The MPU Containerized Power Unit defines the standard for heavy duty base load generation equipment where reliability and efficiency are a must.

These heavy duty generator sets are intended for use in harsh and remote locations. They are specially engineered for base or peak load applications where dependability is critical. Designed for rapid deployment, the Self-Contained MPU features the only slow to medium speed reciprocating engine driven 1500 to 2500Kw. Low operating and maintenance cost are key features.

The MPU can be delivered in continuous output ratings of 1500kW and 2500kW, while maintaining an additional power reserve of 10% for standby requirements. Each unit is capable of regularly accepting block loads of 110% of the continuous output rating.

MPU generator sets are rugged in design for service in heavy duty industrial and utility power applications. These units are an optimal choice of equipment for standby or continuous duty requirements of 1.5 to 50 Megawatts or more. A Mobile Power Unit (MPU) is delivered in a 44’ steel ISO sound attenuated container with the switchgear and local/remote plant controls installed in a climate controlled room.

The advanced “Standard” control features of the MPU unit provide for full local and remote operation as well as monitoring features for single or multiple unit installations.

These exceptional features, our technical support and field services, make the MPU, an efficient “Mini- Utility,” the best choice for any critical power needs.
### Technical Information Common to all MPU Medium Speed MOBILE Generator Set

**Complete Unit**
- Manufacturer/Packager: PowerTeam Engineering

**Engine**
- Manufacturer: EMD
- Type: 2 Cycle, V-45
- Fuel Type: Bio-Diesel, Diesel, Natural Gas, Dual Fuel
- Number of Cylinders: 12, 16 & 20 Cylinder
- Bore: 9-1/16th inch
- Stroke: X 10 inch
- Displacement: 645 cubic inches
- Piston Speed: 1,500 ft. / min
- Engine Speed: 750 - 900rpm
- Governor: Electronic - Woodward - EG
- Starting Motor: Air, or DC
- Control Power: 120VAC & 24VDC

**Generator**
- Manufacturer: Baylor
- Type: Brushless, insulated single roller bearing
- Insulation: NEMA Class F
- Construction: Vacuum Pressure Impregnation
- Enclosure: Drip Proof
- Temperature Rise (continuous @ .7 PF): 80 degrees C
- Exciter: PMG
- Voltage Regulator: Basler, SSR-12
- Electrical Rating: 1500kW, 2500kW
- Weight: 18,700 lbs

**Heat Rate MPU Models:**
- Diesel, Bio-diesel: 9240 BTU/kW/hr
- Natural Gas: 10,300 BTU/kW/hr

**Weights and Dimensions**
- Length: 40-44 feet
- Width: 8 feet
- Height: 13 feet 6 inches
- Weight: 92 to 125,000 lbs

**For further information, please refer to the following MPU Models:**
- prime/standby
  - MPU 1500/1650 - diesel or gas
  - MPU 2500/2750 - diesel or gas

---

To get the advantage you need and the performance you require call -

**POWERTEAM**
600 Prairie Industrial Parkway, Mulberry FL 33860
Direct: +1 863 425 3030
Fax: +1 863 425 3131
Internet: www.powerteamus.com
** MPU 2500/2750 General Layout**

Dimensions: 8ft Wide x 44ft Long x 11ft High

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Each MPU utilize 100% BASE LOAD UTILITY GRADE COMPONENTS AND CONSTRUCTION DESIGN.

Each MPU Generator Set proposed includes an integrally mounted switchgear cubicle with a 15kV vacuum breaker and cable ready connection points located outside the unit within a Docking Compartment located on the side of the unit. Ready to be connected to the distribution point.

Each switchgear cubical contains a draw-out type vacuum circuit breaker.

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**Power Team MPU 2500/2750 - Mobile Power Unit**

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Standard MPU Description

“Stackable” Mobile Power Plants up to 100 MW + per site
PowerTeam 2.5 Megawatt Mobile Power Units

Standard Documentation
- Operations and Maintenance Training Manual
- Equipment Technical Manuals
- Renewal Parts Manuals
- Consumables Manuals
- Installation drawings
- Export Packaging

Prime Mover
Each 2.5 MW MPU 2500/2750 Generator Set Includes the following Engine Components:

√ EMD diesel two stroke engine
  - Bore                      9 1/16" (23.02 cm)
  - Stroke                    10" (25.4 cm)
  - Arrangement & No. of Cylinders V-20
  - Approx. dry weight – engine only 44,080 lbs. (22,625 kg)
  - Rotation from Flywheel end Counterclockwise

√ Engine Systems
   (Common to all models, specific sizing may vary due to output difference)
   - Lube Oil System – skid mounted
     • Engine driven lube oil pump
     • Pressure relief and regulating valve
     • Automatic lube oil filter with integral centrifuge. Includes bypass, safety net, counter flanges and pressure drop indicator, with centrifuge, installed in accessory rack
     • Plate type oil cooler
     • Preheat system

√ Cooling Water System
   - Expansion Tank, dual chamber, site glasses and level detection switches
   - Engine Cooling Radiator (one per gen-set) sized for 40° C (104° F) ambient
     • Remote mounted
     • Forced draft design
     • Electric motor and motor starters
     • Vertical air discharge
   - High Temperature (HT) Cooling Water System
     • Engine driven fresh water pump
     • Pre-Heat System installed in accessory rack
- High temperature cooling circuit thermostatic valve – installed in accessory rack
- Low Temperature (LT) Cooling Water System
- Engine driven fresh water pump
- Low temperature cooling circuit thermostatic valve – installed in accessory rack

**Intake Air System**
- Intake air filter housing, two stages for baggie and spin type filters with differential pressure gauge – installed in accessory rack
- Inertial filter elements, qty as required
- Baggie type air filter elements as required
- Flexible air inlet duct and clamps, air filter to turbocharger inlet

**Exhaust System**
- Exhaust manifold blanket
- Exhaust stack transition section (rectangular to 20” diameter round)
- Exhaust stack, duct work and required supports
- Exhaust silencer, 25 to 30 dba noise reduction design
- Expansion joints – two (2) – 300 series stainless steel – 24” nominal diameter

**Air Start System** - (Battery Start System Optional)
- Engine air starter motor – turbine type
- Air start solenoid
- Pressure switch for start/stop functionality
- Pressure regulator
- Air piping and fittings size as required, maximum of 50 ft of piping total

**Control System**
- Engine Control System
  - Control System 2100
  - Gauges Digital and Gauge
  - Operator touch screen/display - Engine, Generator and Buss

**Auxiliary Systems**
- Auxiliaries installed on a fully fabricated and assembled Accessory Rack that includes: lube oil cooler, lube oil filtration, fuel oil filtration lube, water temperature regulating valves, systems piping, control panels with motor controls, lube oil, fuel oil, and/or gas and jacket water pressure and temperature regulating valves and gauges.

**Switchgear**
- Generator Circuit Breaker
- Low voltage, 5kV or 15 kV
- 1200 Amp or larger
- Metering & Relaying
  - CT’s (3)
  - Pt’s (3-phase Delta) – generator
  - PT’s (1-phase Delta) – Bus – for synchronizing
  - Voltage regulator
  - Auto Paralleling / Synchronizer with sync check
  - Protective Relaying and Metering
- Master Control System 21000 with touch screen HMI
- Speed/Load governor control
Generator

- Manufacture: Baylor
- Rotational speed: 750 - 900 rpm
- Continuous power rating: 2500kW
- Rated voltage: 50 Hz or 60 Hz – Varying voltages available
- Power Factor: 0.8
- Connection: 6 wire Wye connected
- Temperature rise: Class F
- Rated Altitude: less than 1000 meters
- Insulation: Class F
- Enclosure design: IP 23
- Cable entry: Right hand side facing drive end
- Bearings: anti-friction bearing
- Drive configuration: Single bearing design
- Voltage regulator: Basler SSR12512 or equivalent
- Excitation: Brushless
- Temperature monitoring: 6 RTD’s 2 per phase 100Ω platinum
  1 RTD 1 per bearing 100Ω platinum
- Space heater: 500W
- CTs for differential protection
- CT (1 phase) fault protection

Genset:

- Containerized MPU (Mobile Power Unit)
  - Fabricated structural steel main base frame and cross members with ISO steel Container house.
  - Four point lifting arrangement

Standard Technical

Start up and commissioning; a total of 3 days per unit for on-site technical support for installation, commissioning is included per unit and per site.

Additional On-Site Technical Services or Turn-Key Installation may be provided (as an OPTION in the Pricing Section) under a separate purchase order. Please note all travel will be charged at cost plus five (5) percent to account for administrative costs.

Drawings

A Complete Drawing package will be provided once a specific design is selected.

Contract drawings for each generator set or power station shall be made available for reference and comment no later than ten (10) days after PowerTeam acceptance of the purchase order.

Exclusions

The following equipment has been excluded from the scope of this proposal.
- Specialized tooling – priced separately
- Consumables
- Installation
- Building or site construction
- Spare parts
- Lube Oil
Customer Responsible For the Following:
(Unless option for turn-key installation is requested)

- Site preparation
- Field wiring, supply and installation for:
  - Remote control system
  - Line side of MV switchgear
  - External fuel system
- Fit up of external fuel piping
- Connections to plant ground system
- First fill of lubricants
- Main Fuel storage tank(s)

Applicable Standards
- Diesel Engine
- Alternator NEMA MG1, IEEE, IEC 60034-1
- Control Panel NEMA ICS1, NEMA ICS1-4, NEMA PB1, NEMA 107
- Switchgear IEC 60298, 60694, 60056
- Fuel tank & Aux. accessories Manufacturer's standard
- Electrical Instrumentation ISA, IEC/EN 60044-1
- Transformers ANSI C57, NEMA, IEE, IEC 60076
- Electrical Components NEMA 250, NEMA 4 or 12, AB1, AB3, FB1 & 107,
  IEC 60947-4-1, IEC 60947-4-2
- Heat Exchanger HEI
- Piping on genset skid manufacturer's standard
- Air compressor tank ASME/CE PDE

Factory Testing
The factory test will or have been completed according to our standard procedures and more in
detail:

Generator
Generator shall be factory tested per manufactures standard test procedure, certificate issued by
the manufacturer, according to NEMA MG1 or IEC 34.1 rules and manufacturer’s standard
procedures.

Diesel Engine
Break-in engine type test certificate, issued by the manufacturer of the engine, carried out at
PowerTeam’s packager in accordance with Power Team test procedures.

Assembled Generator Set

During the load test the following will be recorded:
- Power
- Current
- Voltage
- Engine temperatures

Load tests will be per the schedule below:

- 15 minutes at 25% load
- 15 minutes at 50% load
- 15 minutes at 75% load
- 30 minutes at 100% load
- 10 minutes at 110% load

All tests will be carried out at unity power factor
Standard Performance Specifications

MPU 2500/2750 Generator Set

Prime Mover – EMD 20/645/F4B
MPU 2500/2750 STANDARD (DIESEL) ENGINE ARRANGEMENT

HEAT RATE
Electrical power output net at main generator terminal --- 2500 kW Continuous / 2750 kW Standby
Heat rate at above rating -------------------------------------------- 9240 BTU/KW hr (LHV)

AVAILABILITY
Typical Operating hours between overhauls 35,000 – 40,000 hrs
Availability Factor 97%
Total hours per year required for scheduled maintenance 262
Total operating hours per year at rated capacity 8487
Total allowable operating hours per year at a 110 % load factor 876
Percent of full load rating required achieving optimal heat rate 90%

Standard Sound Level: (Standard) 80db @30 meters

Standard Rating Conditions
All engine ratings contained herein apply under the following conditions as specified in ISO 30461:

 o Site Air Intake Temperature - 95° F
 o Altitude – up to 4000 meters
 o 29.61 in. Hg. (100 kPa) barometer
Standard Equipment Weights and Dimensions

MODEL: MPU EMD 20/645/F4B Containerized Generator Set

<table>
<thead>
<tr>
<th>PER Unit</th>
<th>Lbs.</th>
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<tbody>
<tr>
<td>Engine – Dry</td>
<td>44000</td>
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<tr>
<td>Drive Line Couplings and Driving Disc</td>
<td>725</td>
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<tr>
<td>SUB-TOTAL</td>
<td>44,725</td>
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<tr>
<td>Basic Generator End</td>
<td>18,500</td>
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<tr>
<td>Total - unit less Common Base and Accessory Rack</td>
<td>63,225</td>
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<tr>
<td>Common Base</td>
<td>19,200</td>
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<tr>
<td>Total - unit with Common Base less Accessory Rack</td>
<td>82,425</td>
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<tr>
<td>Skid Mounted Accessories, Steel House &amp; Electrical</td>
<td>38,000</td>
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<tr>
<td>Electrical Switchgear and Controls</td>
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<tr>
<td>Total – unit with Common Base and Accessory Rack</td>
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Liquid Weights:

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<table>
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<tr>
<th></th>
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<tr>
<td>Lube Oil in Engine</td>
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<tr>
<td>Lube Oil in Accessories</td>
<td>800</td>
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<tr>
<td>Water in Engine</td>
<td>1,270</td>
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<tr>
<td>Water in Accessories</td>
<td>910</td>
</tr>
</tbody>
</table>

Technical Services

Standard Drawing Package / Documentation
The “fully load tested equipment” shall mean that the generation equipment has successfully completed load test’s in accordance with Standard Performance Specifications listed in Section 2.5 of this technical proposal.

Start-Up and Commissioning
Standard pricing includes start up and commissioning. PowerTeam to provide a technician on site for up to four (4) days per unit for the start-up and commissioning of each generator set.

Additional startup and commissioning services can be provided upon request. PowerTeam’s Standard Rates and Services will apply.
Extended Services

Operations and Maintenance Staff Training
Prior to commencement of the commercial operations of your PowerTeam supplied power equipment, PowerTeam will provide training for your personnel in the correct operations and maintenance of the MPU generator equipment during the four (4) days our site technician is present for start-up and commissioning. Customer is responsible for coordinating with the site technician and providing operators for such training.

PowerTeam can provide additional or extended technical training of your personnel in the correct operations and maintenance of the MPU generator equipment or the complete power plant facility on site at your facility, or at our facility.

Service
Field Service and Technical Support are available from PowerTeam 24 hours a day to help keep your power equipment operating efficiently and reliably. Service technicians can be dispatched 24 hours a day to provide repairs and overhaul services.

Parts and Consumables
A complete line replacement parts and consumables are available to support the complete operations and maintenance requirements of the power plant facility.