Scope of Supply

General

The offered scope of supply comprises the delivery of two (2) SGT5-PAC 4000F, including two (2) SGT5-4000F gas turbines, two (2) SGen5-1200A generators and associated auxiliary equipments based on the technical description and comments issued in Siemens technical offer.
The scope of supply is completely described in this section. Any hints on equipment, numbers of components etc. given in other sections are not binding even if the wording suggests something different.

Gas Turbine Package

Gas Turbine	**Quantity**
Gas turbine type	SGT5-4000F
Number of offered gas turbines	2
Each core gas turbine mainly comprising:	
▪ Ring combustor	1
▪ Turbine	1
▪ Compressor	1
▪ Bearings	2
Loose supplied gas turbine parts, mainly comprising:	
▪ Burners	1 set per gas turbine
▪ Intermediate shaft	1 per gas turbine
▪ Gas turbine instrumentation and actuation	1 set per gas turbine
▪ Gas turbine insulation	1 set per gas turbine
▪ Shaft turning gear	1 per gas turbine

Gas Turbine Auxiliaries	**Quantity**
Base Module, comprising the auxiliary packages for	1 per gas turbine
▪ Fuel gas and ignition gas within separate compartment	
▪ Lube oil with plate type heat exchanger 2x100%	
▪ Hydraulic oil supply for valves and actuators	
▪ Hydraulic clearance optimization	
Natural Gas Flow Metering for Performance Test (loose supply only)	1 per plant
Natural Gas Draining System	1 per gas turbine
Dual Fuel Module, comprising the auxiliary packages for	1 per gas turbine
▪ Fuel oil (with 2x100% fuel oil pumps)	
▪ Purge water	
▪ NOx (with 2x100% NOx water pumps)	
Sealing Air Supply System	1 per gas turbine
Advanced Compressor Cleaning System, including piping connection to cleaning water nozzle system	1 per plant (common for both GTs)

Gas Turbine Systems	**Quantity**
Air lntake System	1 per gas turbine
▪ Filter system with pulse filter stage	
▪ lnlet air filter house including weather hood, bird screen, weather louvre, interna! support structure, instrumentation, lighting, power sockets, access ladders, platforms and doors	
▪ lnterconnecting duct work with expansion joint, manhole, damper and silencer	
▪ Anti-lcing System	
▪ Electrical hoist for maintenance (250kg)	
▪ Dehumidifier for gas turbine standstill	
▪ Nozzle system for compressor cleaning inside air inlet plenum	
Exhaust Gas System	1 per gas turbine
▪ Exhaust gas diffuser	
▪ Compensator between gas turbine and exhaust gas diffuser	
Gas Turbine Control System	
Control System Type	SPPA-T3000
Turbine Controller	1 per gas turbine
▪ Redundant automation processor for closed-loop control functions	
▪ 1/0 modules, as per 1/0	
Turbine Failsafe Protection and Trip System	1 per gas turbine
▪ Failsafe system for protection and trip functions	
▪ Turbine Function Group Automatic and Operational Protection System	
▪ Redundant automation processor for open-loop control functions, sequence control functions and operational protection functions	
▪ 1/0 modules, as per 1/0	
l&C Cables	1 set
▪ Turbine related special instrument cables at turbine and on skids (from sensor to junction box)	
▪ Turbine related special control cables (flame monitoring cable)	
Application Server	1
▪ Redundant server for operating, monitoring, engineering function	
Turbine Operating / Monitoring / Engineering System	1 per gas turbine
▪ Operator terminal with 2x 24" LCD monitor, keyboard and mouse	
▪ Printer, DIN A4 color laser	
Turbine Network Bus System	1 set
▪ SPPA-T3000 bus system with necessary network components	
▪ Fiber optic bus cable to plant central control room, maximum length	300m
Signal Interface with Plant Distributed Control System	1 set
▪ Terminal points for hardwired signal exchange	
▪ Maximum number of signals per turbine package	30
▪ Terminal point for bus signal exchange (with OPC)	
▪ Maximum number of signals per turbine package	500

WIN_ TS Diagnostic System — 1 set

- WIN_ TS analysis system hardware + peripherals
- Software module for gas turbine special condition monitoring
- Vibration analysis

Gas Turbine Electrical Equipment	**Quantity**
Power Control Center (UBA01 / UBA02)	2 per gas turbine
AC Power Supply System	
- Low voltage switchgear, AC MCC (BFE / BME)	2 per gas turbine
DC Power Supply System	
OC voltage distribution (BUB / BUC)	2 per gas turbine
Battery (BTA)	1 per gas turbine
Battery charger (BTL)	2 per gas turbine
DC/DC converter (BUK)	2 per gas turbine

Gas Detection and Fire Protection System	**Quantity**
Gas Detection System	1 per gas turbine

- Gas detectors, horns and beacons, control unit
  - Covering following areas:
    - Gas turbine Enclosure
    - Fuel gas skid

Fire Detection System far Gas Turbine Unit — 1 per gas turbine

- Fire detection and control system with local panel
  - Covering following areas:
    - Gas turbine enclosure and fuel gas skid annex
    - Base Module
    - Power Control Center
    - Dual Fuel Module
    - Generator Bearings

Fire Extinguishing System — 1 per gas turbine

- Battery of high pressure bottles far $C0_2$ and direction valve station
- Piping system from bottle rack / storage system to spray nozzles inside the enclosure incl. supports
  - Covering following areas:
    - Gas Turbine Enclosure
    - Fuel Gas Skid Enclosure
    - PCCs

Noise Protection Measures	**Quantity**
Noise Enclosure for Gas Turbine ▪ Structural steel, with corrosion protection ▪ Noise abatement panels, galvanized ▪ Interna! service platforms and ladders, galvanized ▪ Doors with safety windows ▪ Interna! lighting, including emergency lighting	1 per gas turbine
Ventilation System for Gas Turbine Enclosure ▪ Air intake openings with protective grills, dampers and silencer ▪ Air handling unit, equipped with back draft dampers, fans including mechanical redundancy, and silencers	

Generator	**Quantity**
Generator type	SGen5-1200A
Number of offered generators	2
Core generator, each mainly comprising:	
▪ **Stator,** consisting of Base frame Stator core, made up of dynamo sheet segments, stacked and pressed together with insulated non-magnetic through bolts Stator winding, three-phase, double layer type, made up from transposed solid strands with MICALASTIC® post-impregnation	1
▪ **Rotor,** consisting of Shaft from one piece forging; rotor winding made up of silver alloyed low oxygen copper conductors with radial cooling Rotor retaining rings; one piece construction, made up of nonmagnetic steel, which is not susceptible to stress corrosion cracking and is shrunk onto the rotor body Single-flow axial fans arranged on the rotor shaft for circulation of the cooling medium Steel slip rings arranged on generator shaft	1 2 2 2
▪ **Bearings,** consisting of Sliding contact bearings with jacking oil device; insulated towards ground, designed for externa! bearing lube and jacking oil supply (turbine scope)	2
▪ **Thermocouples** (Type K) Triplex TC embedded in metal of each generator bearing	1
▪ **Resistance Temperature Detectors** (Platinum, 100 ohms at O ºC) Slot RTDs embedded in armature windings acc. IEC 60034-3 Duplex RTDs in the generator warm air cooler inlet Duplex RTDs in the generator cold air cooler outlet	 6 1 2+2

Further equipment:

- **Cooler cover,** consisting of
  Sound proof cover, attached to generator cover 1
  Cooler elements, air-to-water (25% each) 4
  Liquid level detectors 1
- **Stator sound proof enclosure** **1**
- **Bushings suitable for mounting current transformers** **6**
- AII instruments wired to plugs or junction boxes
- Rotor grounding brushes 1 set
- Provision for vibration monitoring at bearings 1 set
- Space heater 1 set
- Special tools for rotor removal, installation, erection and maintenance, one per site per style
- Anchor bolts and nuts 1 set
- Leveling plates and primary bearing plates 1 set

Generator Electrical Equipment	**Quantity.**
Generator Equipment for Gas Turbine Generator	per generator
Generator neutral tie enclosure	1
Generator current transformers, line side	3 x 3 cores
Generator current transformers, neutral side	3 x 3 cores
Generator neutral earthing cubicle (BAB11)	1
Protection Equipment far Gas Turbine Generator	per generator
Generator protection (CHA)	1 set
Generator synchronization (CHA)	1 set
Starting Frequency Converter (SFC) far Gas Turbine Generator (CJT)	1 per generator
Line side and machine side B6C converter bridge	
DC link between line side and machine side converter	
Overvoltage protection on line side and machine side	
Speed control	
Compressor washing function	
Boiler purge function (for 10 minutes)	
Static Excitation Equipment (SEE) far Gas Turbine Generator (CJN)	1 per generator
Fully controlled converter bridge type B6C	
Equipment for rapid de-excitation	
DC side overvoltage protection	
2 channels, each with automatic and manual mode	
Power system stabilizer	
Transformer far Gas Turbine Generator	
SFC transformer with metal enclosure (MBJ)	1 per generator
SEE transformer with metal enclosure (MKC)	1 per generator