

## **Bill of Material OPI 4000 Gas Turbine Generator Package**

The Gas Turbine Generator Package will include the following drive train, equipment that are mounted on the structural baseplate as well as components and systems that are mounted on or within the package enclosure.

- Rolls-Royce Corporation Allison Aeroderivative Industrial Gas Turbines.
  - Model 501-KB5S – 4000KW @ ISO Conditions No Losses
- Speed Reduction Gearboxes.
  - Epicyclic Design
  - Parallel Offset Design
- Drive couplings
  - High speed gear type coupling between turbine and gearbox
  - Low speed diaphragm type coupling between gearbox and generator
- Synchronous Electric Generator designed to NEMA standard MG 1
  - Brushless Exciter and Permanent Magnetic Alternator.
  - Open drip-proof enclosure
  - NEMA Class B temperature rise (80°C above 40°C ambient)
  - NEMA Class F insulation temperature rise (105°C above 40°C ambient)
  - 4160 or 13,800 volt, 3 phase, 60 hertz, 1,800 rpm, 0.85 power factor.
  - 6600 or 11,500 volt, 3 phase, 50 hertz, 1,500 rpm, 0.85 power factor
  - Generator high voltage terminal box including buss bar terminations, lighting arrestors and surge capacitors.
  - Current transformers (CT's).
  - High resistance transformer / resistor neutral ground
- Fuel System options
  - Natural gas fuel
  - Liquid fuel
  - Dual fuel, natural gas and liquid fuel
  - Propane fuel
  - Low BTU fuel including bio-fuels and land-fill gas
- Combustion Control System options
  - Water injection
  - Steam injection
  - Dry Low Emissions (DLE) combustors
- Start system options
  - Starter pad gearbox mounted with overrunning clutch
  - Electric Start motor with off-skid variable frequency drive.
  - Electric motor driving hydraulic pump and hydraulic motor
  - Diesel engine driving hydraulic pump and hydraulic motor
  - Pneumatic / gas motor gearbox mounted with overrunning clutch.
- Common lubrication system for gas turbine, gearbox and generator.
  - Shaft driven main oil pump
  - Electric motor driven auxiliary / pre-lube / post-lube pump
  - Duplex lube oil filter with differential pressure gauge / switch
  - Lube oil reservoir with electric immersion heater

- Standard remote air cooled heat exchanger with thermostatic valve
- Optional shell & tube water cooled heat exchanger with thermostatic valve
- Fire suppression and gas detection system.
  - CO2 bottles and off-skid bottle rack.
  - CO2 discharge nozzles
  - Combustion gas sensors
  - Thermal detectors
  - U-V detectors
  - Alarm horn and strobe
  - Manual pull stations
- On-line and crank soak water wash cleaning system
  - On-line spray nozzles
  - Crank soak spray nozzles
  - In-line strainer, check valves and isolation valves
  - Portable water wash cart
- Drive train instrumentation system
  - Turbine air inlet RTD
  - Turbine compartment RTD
  - Gearbox and generator bearing RTD's
  - Generator stator winding RTD's
  - Generator space heater
  - Gearbox and generator proximity probes and proximitors
  - Gas turbine velocity pick-up
  - Gas turbine speed pick-up
  - Gas turbine exhaust thermocouples
  - Turbine air inlet pressure gauges, switches and transmitter
- Instrument air system
  - Ventilation dampener actuation - pneumatic cylinders
  - Ventilation dampener actuation - 3-way solenoid valves
  - Turbine compressor bleed valve actuation – 3-way solenoid valve
  - Fuel system control – 3-way solenoid valves
- Low voltage and control terminal box.
  - Wiring from all package systems terminate for connection to remote control panel.
- Single lift structural baseplate for gas turbine, gearbox and generator.
- Acoustical and weatherproof enclosure.
  - Baseplate mounted covering the gas turbine, gearbox and generator.
  - Post and beam construction with roof, wall sections and doors.
  - Enclosure light fixtures and service receptacles.
- Gas Turbine maintenance removal hoist.

- Combustion and ventilation air flow systems:
  - Combustion and ventilation air filter assemblies
    - o Two stage media type filter
    - o Pulse clean type filter for high dust environments
    - o Pre-filter and pocket type filter for marine installations
  - Duct work between filter and turbine package
  - Combustion Air Silencer and last chance screen
  - Combustion and ventilation duct work expansion joints.
  - Ventilation inlet and discharge air silencers
  - Vaneaxial ventilation fans package roof mounted.
  - Ventilation discharge hood.
- Turbine Exhaust Diffuser and Bellows type Expansion Joint
- Turbine Exhaust Silencer free standing with 90 degree elbow
- Water Wash Cart – one per project
- Gas Turbine and Generator Control Panel, including instrument monitoring and control, generator metering, synchronization, protective relays and automatic voltage regulator.
- Control Power Batteries and Battery Charger

**Optional equipment and services:**

- Installation of gas turbine generator set package.
- Installation of combustion and ventilation air filter houses, duct work, ventilation fans, silencers and discharge hood.
- Duct work penetrations and flashing through architectural wall.
- Inlet air evaporative cooling.
- Inlet air chilled water cooling coil.
- Potential Transformers (PT's).
- Power system stabilizer.
- 5Kv or 15 Kv Class electrical generator switchgear
- Motor control center
- Natural gas fuel supply pressure regulator.
- Natural gas fuel vortex type flow meter.
- Natural gas fuel filter / coalescer (10 micron).
- Natural gas fuel treatment / conditioning skid.
- Natural gas fuel booster compressors.
- Interconnecting piping between the gas turbine generator package and the following:
  - Lube oil cooler
  - Chilled water supply to inlet air cooling coil.
  - Fire system carbon dioxide bottle rack
  - Natural gas fuel supply

