

---

## ADDENDUM # 1



**DERWICK ASSOCIATES, S.A.**  
**PDVSA SUPPLIER CODE: 350015280**  
**REQUEST FOR QUOTATION (RFQ): 6000335081**  
**4 X GE TM 2500**

## Technical:

### Equipment Data Sheets/Specification/Configuration

#### **Model: GE TM 2500**

Simple Cycle Performance

60Hz

- Serial Numbers 481-364/481-694/481-757/481-774
- Output 22MW
- Heat Rate 9,550 Btu/kWh (10,075J/kWh)
- Efficiency 36%
- Dual Fuel Equipment
- Exhaust Flow 143 lb/sec
- Turbine Speed 3600 rpm
- Exhaust Temperature 860°F (429°C)
- Model Designation TM2500PE
- Fuel Consumption 59,822 (Gallons/hr)  
14,956 (Liters/hr)
- Cubic-Feet/hr 203,888 (Cubic feet/hr)



## STANDARD 60Hz TM2500 GENERATOR PACKAGE

### Gas Turbine

16 Stage Axial Compressor

- 1st 6 stages have variable station
- Horizontal Split Casing
- 20:1 Compression Ratio
- 150 lb/s Nominal Inlet Mass Flow

Annular Combustor

- 30 Nozzles Gas Fuel, Water Injection for NOx Control

6 Stage Power Turbine

### Generator

Continuous Duty 13.8kV, 0.85 PF

2 Pole, 3 Phase Brushless Exciter

WPII Weather Protected

Voltage Regulator/Neutral Side Protection CT's

NEMA Class F Insulation & B Temperature Rise

### Package

24V and 125V DC Batteries

90dBA Near Field Design

Barrier Inlet Air Filters

Electro-Hydraulic Start System

Class I Div 2 Group D Class Electrical System

Digital Control System with a Human Machine Interface (HMI)

Turbine and Generator Lube Oil System with Simplex Shell and Tube Coolers

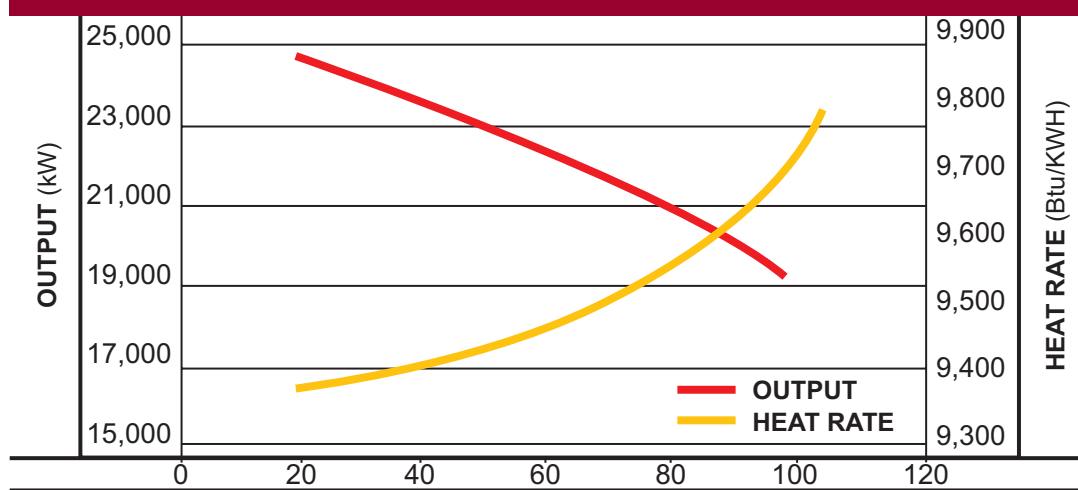
On/Off-line Water Wash





## TM2500 FACT SHEET

### TM2500 60Hz Output and Heat Rate



0 ft. 60% RH, 4/6 in H<sub>2</sub>O inlet/exhaust loss on natural gas with water injection to 25ppmvd NO<sub>x</sub> water inj.

AMBIENT(°F)

### Turbine

	TM2500
Power Output (kWe)	18,400
Heat Rate LHV (Btu/kWe-Hr)	9,900
Exhaust Flow (lbs/sec)	143
Exhaust Temperature (°F)	860
Emissions (ppmvd)	NO <sub>x</sub> /CO
Gas-DLE	25/25
Gas or Liquid-Water	25/75, 42/55
Gas-Steam	25/74
Power Turbine Speed (rpm)	3,600
No. of Compressor Stages	16
No. of Turbine Stages	6

## **Descriptive Equipment Information/Configuration:**

### **Gas Turbine Generator Set Scope Of Supply**

- TM2500PE gas turbine configured for both natural gas and liquid fuel operation
- Mobile 4-Trailer assembly
- Air cooled Brush 2 Pole generator w/brushless excitation.
- Dual Fuel Capacity
- Dual frequency-quick converted from 50 to 60 Hertz-no reduction Gear.
- Coupling for direct drive at 3600 rpm, for a 60 Hz operation if required.
- Weatherproof acoustic enclosure for gas turbine and electric generator
- Low emission with Demineralized water injection.
- Quick set up in less than 5 days. (When all the BOP and landscape are ready for the installation).
- Woodward/Netcom 5000 control system. "Single lift" I beam base plate
- Minimal foundation requirements.

---

## **SCOPE OF SUPPLY**

### **TM 2500 MOBILE Gas Turbine Generator**

The TM2500 consist of four trailers describe below. The trailers include the main trailer, auxiliary trailer, air filter trailer and exhaust trailer. The scope of each of these trailers will be described in detail.

#### **Main Trailer**

The main Trailer consists of the following components:

#### **Main Trailer and Jeep**

A six-axle, air ride suspension trailer (3+3) and a 3 axle jeep are used to transport the main trailer components. The trailer and jeep combination is approximately 108" (32.9m) long (less tractor) during transport and weighs approximately 210,000 pounds (95,254 Kg) fully loaded. At the jobsite, the jeep and trailer gooseneck are removed as well as the 3 rear axles of the trailer. With these pieces removed, the main trailer is approximately 58" (17.7m) long during operation. Ten landing legs are provided to support and level the equipment at the jobsite.

#### **Gas Turbine**

General Electric LM2500 - PE-MG gas turbine, ISO rated at 30,563 HP for continuous duty, with a heat rate of 6772 Btu/HP-hr (LHV). Suitable for base load or peaking, designed for simple cycle, combined cycle or cogeneration service. Turbine is shock mounted and shipped in position, ready to run. Turbine is complete with "last chance" inlet screen and bellmouth seal for protection against foreign object damage.

#### **Generator**

Air-cooled open air, 2 pole generator capable of handling the full continuous power of the gas turbine at any ambient temperature throughout the operation range. Filtered air from the inlet air filter is used to cool the generator. A cooling water loop and its associated fans and pumps are not required. The generator includes a brushless excitation system with permanent magnet generator. Neutral and line side cubicles and voltage regulator are also included. The generator is hard mounted to a base on the main trailer. Generator air inlet filtering and air silencing is provided.

## **Unit Enclosure**

The basic equipment package is supplied with a weatherproof acoustic enclosure for the turbine. The enclosure is completely assembled and mounted over the equipment prior to testing and shipment. Both turbine and generator compartments are fully ventilated with redundant fans (3 x 50% provided on the air filter trailer). Provision for turbine removal and personal access are included.

## **Gas Turbine Baseplate**

A steel baseplate is provided for gas turbine support. The baseplate will be designed to provide suitable strength and all the necessary installation provision. A 3 point mount system between the baseplate and the trailer provide engine and enclosure isolation from main trailer movement during transport.

## **Turbine Exhaust**

The basic equipment package is supplied with a rectangular, RH horizontal (aft looking forward) exhaust outlet with connection flange to facilitate in-line mounting of the simple cycle exhaust trailer.

## **Fuel System**

The basic equipment package is supplied in a dual configuration. The package is supplied with a natural gas fuel system using an electronically controlled fuel-metering valve. For full-load operation, the gaseous fuel must be supplied to the auxiliary trailer skid at 375 psig  $\pm$  20 psig. All necessary shutoff valves, piping and instruments between the auxiliary trailer skid connection and the engine are included. Gas fuel must meet General Electric specification MID-TD-0000-1.

The package is also equipped with a liquid fuel system. Typical liquid fuels include DF1, DF2 or JP4. Customer must supply liquid fuel to the connection at the auxiliary trailer skid at 20 -10 psig (138-276kpag) and at least 20 degree F (11 C) above the wax point temperature. Customer supplied fuel must be clean filtered and meet the GE fuel Specification MID-TD-0000-2. All necessary shutoff valves, flow meter, piping and instruments between the auxiliary Trailer Skid connection and the engine are included. Customer must provide and supply piping only.



## **Water Injection System**

The basic equipment package is supplied with a water injection system for Nox reduction. The system is complete with inlet strainer, pump, valves, flow meter, piping and controls. Customer must provide a supply of purified water per GE Water Specification MI D-TD-0000-3 to the Auxiliary Trailer Skid at 20-40 psig (138-276 kPag).

## **Lube Oil Systems**

The basic equipment package is supplied with two separate lube oil system; one for the gas turbine and one for the generator. The oil reservoirs and piping are all stainless steel and the lube oil system valves have stainless steel trim. Each lube oil system has a pump, simplex filters, necessary valving and instrumentation, and thermostatic-controlled electric heaters. A dual fan, single core fin-fan cooler is provided to cool the turbine, generator lube oil and hydraulic oil. The cooler is mounted on the auxiliary trailer and the rest of the lube oil systems are mounted on the main trailer.

## **Switchgear**

The basic equipment package is supplied with a 3 NEMA 3 R switchgear enclosure. The switchgear includes a set of generator circuit breaker equipment, 2 sets of incoming line voltage monitoring equipment, a marshalling cabinet and a set of switchgear accessories. Permanent cable terminations from the neutral and lineside of the generator are also included. The customer is only required to connect the 11kV power cables at site.

## **Auxiliary Trailer**

The auxiliary trailer is approximately 48' (14.6m) long and 8'-6" (2.6 m) wide and weighs approximately 46,000 pounds (20,865kg) fully loaded. The trailer is provided with a tandem air ride suspension and includes the equipment listed below. Four landing legs are provided to support and level the trailer at site.

## **Auxiliary Trailer Skid**

The auxiliary trailer skid includes the two fuel and water injection system components not mounted on the main trailer. The pumps, filters and necessary instrumentation are connected to the main trailer components at site with interconnected hoses. The auxiliary Equipment module and the main baseplate are also furnished.

## **Electro-Hydraulic Starting Module**

The basic equipment package is supplied with a hydraulic starting which includes an electric motor driven hydraulic pump assembly, filters, coolers and controls, mounted on the auxiliary equipment module. A hydraulic motor is also mounted on the gas turbine accessory gearbox to turn the gas generator shaft. All piping and fitting on the baseplate, plus hydraulic connections between the auxiliary equipment module and the main baseplate are also furnished.

## **"Off Line" Soak Wash System**

The basic equipment package is supplied with an "off line" cleaning system, with a water wash reservoir and all necessary filters and instrumentation supplied. Customer is required to provide purified water to the standards listed in the water injection system..

## **Fire Protection System**

The basic equipment package is supplied with an installed fire and gas detection and extinguishing system includes hydrocarbon sensing and thermal detectors; complete with piping and nozzles in the engine compartments. The fire protection system includes cylinders of CO<sub>2</sub> extinguishant mounted on the auxiliary trailer. Proenergy furnishes a dedicated 24V DC battery and charger to power the fire protection system. Fire system alarms and shutdowns are annunciated at the turbine control panel. An alarm sounds at the turbine enclosure and unit control panel if the gas detectors sense high gas levels, or if the system is preparing to release the CO<sub>2</sub>. When activated, the primary CO<sub>2</sub> cylinders discharge into the turbine compartments via multiple nozzles, and ventilation dampers close automatically. After a time delay, the reserve supply of CO<sub>2</sub> is discharged, if required.

## **Fin Fan Cooler**

The basic equipment package is supplied with a 100% redundant dual fan, single core cooler with separate coils for the turbine, generator lube oil and hydraulic oil. The cooler is equipped with all interconnect piping and instrumentation necessary for the three circuits.

## **Turbine Ventilation Silencer**

A Turbine ventilation silencer is provided with the package and is mounted on a rail system to slide into position at the jobsite. The silencer is bolted to the side of the turbine opposite the exhaust collector and expansion joint and fire damper are provided.

## Digital Control System

The basic equipment package is supplied with a free-standing control panel suitable for mounting in an indoor, non hazardous area. The control system features an integrated electronic fuel management system with a PLC based programmable sequencer, vibration monitor, fire system monitor, digital meter, and a digital generator protective relay module. A desk top PC with separate workstation and chair is provided for HMI control. 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. An optional printer can be furnished to provide hard copy records. Power for the control panel is provided by a dedicated 24V DC battery system with dual 100% capacity chargers.

## Generator Protective Relays

The basic equipment package is supplied with a microprocessor based generator protective relay module, mounted in the turbine control panel. Protective relay system includes all functions necessary for protection of the generator.

## Unit Motor Control Center

A free standing lineup of motor controls for all motors furnished by GE is supplied. The motor control center is installed in the control house and also includes a 30kVA lighting and distribution transformer.

## Battery and Charger System

The basic equipment package is supplied with a 24 VDC control system battery system and charger, a 24VDC fire system battery system and charger, and a 125 VDC switchgear and backup generator lube pump motor battery system and charger. The battery systems are fully wired and mounted in racks and are installed in the control house along with the wall mounted chargers.

## Air Filter Trailer

The air filter trailer is approximately 48' (14.6m) long and 8'-6" (2.6,) wide and weighs approximately 46,000 pounds (20,865kg) fully loaded. The trailer is provided with a tandem air ride suspension and includes the equipment listed below. Four landing legs are provided to support and level the trailer at the jobsite.

The trailer is equipped with a two stage filtration system for both ventilation and combustion air, with panel type pre-filters housed in hinged doors and high efficiency bag barrier filters. Vane separators are installed in front of and behind the filtration system and inlet silencers are provided. A heating/cooling coil is provided with flanged customer connections for heating and chilling capability. An inlet plenum with access door is provided for access to the FOD screen and commissioning screen.

Ventilation fans for the turbine enclosure are installed on the air filter trailer. Three 50% fans are installed and are equipped with back draft dampers. All of the items listed are housed in the filter house that is complete with access door and lighting for maintenance, separate air paths and turning vanes and the necessary instrumentation. For connection to the main trailer, a flex connection for the combustion inlet to the engine bellmouth and a trailer flex connection are provided.

## Exhaust Trailer

The exhaust trailer is approximately 48' (14.6m) long and 8'-6" (2.6,) wide and weighs approximately 40,000 pounds (18,144kg) fully loaded. The trailer is provided with a tandem air ride suspension and includes the equipment listed below. Four landing legs are provided to support and level the trailer at the jobsite.

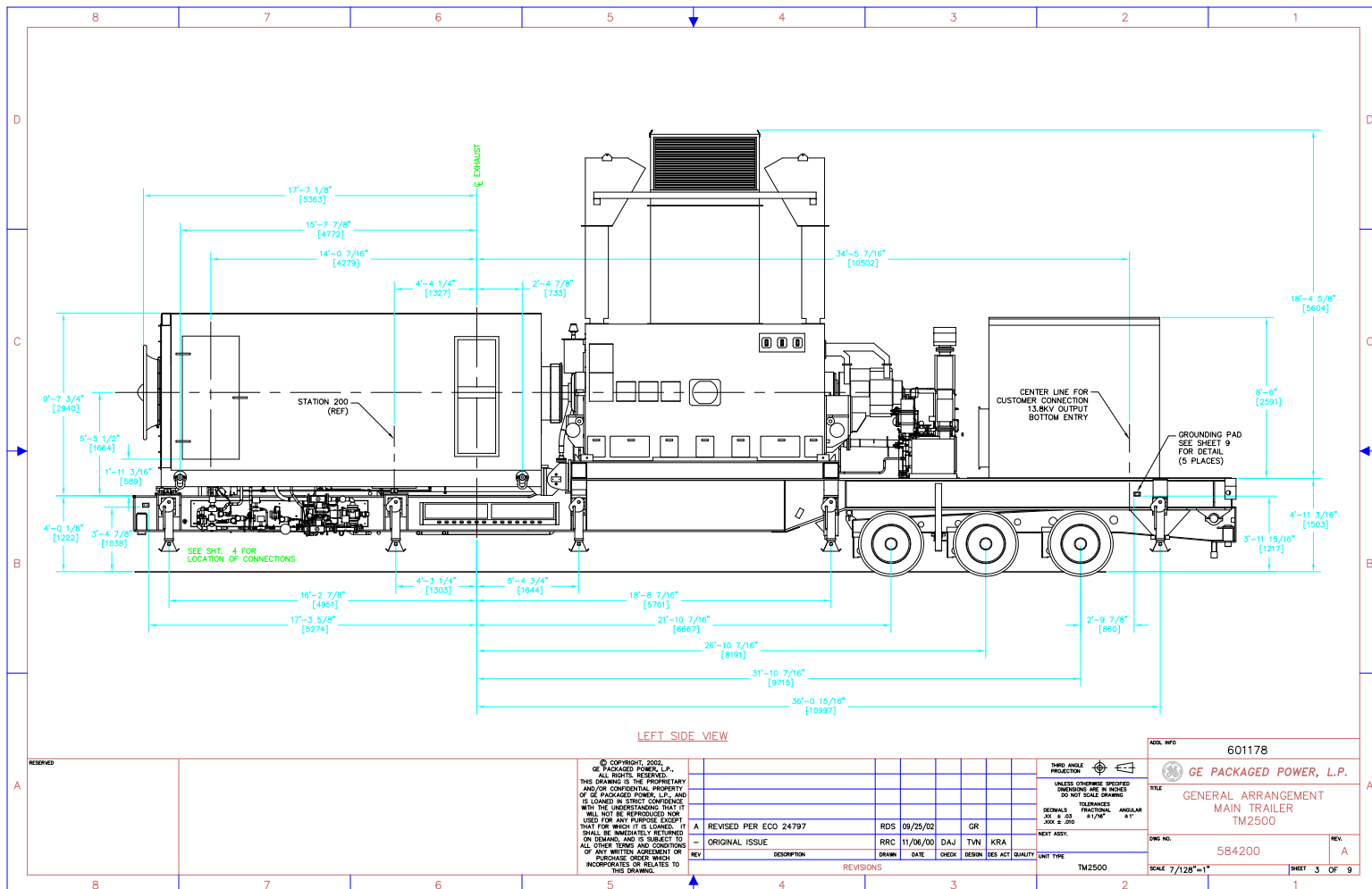
The exhaust trailer is equipped with an expansion joint for trailer connection to the main trailer exhaust collector flange. An exhaust trailer is equipped with an expansion joint for trailer connection to the main trailer exhaust collector flange. An exhaust transition with access hatch, a horizontal exhaust silencer, a 90 degree exhaust elbow, and a vertical stack are also included. The stack is lifted into position at the job site. The exhaust trailer is 13'-6" (4.1m) tall for roading purposes and is 20' (6.1M) tall with the stack in position at site.

---

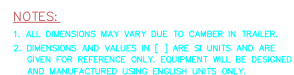
### **Equipment Origin**

The TM2500 is manufactured in GE Plant at Jacinto port in Houston, Texas

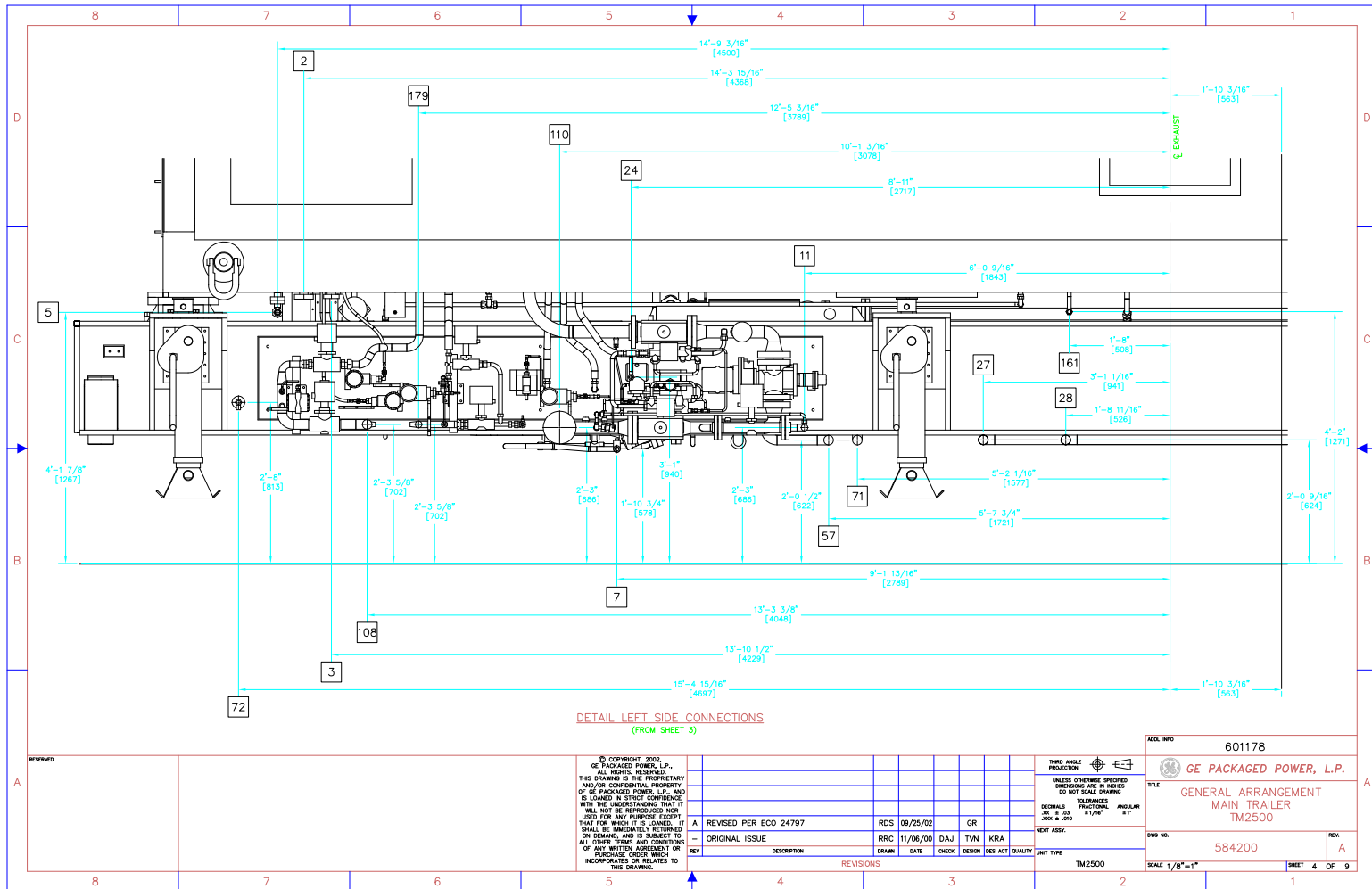
However these units that Derwick is offering are located in Dar ES Salaam, Republic of Tanzania. Africa.



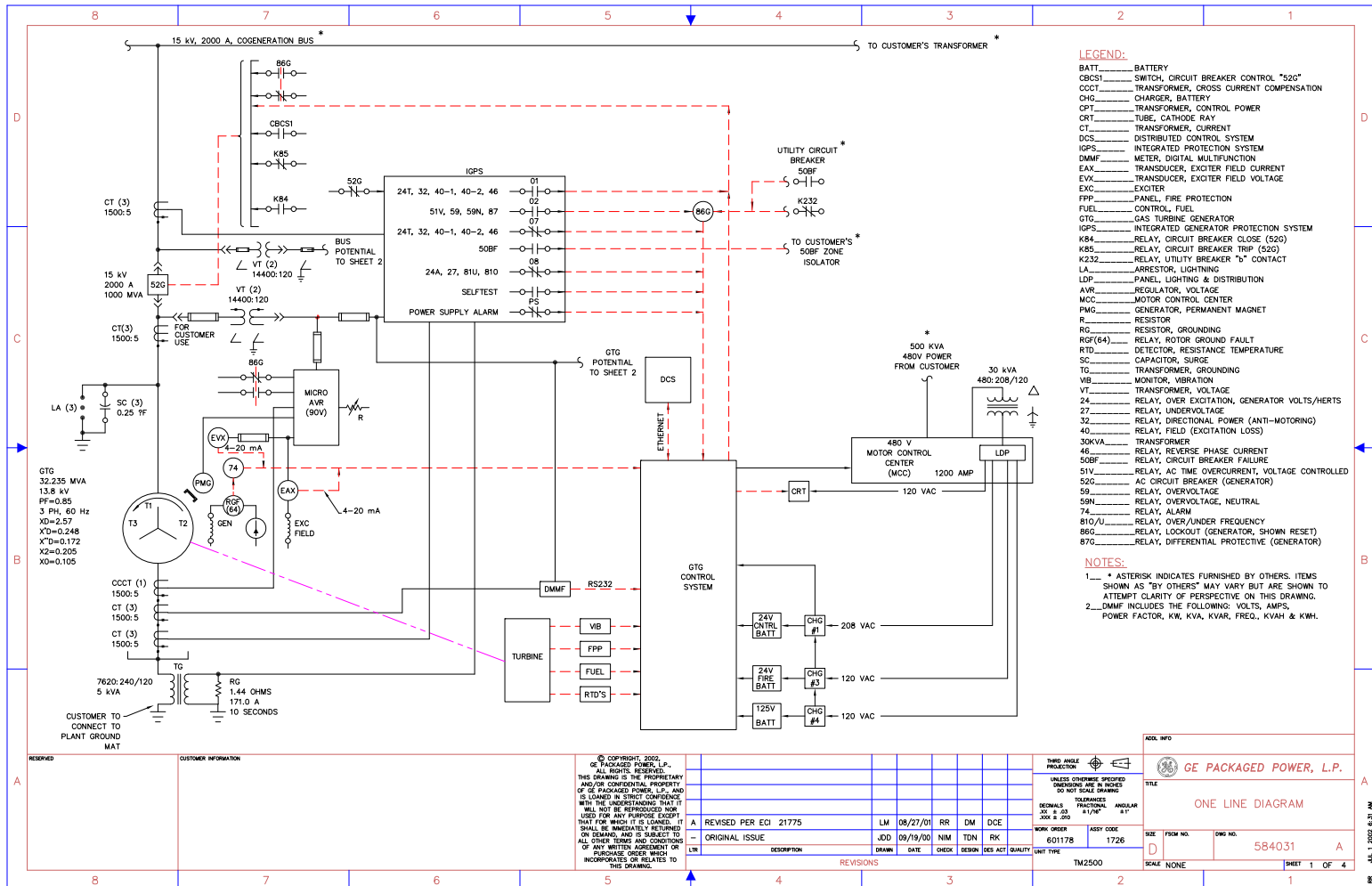




A horizontal number line with tick marks at every integer from 0 to 10. The numbers are written in red above the line. A blue arrow points upwards to the tick mark for the number 5.







NOTES:  
SEE SHEET 1

## EXCLUSIONS

**We certify that our quotation complies with all your inquiry, documents and specifications except for the following:**

Derwick Associates has excluded these items listed below from our offering. There may be part of the EPC Proposal. Any other equipment or service not described in our written proposal is also excluded.

- Absorption chiller and chilled water supply system
- Balance of plant and energy optimization controls
- Boiler feed pump and auto level control assembly
- Building, foundations, anchor bolts, embedment and grouting
- Bus bars and bus duct beyond generator lineside and neutral enclosures
- Cooling tower and circulating water system
- Deaeration and chemical injection equipment
- Desuperheater equipment
- Distributed plant control
- Filter house support structure, other than standard
- Field Supervision
- Fuel, fluids and chemicals
- Fuel storage tanks, forwarding equipment and primary fuel filter
- Gas compression, filtration, and separation or regulation equipment
- Heat recovery boiler and blow down controls
- High voltage transformer(s), cables, switchgear and associated equipment
- Interconnecting piping, conduit, and wiring between equipment modules (site layout is unknown at this time)
- Plant utilities



- 
- Power plant calibration tools and ordinary hand tools
  - Spare parts (quoted separately)
  - Steam filtration and purification equipment
  - Steam turbine condenser and condensate pumping equipment
  - All Transportation to job site, loading and off loading of equipment
  - Water injection pressurization equipment
  - Water treatment and purification equipment
  - Yard light and fences