

STATEMENT OF SPECIFICATIONS
Medium-Voltage Packaged Engine Generators
Schriever AFB Colorado
25 July 2008

PART 1 – GENERAL:

1.1 SUMMARY:

- 1.1.1. Scope: Provide a complete and operable Standby electric generating system, including all devices and equipment specified herein. Equipment shall be new, factory tested, and delivered ready for installation.
- 1.2.2. This Section includes packaged engine generator sets with the following features and accessories:
 - 1.2.2.1. Battery chargers
 - 1.2.2.2. Day tank and fuel oil cooler
 - 1.2.2.3. Engine generator set
 - 1.2.2.4. Exhaust piping and coolant piping external to set
 - 1.2.2.5. Remote critical silencer
 - 1.2.2.6. Remote radiator and associated fan/motor
 - 1.2.2.7. Remote stop switch
 - 1.2.2.8. Starting batteries and associated accessories

1.3 DEFINITIONS:

- 1.3.1. Standby Rating: Power output rating equal to the power the generator set delivers at site conditions under normal varying load and power factor for the duration of a power outage.
- 1.3.2. Operational Bandwidth: The total variation from the lowest to highest value of a parameter over the 3range of conditions indicated, expressed as a percentage of the nominal value of the parameter.
- 1.3.3. Steady-State Voltage Modulation: The uniform cyclical variation of voltage within the operational bandwidth expressed in Hertz or cycles per second.

1.4. SUBMITTALS:

- 1.4.1. Exceptions: All exceptions to the specifications shall be made in a typed, written, and detailed format with all sections and paragraphs referenced. All exceptions shall be submitted with the first submittal.
- 1.4.2. Partial Submittal: All submittals shall be complete in every respect. A partial submittal shall be immediate cause for rejection
- 1.4.3. Product Data:
 - 1.4.3.1. Manufacturer's product data including features, components, and performance data sufficient to verify compliance to this specification.
 - 1.4.3.2. Manufacturer's certification of prototype testing.
 - 1.4.3.3. Manufacturer's published warranty documents.
 - 1.4.3.4. Shop drawings showing plan and elevation views with certified overall dimensions, weight, and dimensioned mounting bolt locations.
 - 1.4.3.5. Interconnection wiring diagrams showing all external connections required; with field wiring terminals marked in a consistent point-to-point manner.
 - 1.4.3.6. Manufacturer's installation instructions, including required clearances.
 - 1.4.3.7. Factory certified de-rating calculations and any altitude test data verifying the unit's output at 6300 feet and 104°F ambient temperature.

- 1.4.3.8. Drawings and literature describing all auxiliary equipment being furnished.
- 1.4.3.9. Drawings showing top, side, front, and rear views and literature describing the unit, day tank, remote radiator, remote silencer, etc.
- 1.4.4. Factory test report of tests specified in Part 3.
- 1.4.5. Maintenance Data: For each packaged engine generator and accessories to include in maintenance manuals specified in Division 1. Include the following:
 - 1.4.5.1. The manuals shall include outline, interconnection, wiring, and control drawings accurately describing the equipment provided. Provide ladder logic for all programmable logic controllers in the system.
 - 1.4.5.2. List of tools and replacement items recommended to be stored at the Project for ready access. Include part and drawing numbers, current unit prices, and source of supply.
 - 1.4.5.3. Detail operating instructions for both normal and abnormal conditions.
 - 1.4.5.4. Include all features and operating sequences, both automatic and manual. List all factory settings of relays and provide relay-setting and calibration instructions, including software, where applicable.
- 1.5. QUALITY ASSURANCE:
 - 1.5.1. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, Article 100.
 - 1.5.2. Comply with NFPA 70.
 - 1.5.3. Comply with NFPA 110 requirements for Level 1 emergency power supply system.
 - 1.5.4. Engine Exhaust Emissions: Comply with applicable state, local, and federal government requirements including, but not limited to, 40 CFR 60.4200 and 40 CFR 89.112(a). (Also See 2.1.7.9. for EPA TIER 2)
- 1.6. DELIVERY, STORAGE and HANDLING: Deliver engine generator set and system components to their final locations in protective wrappings, containers, and other protection that will exclude dirt and moisture and prevent damage from construction operations and transportation hazards. Do not remove protection after equipment is delivered. Crankshaft and turbochargers shall be blocked and braced for shipment to prevent thrust movement. Provide detailed description of where the blocks are placed and how to safely remove them.
- 1.7. EXTRA MATERIALS: Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: One for every ten of each type and rating, but not less than one of each.
 - 2. Indicator Lamps: Two for every six of each type used, but not less than two of each.
 - 3. Filters: One set each of lubricating oil, fuel, coolant, and combustion-air filters.

PART 2 – PRODUCT:

2.1 DIESEL ENGINE-GENERATOR SET:

- 2.1.1. Four-cycle, 1,800 rpm, diesel engine generator set with remote radiator and silencer.

2.1.1. Generator Set Ratings: 3100 kW, 3875 kVA at 0.8 PF, standby rated. Based on site conditions noted below the unit shall be able to achieve a minimum standby rating of 2400kW/ 3000kVA.

2.1.1.2. System Voltage: 12,470V AC, 3-phase, 4-wire, 60 Hz.

2.1.1.3. Site Conditions: Altitude 6300 feet, ambient temperatures up to 104°F and as low as -15°F.

2.1.2. Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.50%. An electronic governor system shall provide automatic isochronous frequency regulation.

2.1.3. The engine-generator set shall be capable of single step load pick up of 100% nameplate kW and power factor, with the engine-generator set equipped with all necessary operating accessories, such as remote radiator and fan, air cleaners, lubrication oil pump, fuel transfer pump, rack style fuel injection pump, fuel oil cooler, jacket water pump, jacket water heater, governor, charging generator, alternating current generator, and exciter regulator, at operating temperature. The following values shall not be exceeded:

| Full Load Acceptance: | | Full Load Rejection: | |
|-----------------------|-------------|----------------------|--------------|
| Voltage Dip: | 44.7% | Voltage Rise: | 27.0% |
| Recovery Time: | 4.9 Seconds | Recovery Time: | 2.09 Seconds |
| Frequency Dip: | 8.8% | Frequency Rise: | 3.4% |
| Recovery Time: | 5.2 Seconds | Recovery Time: | 2.3 Seconds |

2.1.4. Motor Starting: Provide motor starting capability of 8973 skVA at 30% voltage dip and 0.4 PF as defined per NEMA MG 1. Sustained voltage dip data is not acceptable.

2.1.5. Sub-Transient Reactance: The minimum value shall be 15%.

2.1.6. The generator shall produce a clean AC voltage waveform, with not more than 5% total harmonic distortion at full linear load, when measured from line-to-neutral, and with not more than 3% in any single harmonic. Telephone influence factor shall be less than 50.

2.1.7. Engine: The engine shall be diesel fueled, 4-cycle, direct injected, turbocharged and after-cooled with remote critical silencer; remote radiator and fan; adjacent day tank and fuel oil cooler, while operating with nominal speed not exceeding 1800 rpm. The horsepower rating of the engine at its minimum tolerance level shall be sufficient to drive the alternator and all connected accessories.

2.1.7.1. Engine accessories and features shall include:

2.1.7.1.1. Remote-mounted radiator (approximately 40 feet from generator - 10 feet interior and 30 feet exterior and cooling system rated for full load operation in 104°F ambient as measured at the radiator air inlet. Radiator shall be provided with a duct adapter flange and 90 degree turning duct. The cooling system shall be filled with 50/50 propylene glycol/reverse osmosis processed water mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact per OSHA requirements.

2.1.7.1.2. Two electric starters with individual and separate battery systems; capable of three complete cranking cycles without overheating.

2.1.7.1.3. Positive displacement, mechanical, full pressure, lubrication oil pump.

2.1.7.1.4. Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.

2.1.7.1.5. An engine-driven, mechanical, positive displacement fuel pump. A fuel filter with replaceable spin-on canister element.

2.1.7.1.6. Replaceable dry element air cleaner with restriction indicator.

2.1.7.1.7. Flexible supply and return fuel lines.

2.1.7.1.8. Engine mounted battery charging alternator, 35 ampere minimum, and solid-state voltage regulator.

2.1.7.1.9. The engine shall comply with the more stringent of federal, state, and local Emission regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with applicable EPA emissions standards per ISO 8178 – D2 Emissions Cycle at specified kW/bHP rating. Utilization of the “Transition Program for Equipment Manufacturers” (also known as “Flex Credits”) to achieve EPA certification is not acceptable. The in-cylinder engine technology must not permit unfiltered exhaust gas to be introduced into the combustion cylinder. Emissions requirements/certifications of this package are EPA TIER 2 and must meet 40 CFR 60.4200 and 40 CFR 89.112(a).

2.1.7.1.10. Engine Governing: The engine governor shall be an electronic Engine Control Module (ECM) with 24V DC Electric Actuator. The ECM shall be enclosed in an environmentally sealed, die-cast aluminum housing which isolates and protects electronic components from moisture and dirt contamination. Speed droop shall be adjustable from 0 (isochronous) to 10%, from no load to full rated load. Steady state frequency regulation shall be +/-0.25%. Speed shall be sensed by a magnetic pickup off the engine flywheel ring gear. A provision for remote speed adjustment shall be included. The ECM shall adjust fuel delivery according to exhaust smoke, altitude and cold mode limits. In the event of a DC power loss, the forward acting actuator will move to the minimum fuel position.

2.1 8. AC Generator:

2.1 8. 1. The AC generator shall be synchronous, 4-pole, 2/3 pitch, revolving field, drip-proof construction, two pre-lubricated sealed bearings, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 105°C.

2.1 8. 2. The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.

2.1 8. 3. Embedded stator winding temperature detectors shall be provided to ensure proper operation. Stator coils shall be of form wound coil construction with windings above 6600 volts controlling surface corona through the use of semi-conductive and conductive grounding tapes. The excitation system shall enable the alternator to sustain 300% of rated current for 10 seconds during a fault condition and shall improve the immunity of the voltage regulator to non-linear distorting loads.

2.1 8. 4. Digital Voltage Regulator:

2.1.8.4.1. The digital voltage regulator shall be microprocessor based with fully programmable operating and protection characteristics. The regulator shall maintain generator output voltage within +/- 0.25% for any constant load between no load and full load. The regulator shall be capable of sensing true RMS in three phases of alternator output voltage, or operating in single phase sensing mode. The voltage regulator shall include a VAR/Pf control feature as standard. The regulator shall provide an adjustable dual slope regulation characteristic in order to optimize voltage and frequency response for site conditions. The voltage regulator shall include standard the capability to provide

generator paralleling with reactive droop compensation and reactive differential compensation.

2.1 8.4. 2.The voltage regulator shall communicate with the Generator Control Panel via a J1939 communication network with generator voltage adjustments made via the controller keypad. Additionally, the controller shall allow system parameter setup and monitoring, and provide fault alarm and shutdown information through the controller. A PC-based user interface shall be available to allow viewing and modifying operating parameters in a windows compatible environment.

2.1 8. 5. Generator Grounding: The generator frame shall be solidly grounded to an earth ground. The neutral of the generator shall be grounded through an existing 200A, 10-second, and 8 kV neutral resistor.

2.1.9. Engine Generator Set Control (Caterpillar EMCP 3.3 or other manufacturer's equivalent): The NEMA 1 enclosed control panel shall be mounted on the generator set with vibration isolators. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered. The generator set mounted control shall include the following features and functions:

2.1.9. 1.Three position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.

2.1.9. 2.RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

2.1.9. 3.Red "mushroom head" pushbutton EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.

2.1.9. 4.PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power.

2.1.9. 5.Generator Set AC Output Metering: The generator set shall be provided with a metering set with the following features and functions:

2.1.9. 5.1.Digital AC voltmeter, dual range, 90 degree scale, 2% accuracy; Digital AC ammeter, dual range, 90 degree scale, 2% accuracy; Digital frequency/rpm meter, 45-65 Hz, 1350-1950 rpm, 90 degree scale, +/- 0.6 Hz accuracy.

2.1.9. 5.2.Seven position phase selector switch with OFF position to allow meter display of current and voltage in each generator phase. When supplied with re-connectable generators, the meter panel shall be re-connectable for the voltage specified.

2.1.9. 6. Generator Set Alarm and Status Display:

2.1.9. 6.1.The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The lamp condition shall be clearly apparent under bright room lighting conditions. The

generator set control shall indicate the existence of the following alarm and shutdown conditions on the display panel.

- 1) Control Switch Not in Auto (flashing)
- 2) Low oil pressure (alarm)
- 3) Low oil pressure (shutdown)
- 4) Low coolant temperature (alarm)
- 5) High coolant temperature (alarm)
- 6) High coolant temperature (shutdown)
- 7) Low coolant level (shutdown)
- 8) Overcrank (shutdown)
- 9) Overspeed (shutdown)
- 10) Low fuel-daytank (alarm)
- 11) Neutral Ground fault (alarm)

The above points shall also be conveyed back to the Existing Power Switchgear (EPS-E) and be displayed.

2.1.9. 6.2. In addition, provisions shall be made for indication of all the above alarm or shutdown conditions to be displayed remotely. The non-automatic indicating lamp shall be red and shall flash to indicate that the generator set is not able to automatically respond to a command to start from a remote location.

2.1.9. 7. Engine Status Monitoring: The following devices shall be provided on the generator set control:

- a. Engine oil pressure gauge
- b. Engine coolant temperature gauge
- c. Engine operation hour gauge
- d. Battery voltage (DC volts)
- e. Exhaust temperature

2.1.9. 8. Control Functions: Control system shall include a cycle cranking system that shall be for three cranking periods of 15 seconds each, with a 15-second rest period between cranking periods. Fail-to-start shall be indicated by operation of the overcrank alarm indication lamp.

2.1.9.9. Alternator Control Functions:

2.1.9.9.1. The generator set shall include an automatic voltage regulation system which is matched and prototype tested with the governing system provided. It shall be immune from misoperation due to load-induced voltage waveform distortion and provide a pulse width modulated output to the alternator exciter. The system shall include a torque-matching characteristic, which shall reduce output voltage in proportion to frequency below a threshold of 58-59 Hz for 60 Hz machines.

2.1.9.9.2. Voltage adjusting rheostat, locking screwdriver type, to adjust voltage +/- 5% from rated value.

2.1.9.9.3. The control system shall include a ground fault monitoring relay. The relay shall be adjustable up to 200 amps, and include adjustable time delay of 0-1.0 seconds. The relay shall be for indication only and not trip or shut down the generator set. Note bonding and grounding requirements for the generator set, and provide relay which will function correctly in system as installed.

- 2.1.9.9.4. Controls shall include a load shed control, to operate a set of dry contacts (for use in shedding customer load devices) when the generator set is overloaded. Controls shall be provided to monitor the output current of the generator set and initiate an alarm when load current exceeds 110% of the rated current of the generator set on any phase for more than 60 seconds. The controls shall shut down and lock out the generator set when output current level approaches the thermal damage point of the alternator.
- 2.1.9.9.5. The voltage regulation system shall include provisions for reactive load sharing and electronic voltage matching for paralleling applications. Motorized voltage adjust pot is not acceptable for voltage matching.
- 2.1.9.9.6. An AC over/under voltage monitoring system which responds only to true RMS voltage conditions shall be provided. The system shall initiate shutdown of the generator set when alternator output voltage exceeds 110% of the operator-set voltage level for more than 10 seconds, or with no intentional delay when voltage exceeds 130%. Under voltage shutdown shall occur when the output voltage of the alternator is less than 85% for more than 10 seconds.
- 2.1.9.9.7. A battery monitoring system shall be provided which initiates alarms when the DC control and starting voltage is less than 20V DC or more than 28V DC. During engine starting, the low voltage limit shall be disabled, and if DC voltage drops to less than 12 volts for more than two seconds a "weak battery" alarm shall be initiated.
- 2.1.9.10. Control Interfaces for Remote Monitoring: Provide the following features in the control system:
 - 2.1.9.10.1. Form "C" dry common alarm contact set rated 2A @ 30V DC to indicate existence of alarm or shutdown condition on the genset.
 - 2.1.9.10.2. One set of contacts rated 2A @ 30V DC to indicate generator set is ready to load. The contacts shall operate when voltage and frequency are greater than 90% of rated condition.
 - 2.1.9.10.3. A fused 10 amp switched 24V DC power supply circuit shall be provided for customer use. DC power shall be available from this circuit whenever the generator set is running.
 - 2.1.9.10.4. A fused, 20 amp, 24V DC power supply circuit shall be provided for customer use. DC power shall be available from this circuit at all times from the engine starting/control batteries.
- 2.1.9.11. Provide a "gateway" communication system that will convert all monitored values of status and alarm to the BACnet protocol for collection and use by the existing generator control system. Gateway shall be capable of two-way communication.
- 2.1.10. Gateway: Provide a "Gateway" Communications system that will convert all monitored values of alarm and status points to MODBUS protocol for collection and use by the existing generator control system. The "Gateway" will be capable of two way communication.
- 2.1.11. Base: The engine generator set shall be mounted on a heavy duty steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

2.1.12. Generator Set Auxiliary Equipment and Accessories:

2.1.12.1. Water Jacket Heater: Engine mounted, thermostatically controlled, water jacket heater for each engine. The heater shall be sized as recommended by the generator set manufacturer. Heater voltage shall be 9000 watts, 460V AC, 3-phase. Provide proper power supply circuits for the heater as required for the voltage and load of the heater, connected to the weatherproof enclosure AC panel.

2.1.12.2. Vibration Isolation: Vibration isolators, spring/pad type, quantity as recommended by the generator set manufacturer. Isolators shall include seismic restraints if required by site location.

2.1.12.3. Exhaust Silencer: Exhaust muffler shall be provided for each engine, size and type as recommended by the generator set manufacturer. The mufflers shall be critical grade. Measured sound level at a distance of 10 feet from exhaust discharge shall be 85 dBA or less. Exhaust system shall be installed according to the generator set manufacturers recommendations and applicable codes and standards. Provide necessary exhaust piping of ASTM A53, Schedule 40, black steel, with welded joints and fittings. Connection from engine to exhaust system shall be flexible section of corrugated stainless steel pipe. The exhaust silencer shall be located outdoors and be mounted horizontally. The unit shall have a condensation drain. Provide all materials so that exhaust may be installed at a later date.

2.1.12.4. Starting and Control Batteries: Starting battery bank, calcium/lead antimony type, 24V DC, sized as recommended by the generator set manufacturer, shall be supplied for each generator set with battery cables and connectors. Install the batteries in a vented fiberglass covered enclosure for containment of spills and leaks. The starting batteries shall also provide back-up control power to the EPS (Existing Power Switchgear "E") system via the 24V DC, Best Battery Source DC system located in the EPS-E.

2.1.13. Battery Charger: A UL listed/CSA certified 20 amp voltage regulated battery charger shall be provided for each engine-generator set. Input AC voltage and DC output voltage shall be as required. Chargers shall be equipped with float, taper and equalize charge settings. Operational monitors shall provide visual output along with individual form C contacts rated at 4 amps, 120V AC, 30V DC for remote indication of:

1. Loss of AC power - red light
2. Low battery voltage - red light
3. High battery voltage - red light
4. Power ON - green light (no relay contact)
5. Analog DC voltmeter and ammeter, 12 hour equalize charge timer, AC and DC fuses shall also be provided on the charger.

2.1.14. Generator Set Main – Generator Main Terminal Compartment: Set mounted and wired, UL listed, with top and bottom conduit access as shown on the drawings. Submittals shall demonstrate that the enclosure provides proper termination and space.

2.1.15. Day Tank Fuel Storage Tank:

2.1.15.1. Provide a dual wall day storage tank with 400 gallons of total fuel capacity and 320 gallons of useable fuel capacity.

2.1.15.2. The equipment, as installed, shall meet all local and regional requirements for above ground tank and be UL-142 listed and labeled.

2.1.15.3. Tank shall be equipped for automatic unattended operation.

- 2.1.15.4. The day tank shall be a standard product supported by the manufacturer of the engine generator set.
- 2.1.15.5. The tank shall be made of heavy gauge steel with welded lap joint construction, and pressure tested to 3 psi.
- 2.1.15.6. The tank shall be constructed to meet NFPA 30 and 37.
- 2.1.15.7. Provide normal and emergency vents with flame arresters piped to 12' 0" above grade.
- 2.1.15.8. The tank shall have a direct reading guarded site fuel tube.
- 2.1.15.9. The tank shall incorporate dual integral fuel supply pumps and motors (120V AC), 10 gpm with 20-foot lift.
- 2.1.15.10. Provide a fuel inlet normally closed solenoid isolation valve (120V AC) for emergency shutdown of fuel supply for remote storage tank. Provide a fuel inlet strainer.
- 2.1.15.11. Provide a normally open fuel inlet solenoid isolation valve (120V AC) for critical high level shutoff of the fuel supply from the remote storage tank.
- 2.1.15.12. All valves shall be fire safe rated and FM approved.
- 2.1.15.13. Provide a return fuel pump, 20 gpm with 20 foot of lift to the remote fuel storage tank.
- 2.1.15.14. The tank shall have a fill pipe with 3-inch male Camlock overflow prevention valve, 7-gallon fill/spill containment box, and fuel supply and return ports.
- 2.1.15.15. The day tank control shall be provided with an On/Off/Automatic Control/Switch, Test/Reset Switch, AC Circuit Breaker, DC Circuit Breaker, level floats, and Indicator lamps:
 - 2.1.15.15.1. Ready (green) - AC supply & DC control power available.
 - 2.1.15.15.2. Low Fuel (50%) (red) - Latching fault, indicates low fuel, pump failure, or operating float switch failure, Closes N/O dry contacts.
 - 2.1.15.15.3. Lead /Lag (green/green) Supply Pump – Latching relays lead pump energized at 80% falling level. Lag pump energized at 70% falling level.
 - 2.1.15.15.4. High Fuel (90%) (red) - Latching fault, indicates fuel level near 90% full, shuts down all supply pumps, de-energizes the N/C fuel inlet solenoid isolation valve, and closes N/O dry contacts.
 - 2.1.15.15.5. Critical High (95%) Fuel Shutdown (red) - Latching fault, indicates near full tank, closes N/O contacts which will close the N/O fuel inlet solenoid isolation valve and energize the return pump.
 - 2.1.15.15.6. Rupture Basin (red) - Latching fault, indicates 5% fuel in rupture basin, shuts down all supply pumps, de-energizes the N/C fuel inlet solenoid isolation valve, and closes N/O dry contacts to energize the return pump.
 - 2.1.15.15.7. Spare (red) - with N/O and N/C dry contacts.

2.1.15.15.8. Return Pump Running (green) – The pump will run when energized by the critical high fuel shutdown and pump until the lead pump turns on. If the rupture basin starts the pump, it shall run unit turned off manually.

2.1.15.15.9. Contacts shall be rated not less than 2 amps at 30V DC and 0.5 amps at 120V AC.

2.1.16. Return Fuel Oil Cooler:

2.1.16.1. A liquid-to-air return fuel oil cooler shall be provided as required by the generator's engine manufacturer for indoor remote radiator applications. The cooler shall be sized to allow the maximum return fuel flow through the cooler and return fuel line piping flow restriction without exceeding the engine's maximum allowable restriction on the return fuel. The cooler shall be equipped with a thermostatic control switch connected to the fan motor. The cooling fan shall run any time the returning fuel oil exceeds 130°F.

2.1.16.2. The fuel oil cooler may be mounted adjacent to the day tank assembly and shipped loose as an accessory to the day tank.

2.1.17. Remote Fuel Oil Storage Tank and Piping: Existing.

PART 3 - FACTORY TESTS:

3.1. Equipment supplied shall be fully tested at the factory for function and performance.

3.2. Generator set factory tests on the equipment shall be performed at rated load and rated PF. Generator sets that have not been factory tested at rated PF will not be acceptable. Tests shall include: run at full load, maximum power, voltage regulation, transient and steady state governing, single step 50%,75%,and 100% load acceptance (record voltage dip, recovery time, frequency dip and recovery time) and 50%, 75% and 100% load rejection (record voltage rise, recovery time , frequency rise and recovery time) , and function of safety shutdowns. All test reports shall be sent to the Construction Officer within two weeks for the date of the tests.

3.2 OPERATING INSTRUCTIONS AND MAINTENANCE MANUAL:

3.2.1. The Engine/Generator Contractor shall submit to the Construction Officer, the operating instructions, maintenance manual, and record drawings presenting full details for care and maintenance of equipment of every nature furnished and/or installed under this Contract.

3.2.1.1. Operating Instructions: Printed and framed instruction chart suitable for wall hanging.

3.2.1.2. Maintenance Manual: Printed and bound instructions covering all details pertaining to care and maintenance of all equipment, as well as data identifying all parts.

3.2.1.3. Drawings of Engine, Alternator Control, and Switching Devices: Complete diagrams must be supplied, as well as one reproducible tracing of all diagrams with title block blanked out for Government's use. These drawings shall be the same size as the contract drawings.

3.3. WARRANTY:

3.3.1. The Government requires a complete two-year warranty from the date of final acceptance by the Government for repair or replacement of defective material and workmanship on each unit purchased i.e., The standby power battery and battery charger system (s), including engine/generator (s), radiator (s) and engine control (s).

3.3.2. During the warranty period, the Manufacturer/Supplier shall be required to make the necessary repairs or replacements on site. The Government shall not accept or pay for travel time, mileage, airfare, freight, labor, rental charges, or any costs incurred to warranty this equipment. Whereas the supplier SHALL consider these cost in their quote.

3.3.3. Warranty service points of contacts (POCs) and their telephone numbers “Shall” be made available to the Central Utilities Plant supervisor and the Contracting Officer by the manufacturer/supplier through the service centers, to provide warranty service calls of the subject equipment.

3.3.4. General Warranty: See FAR 52.212-4.