- Multi-chambers combustion system
- Dual Fuel – gas and distillate combustion system
- Ignition system with spark plugs and U.V. flame detectors
- Borescope openings for maintenance inspection
- Seismic type vibration sensors on bearing caps for protection
- Thermocouples for measuring exhaust temperature
- Thermocouples on bearing drains
- Thermocouples on bearing metal
- Inlet and exhaust plenums
- Exhaust frame blowers

- Off-line compressor wet washing system

7.1.1.2 The Auxiliary Systems:

- Starting and cool down system with :
 - Electric motor drive
 - Hydraulic torque converter
 - DC electro-hydraulic rotor turning device
 - Manual rotor turning device
- Lubricating oil system with:
 - Duplex lube oil filters
 - Duplex lube oil to water heat exchangers
 - Shaft driven main lube oil pump
 - Full flow AC motor-driven auxiliary lube oil pump
 - One (1) partial flow DC motor driven emergency lube oil pump
 - Lube oil tank
 - Lube oil mist eliminator with single extraction Fan
 - Lube oil heater
- Hydraulic oil system with :
 - Shaft driven hydraulic oil pump
 - Duplex hydraulic oil filters
- Atomizing air system with :
 - One (1 x 100%) atomizing air pre-cooler
 - One (1 x 100%) atomizing air compressor
- Cooling water system with :
 - Shaft driven water pump

7.1.2 Couplings:

- Flexible auxiliary coupling
- Auxiliary gear box
- Gas turbine dry flexible type load coupling

- Load gear box, mounted between the gas turbine and the generator :
 - Separate base
 - Lubricating system integral with gas turbine
 - Seismic type vibration sensors on bearing caps for protection
 - Thermocouples on bearing drains
 - Connected to generator with rigid coupling

7.1.2.1 Gas Turbine Packaging

- Lagging and enclosures
 - Enlarged acoustical enclosure around gas turbine and accessory compartments
- Compartment ventilation and heating
 - Dual vent fans and heating system for turbine and accessory compartments
- Hazardous area classification (NEC Class1, Group D, Division 2)
 - Accessory compartment
- Fire detection and protection system with:
 - Thermic detectors

7.1.3 GENERATOR

7.1.3.1 General Information

- Open ventilated air-cooled generator
- Outdoor installation
- 50 Hz generator frequency
- Generator voltage 15 kV
- 0.80 power factor (lagging)
- Capability to 0.95 power factor (leading)
- Class “F” armature and rotor insulation
- Class “B” temperature rise, armature and rotor winding
- Static type inlet filters
- Generator bearings
 - Pedestal bearing support

- Tilting pad bearings
- Roll out bearing capability without removing rotor
- Insulated collector end bearing
- 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 amortisseurs

7.1.3.2 GENERATOR LUBE OIL SYSTEMS AND EQUIPMENT

- Bearing lube oil system
 - Generator lube oil system integral with turbine
 - Sight flow indicator
- Lube oil system piping materials
 - Stainless steel lube oil feed pipe
 - Stainless steel lube oil drain pipe
 - Welded oil piping

7.1.3.3 GENERATOR TEMPERATURE DEVICES

- Stator winding temperature devices
 - 100 ohm platinum RTDs (resistance temperature detector)
 - Single element RTDs
 - Grounded RTDs
 - Twelve (12) stator slot RTDs
- Gas path temperature devices
 - 100 ohm platinum gas path RTDs

- Two (2) cold gas
- One (1) hot gas
- Bearing temperature devices
 - 100 ohm platinum RTDs
 - Dual element temperature sensors
 - Two (2) bearing metal temperature sensors per bearing
- Lube oil system temperature devices
 - 100 ohm platinum RTDs
 - Dual element temperature sensors
 - One (1) bearing drain temperature sensor per drain

7.1.3.4 GENERATOR PACKAGING, ENCLOSURES, AND COMPARTMENTS

- Paint and preservation
 - Epoxy based primer
 - Neutral tie
 - Exciter enclosure for brushless exciter
- Foundation hardware
 - Generator shims
 - Generator alignment key(s) - collector end

7.1.3.5 GENERATOR EXCITATION SYSTEMS

- Brushless type with shunt transformer

7.1.4 THE GAS TURBINE GENERATOR CONTROL EQUIPMENT :

Located into an air conditioned Turbine Control Compartment (TCC) designed for outdoor installation and consisting of :

- Local operator interface <HMI>
- ETHERNET interface to the plant DCS via <HMI>, GSM-TCP/IP protocol (local)
- Generator control, excitation, regulation and protection panel with :
 - Automatic channel back-up (without manual channel)
 - Power system stabilizer (PSS)
 - Protection redundancy (base only)
 - Generator gross output meter active and reactive power class 0.2 (could be located in the auxiliary cubicle if lack of place in the generator control panel)
- Unit AC/DC Motor Control Center, withdrawable type

- Unit AC/DC sub-distribution panel, non-withdrawable
- 125 VDC Ni/Cd unit battery with one (1x100%) battery charger

7.2 OFF-BASE UNIT MECHANICAL AUXILIARIES INCLUDING:

7.2.1 The Inlet Air System:

- Static type air filter with :
 - Weather louvers
 - Pre-filter
 - Coalescer filters
 - High efficiency filters
 - Supporting steel structure

7.2.2 The Side Exhaust System:

- Expansion joint
- Transition piece
- Screen along the exhaust duct for personnel protection
- Low height silencer stack

7.2.3 OFF-BASE COOLING LOOP FOR GAS TURBINE COOLING SYSTEM INCLUDING FOR EACH UNIT:

- One (1) battery of water to air fin fan coolers with AC motor driven fans
 - With one (1) extra motor fan for the complete battery
- Atmospheric expansion tank with level, filling plug with steel structure
- Closed loop interconnecting piping

7.2.4 FIRE PROTECTION FOR GAS TURBINE GENERATOR UNIT INCLUDING FOR EACH UNIT:

- One (1) H.P. CO₂ bottles rack.
 - Inside a storage container
 - With a ventilation system
 - With remote weighting device
- Unit fire protection panel.
- Interconnecting piping up to the gas turbine

7.2.5 WASHING SKID(S) INCLUDING:

- Note: For several units project, the washing skid may be common to several gas turbine units.
- Compressor On and Off-line washing skid with :
 - Water tank 7.5m³ - stainless steel

- First charge of Detergent supplied with the skid
- Detergent supplied with the skid

7.3 OFF-BASE UNIT ELECTRICAL AUXILIARIES INCLUDING:

7.3.1 Connection between Generator Package And Medium Voltage Compartment(s) By:

- Metal enclosed air insulated non segregated phase bus bars

7.3.2 One (1) Medium Voltage Compartment, Per Unit, Designed For Outdoor Installation, Consisting Of:

- Unit circuit breaker (52 G) withdrawable
- 400 kVA unit auxiliary power transformer
- VTs for synchronization and bus bar ground protection
- VTs and CTs for measurement, protection and regulation

7.3.3 ONE (1)

GENERATOR NEUTRAL ACCESSORY COMPARTMENT, PER UNIT, DESIGNED FOR OUTDOOR INSTALLATION, CONSISTING OF:

- CT's for measurement and protection
- Generator grounding (through a resistor)

7.4 REMOTE CONTROL & MONITORING

- One (1) complete remote commercial grade operator interface <HMI>

7.5 MISCELLANEOUS:

- The following consumables :
 - Gas turbine draining system piping
 - Control, power and measure cables between the supplied equipment
 - Anchoring, base plates and positioning blocks for GTG
 - Template for anchor bolts positioning for GTG (for several units project, we do supply one single template for each block of three gas turbine units)
 - Special tools for the gas turbine including :
 - Installation tools list
 - Maintenance tools list
- No load gas turbine factory tests according to Manufacturer's standard

7.6 SERVICES

- One (1) set of civil work guide drawings for the supplied equipment
- End Of Manufacturing Report (EOMR) containing inspection & test records as per Contract Manufacturing Quality Plan (Tab.19) in English language on the following support:

- CD-ROM(two(2)sets)
- Operationandmaintenance manuals,accordingGE EnergyProducts–Europe standardform, in Englishlanguage on the followingsupport :
 - CD-ROM
- Deliveryof equipmentaccordingto Incoterms 2000
- For Training, Technical Advisory Services and Site Testing, see the associated tabs in the proposal.

7.7TERMINAL POINTS

7.7.1Mechanical

- Exhaust gas
 - Outlet flange of the expansion joint
- Cooling Water (Closed Circuit)
 - Filling connection on the expansion water tank
- Washing Water (OFF Line)
 - Filling connection on washing water tank
 - Outlet flange of washing skid
 - Inlet flange on the gas turbine base
- Lube Oil
 - Inlet and outlet connection on lube oil tank for filling and emptying
- Drains
 - Various outlet connections on the Gas Turbine Generator and auxiliary bases
- Sump
 - Outlet flanges of the sump pump
- Ventilation
 - Inlet and outlet openings on the acoustical enclosures

7.7.2ELECTRICAL

- Low Voltage (400 VAC)
 - Incoming circuit breaker terminals on GT MCC (standby incoming)
 - Terminals of the washing skid cubicle
 - Terminals of the liquid fuel forwarding skid
- Medium Voltage (15 kV)
 - Outgoing terminals of the medium voltage compartment (suitable for cables)

- Earthing
 - Terminal points on GTG base frame and various auxiliaries

7.8 SUPPLIES BY OTHERS

7.8.1 Mechanical

- Exhaust system
 - Joints downstream our limit of supply (if applicable)
 - Exhaust emission measurement instrumentation
- Fire fighting system
 - Site fire protection and detection system
- Piping
 - Washing water piping
 - Diesel fuel piping
 - Piping beyond terminal points
- Compressed air system (service and control)
- Washing water (if any) and oily water drain system including water recovery pit, piping from connecting flange near the GT base, water treatment before discharge in sewage system (if any)
- Diesel fuel storage facilities (if any)
- Diesel fuel filtering and forwarding skids (if any)
- Any crane and / or lifting facilities
- Machine shop equipment (if any)
- Laboratory equipment (if any)
- Turbine hall ventilation (if any)
- Various vents to be piped outside the turbine hall (if any)

7.8.2 ELECTRICAL

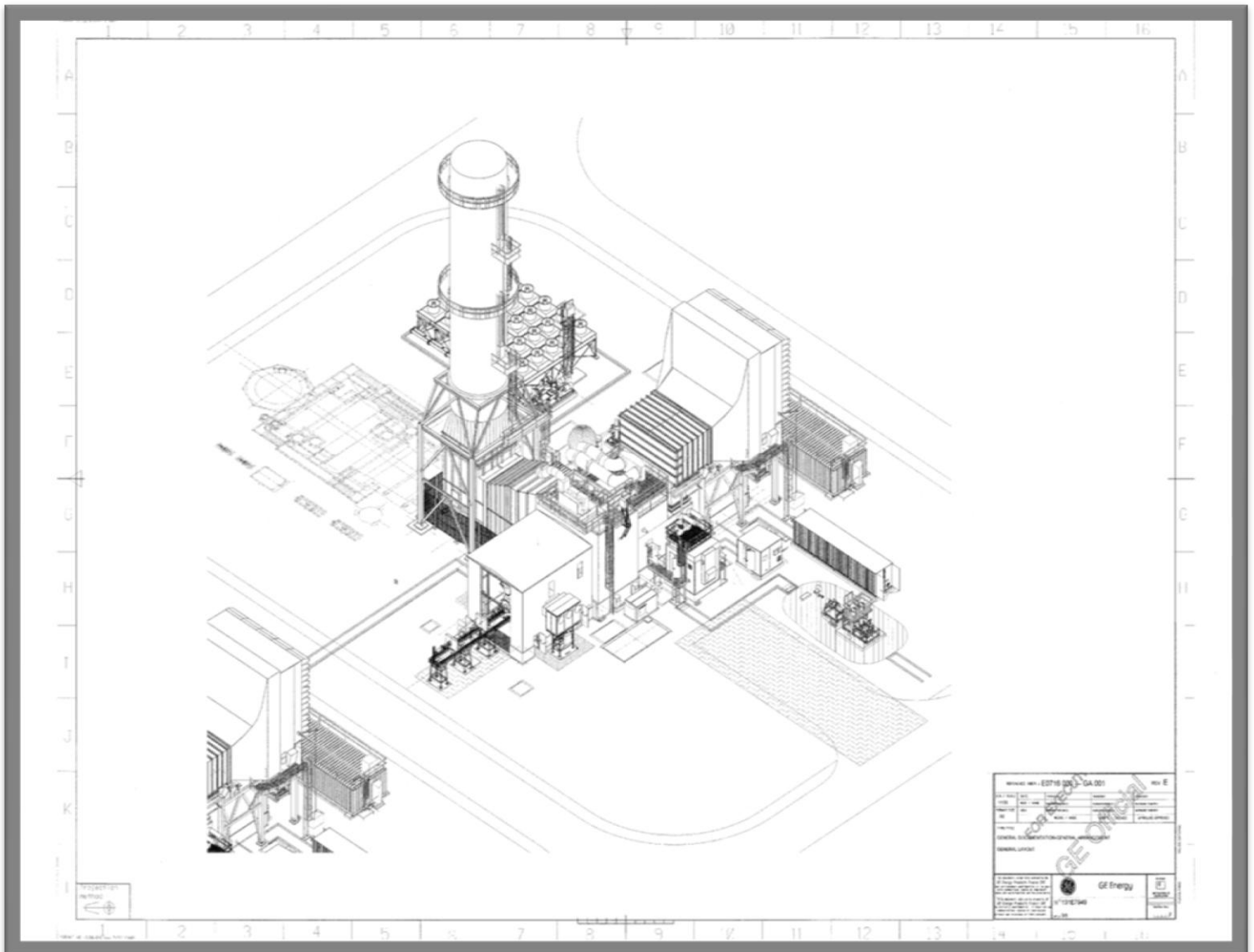
- All LV cables other than those used for interconnection between the supplied equipment
- All MV and HV cables
- Any MV and / or LV site switchboard
- Emergency diesel generating set and black start equipment
- Grounding grid and connections to the grounding cable
- Lightning protection

- Site lighting, fencing
- Cathodic protection
- Generator step-up transformer
- PT's for synchronization on line side
- CT's for the protection of the black-start Steam Turbine transformer leg (870)
- Aircraft warning light (if any)
- Circuit breaker and interlocking devices for the supply of the black-start transformer of Steam Turbine if applicable

7.8.3 MISCELLANEOUS & SERVICES

- Any generator type test
- All consumable, chemicals during erection, commissioning, testing and running of the unit(s) which have not been mentioned in the GE scope above
- Soil investigation, analysis and factual report
- Overall plant operation and maintenance manuals
- Any civil work, concrete structure, road, including design studies (except guide drawings for the supplied equipment)
- Grouting compound for GT unit(s)
- Local transportation to site
- Installation
- Any tax, import duty or import license in the final Country
- All environmental permits and / or approvals such as (but not limited to) air, waste, fluids, coastal zone, noise, hydrology study
- Electrical systems studies
- All governmental permits and / or approvals such as (but not limited to) construction permit, environmental impact statements, licenses, exemptions
- Any other equipment or service not clearly indicated in our Scope of supply

DRAWING:



NITIN