REQUEST FOR PROPOSAL

WTP Generator & ATS

For

Hannibal Board of Public Works
#3 Industrial Loop Drive, PO Box 1589
Hannibal, MO 63401

By

BHMG Engineers, Inc.

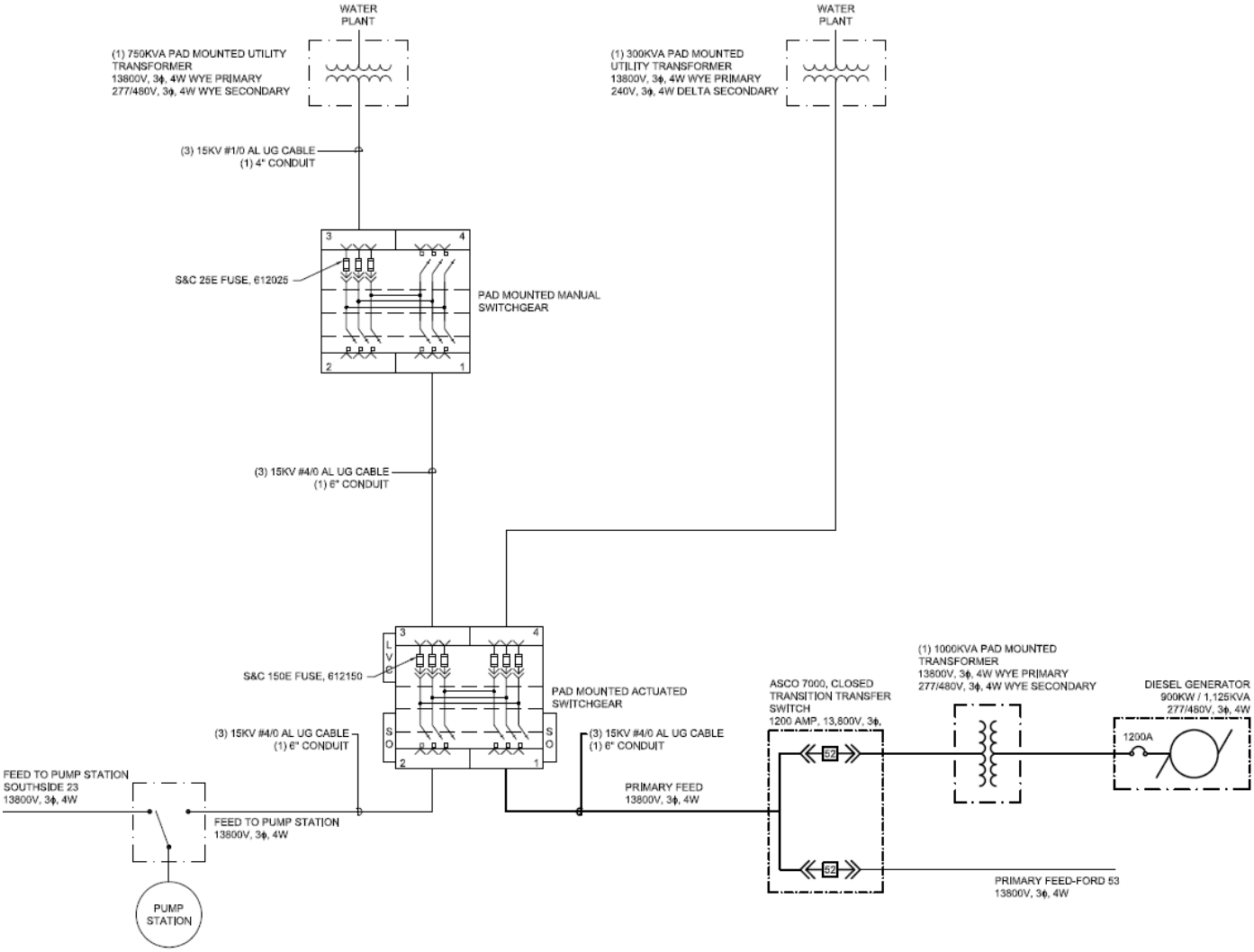
July 9, 2021

Overview:

BHMG Engineers, Inc. is requesting proposals on behalf of the Hannibal Board of Public Works ("HBPW") for the procurement, delivery and startup of a standby generator, sub-base fuel tank, and automatic transfer switch to be provided for the water plant located at 1 Riverview Park Drive, Hannibal, MO.

General:

The generator will be utilized for backup/standby power for the existing water treatment facility. The new ATS will be placed on the incoming line to the facility and complete closed transitions on the 13.8kV system. The equipment will be provided under this contract and the owner will install.



PROPOSED WATER TREATMENT PLANT

Terms and Conditions

- HBPW reserves the right to reject any and all offers, withdraw any item from the proposals at any time.
- HBPW will not be held liable for any reason due to the rejection of any proposal.
- Proposal Evaluation Criteria:
  - Price = 60%
  - Leadtime = 30%
  - Service Response = 10%

Equipment Specifications:

- **16231 – Packaged Engine Generator**
- **16621 – Automatic Transfer Switches**

RFP Schedule:

RFP Issued	07/07/2021
RFP Questions Due	-
Proposals Due	07/22/2021 @ 10:00 AM

Proposal Breakdown:

The supplier is to propose a contract amount based on the following breakdown, include start-up, commissioning, and shipping and handling:

- Generator: $_____ Lead Time: _____
- ATS: $_____ Lead Time: _____
- Tax: $ NONE
- **Total:** **$** _____

- **Optional Items**
  - Cost for five (5) year Maintenance Plan: _____
  - Extended warranty options: _____
  - Cost for extended warranty: _____

This Proposal submitted by:

Company Name: _____

Name (typed or printed): _____

Date: _____

All RFP correspondence shall be sent electronically to Jason Jackson at jjackson@bhmg.com, and Jared Stewart at jstewart@hannibalbpw.org.

Proposal submission

Proposals shall be submitted no later than the date and time prescribed and at the place indicated in the advertisement or invitation to bid and shall be enclosed in a plainly marked envelope with the Project title (and, if applicable, the designated portion of the Project for which the Proposal is submitted) and the name and address of Supplier and shall be accompanied by the required documents. If a Proposal is sent by mail or other delivery system, the sealed envelope containing the Proposal shall be enclosed in a separate package plainly marked on the outside with the notation "PROPOSAL ENCLOSED". A mailed Proposal shall be addressed to:

Hannibal Board of Public Works
3 Industrial Loop Drive
PO Box 1589
Hannibal, MO 63401
WTP Generator

SECTION 16231

PACKAGED ENGINE GENERATORS

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Packaged engine-driven generator sets for standby power supply.

1.2 QUALITY ASSURANCE

A. Installer qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this project.

B. Comply with NFPA 37.

C. Comply with NFPA 110.

D. Comply with UL 2200.

1.3 WARRANTY

A. The package generator set shall be provided with a minimum two year warranty for all defects and failure, labor and materials.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Caterpillar, Inc.

B. Approved equal

2.2 ENGINE GENERATOR SET

A. General: Furnish a coordinated assembly of compatible components.

B. Configuration: The packaged engine generator set will be placed on a concrete pad provided by the Owner. The factory type enclosure shall provide a weatherproof environment and containment area for the packaged engine generator set.

C. Nameplates: Each major system component shall be equipped with a conspicuous nameplate of component manufacturer. Nameplate shall identify manufacturer of origin and address, and model and serial number of item.

D. Resistance to Seismic Forces: Supports for internal and external components, and fastenings for batteries, wiring, and piping are designed and constructed to

withstand static or anticipated seismic forces, or both, in any direction. For each item, use a minimum force value equal to weight of item.

E. Power Output Ratings: Nominal ratings as indicated, with capacity as required to operate as a unit at the specified conditions, as evidenced by testing.

F. Skid: Adequate strength and rigidity to maintain alignment of mounted components without depending on a concrete foundation. Skid is free from sharp edges and corners. Lifting attachments are arranged to facilitate lifting with slings without damaging any components.

G. Rigging Diagram: Inscribed on a metal plate permanently attached to skid. Diagram indicates location and lifting capacity of each lifting attachment and location of center of gravity.

2.3 GENERATOR SET PERFORMANCE

A. Capacity: Engine-generator set shall be provided with the following ratings at specified operating conditions:
   1. Rated Voltage: 277/480 volt; series wye.
   2. Rated Frequency: 60 hertz.
   3. Rated Power Factor: 0.8 percent lagging.
   4. Rated kW/kVA: 900 KW/1125 KVA.

B. Steady-State Voltage Operational Bandwidth: Plus or minus 1 percent of rated output voltage from no load to full load.

C. Steady-State Voltage Modulation Frequency: Less than 1 hertz.

D. Steady-State Frequency Operational Bandwidth: Plus or minus 0.25 percent of rated frequency from no load to full load.

E. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.

F. Step Load Performance: Step load shall be the sudden application, or removal, of 90% rated load at rated power factor with the engine-generator operating at rated speed, rated voltage. The following are the step load response constraints:
   1. Step load transient voltage limits: Plus 9% and minus 12%.
   2. Step load change transient recovery time: Not greater than 5.0 seconds.
   3. Step load transient frequency limits: Plus 4% and minus 7%.

G. Output Waveform: At no load, harmonic content measured line to neutral does not exceed 2 percent total with no slot ripple. The telephone influence factor, determined according to NEMA MG 1, shall not exceed 50.

H. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, the system shall supply a minimum of 300 percent of rated full-load current for not less than 10 seconds and then clear the fault automatically, without damage to winding insulation or any other generator system component.

I. Excitation System: Performance shall be unaffected by voltage distortion caused by nonlinear load.

J. Start Time: Generator shall be capable of starting and coming up to 90% rated voltage and 90% frequency ready to accept load in 10 seconds from time of receiving a start signal in an ambient of 0 degrees F.

K. External Cooling Fan Static: The fan shall overcome a minimum of 0.5" H2O of external fan static.

L. Environmental Conditions: Engine generator system shall withstand the following environmental conditions without mechanical or electrical damage or degradation of performance capability:
1. Ambient Temperature: -10 to 110 degrees F.
2. Relative Humidity: 0 to 95 percent.
3. Altitude: Sea level to 1000 feet (300 m).

2.4 ENGINE

A. General: Comply with NFPA 37.

B. Fuel: Diesel fuel oil, ULSD.

C. Rated Engine Speed: 1800 rpm.

D. Number of Cycles: Four.

E. Maximum Piston Speed for Four-Cycle Engines: 2250 fpm (11.4 m/s).

F. Lubrication System: Pressurized by a positive-displacement pump driven from engine crankshaft. The following items shall be mounted on engine or skid:
1. Filter and Strainer: Rated to remove 90 percent of particles of 5 micrometers and smaller while passing full flow.
2. Thermostatic Control Valve: Shall control flow in system to maintain optimum oil temperature. Unit shall be capable of full flow and shall be designed to be fail-safe.
3. Crankcase Drain: Arranged for complete gravity drainage to an easily removable container with no disassembly and without use of pumps or siphons or special tools or appliances.

G. Engine Fuel System: The following items shall be provided:
1. Main Fuel Pump: Mounted on engine and sized to ensure adequate primary fuel flow under starting and load conditions.
2. Relief/Bypass Valve: Shall automatically regulate pressure in fuel line and returns excess fuel to source.

H. Coolant Jacket Heater: Electric-immersion type, factory installed in coolant jacket system. Comply with NFPA 110 requirements for Level 1 equipment.

2.5 GOVERNOR

A. Type: Adjustable isochronous, with speed sensing as manufactured by Woodward, or approved equivalent.

2.6 ENGINE COOLING SYSTEM

A. Description: Closed loop, liquid cooled, with radiator factory mounted on engine generator-set skid, integral engine-driven coolant pump and the following:
   1. Fan: Driven by multiple belts from engine shaft.
   2. Expansion: Adequate to contain expansion of total system coolant from cold start to 110 percent load condition.
   3. Coolant: Solution of 50 percent ethylene-glycol-based antifreeze and 50 percent water, with anticorrosion additives as recommended by engine manufacturer.

B. Temperature Control: Self-contained, thermostatic-control valve modulates coolant flow automatically to maintain optimum constant coolant temperature as recommended by engine manufacturer.

C. Coolant Hose: Flexible assembly with inside surface of nonporous rubber and outer covering of aging-, ultraviolet-, and abrasion-resistant fabric.
   1. Rating: Non-collapsible under vacuum and selected for the maximum working pressure and temperature.
   2. End Fittings: Flanges or steel pipe nipples with clamps to suit piping and equipment connections.

2.7 FUEL OIL SYSTEM

A. General: Comply with NFPA 30 and NFPA 37.

B. Fuel Tank: Base-mounted, factory-fabricated assembly of a fuel tank listed by a nationally recognized testing laboratory, with the following features:
   1. Tank Capacity: Adequate to supply fuel to engine for an uninterrupted period of twelve (12) hours of operation at 100 percent of rated power output of engine generator system without being refilled.
   2. Containment: Integral rupture basin with a capacity of 150 percent of nominal capacity of the tank. Provide leak detection located in rupture basin and connect to provide audible and visual alarm in the event of fuel tank leak.
   3. Tank Connections: Provide the following tank fittings and accessories:
      a. One (1) fill port with overfill prevention device and EPA approved spill containment box.
      b. One (1) fuel tank gauge.
      c. One (1) fuel tank drain with manual drain valve.
      d. One (1) fuel tank vent connection.
      e. One (1) engine fuel supply and return connection.
      f. One (1) fuel tank emergency vent connection.
      g. One (1) rupture basin drain with manual drain valve.
      h. One (1) rupture basin vent connection.
      i. One (1) monitor port. The tank shall be equipped with a monitor port utilized for the detection of leaks from the primary to the secondary tank. The monitor ports shall be a minimum of 2” steel pipe rigidly

attached to the tank and suitable for manual or automatic electronic monitoring as required by local fire codes. A lockable cap equal to Morrison 678XA shall be furnished with the monitor tube.

4. Fuel Oil Water Separator: Provide a fuel oil water separator to remove any water contamination in the fuel supply to the prime mover. The separators shall be unit mounted and installed between the fuel oil storage tank and the fuel oil filter. Provide redundant separators as manufactured by Racor. Fuel oil water separators shall be piped on a common header with all required fittings and shutoff valves.
5. Oil Cooler: An air cooled fuel oil cooler shall be provided to lower the return fuel oil temperature to not more than 100 degrees F and allow the unused supply fuel oil to be returned to the integral based mounted day tank.
6. Overfill Prevention Device: Provide an overfill prevention device at the main fill port to stop the flow of product when the tank reaches 95% of tank capacity.
7. Fill Alarm Panel: Provide a local audible and visual alarm with notification near the fill port when the tank reaches 90% of tank capacity and at 95% capacity

2.8 ENGINE EXHAUST SYSTEM

A. Muffler: Critical type, sized as recommended by engine manufacturer. Measured sound level at a distance of 10 feet (3 m) from exhaust discharge shall be 65 dBA or less.

B. Condensate Drain for Muffler: Schedule 40, black steel pipe connected to muffler drain outlet through a petcock.

C. Connections from Engine to Exhaust System: Flexible section of corrugated stainless-steel pipe.

D. Connection from Exhaust Pipe to Muffler: Stainless-steel expansion joint with liners.

2.9 STARTING SYSTEM

A. General: Components shall be sized so they will not be damaged during a full engine-cranking cycle as required by NPFA 110 for system level 1 and at ambient temperature range herein specified.

B. Description: 24-VDC electric, with negative ground and including the following items:
   1. Cranking Motor: Heavy-duty unit that automatically engages and releases from engine flywheel without binding.
   2. Dual Battery System: Provide double system with adequate capacity within ambient temperature range herein specified. Provide specified cranking cycle at least three times without recharging.
   3. Battery Cable: Size as recommended by generator set manufacturer for cable length indicated. Include required interconnecting conductors and connection accessories.

4. Battery Compartment: Factory fabricated of metal with acid-resistant finish and thermal insulation. Thermostatically controlled heater is arranged to maintain battery above 10 degrees C regardless of external ambient temperature within range herein specified. Include accessories required to support and fasten batteries in place.
5. Battery-Charging Alternator: Factory mounted on engine with solid-state voltage regulation and 35-A minimum continuous rating.
6. Dual Battery Charger: Provide two systems, current-limiting, automatic-equalizing and float charging type. Unit complies with UL 1236 and includes the following features:
    a. Operation: Equalizing-charging rate of 10 A is initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall automatically switch to a lower float-charging mode and continues operating in that mode until battery is discharged again.
    b. Automatic Temperature Compensation: Adjusts float and equalizes voltages for variations in ambient temperature from minus 40 degrees C to plus 60 degrees C to prevent overcharging at high temperatures and undercharging at low temperatures.
    c. Automatic Voltage Regulation: Maintains output voltage constant regardless of input voltage variations up to plus or minus 10 percent.
    d. Ammeter and Voltmeter: Flush mounted in door. Meters shall indicate charging rates.
    e. Enclosure and Mounting: NEMA 250, Type 1, wall-mounted cabinet.
    f. Safety Functions: Include sensing of abnormally low battery voltage, high battery voltage and loss of ac input or dc output of battery charger. Conditions shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel. Provide the following indications:
        1. High DC Voltage local and remote alarm.
        2. Low DC Voltage local and remote alarm.
        3. AC Input failure local and remote alarm.
        4. AC Input Power available indicator lights.
        5. Remote summary alarm.

2.10 CONTROL AND MONITORING

A. Functional Description: When the mode-selector switch on the control and monitoring panel is in the automatic position, remote-control contacts in one or more separate automatic-transfer switches initiate starting and stopping of the generator-set. When the mode-selector switch is switched to the on position, the generator-set shall manually start. The off position of the same switch initiates generator-set shutdown. When the generator set is running, specified system or equipment failures or derangements shall automatically shut down the generator-set and initiate alarms. Operation of a remote emergency-stop switch shall also shut down the generator-set.

B. Configuration: Operating and safety indications, protective devices, basic system controls, and engine gages are grouped on a common control and monitoring

panel mounted on the generator-set. Mounting method shall isolate the control panel from generator-set vibration.

C. Industry standard open architecture communication protocol for high speed serial communication via RS422/485 compatible.

D. Indicating Devices and Controls: Include those required by NFPA 110 for a Level 1 system, and the following:
1. AC voltmeter.
2. AC ammeter.
3. AC frequency meter.
4. DC voltmeter (alternator battery charging).
5. Engine-coolant temperature gage (outlet).
6. Engine lubricating-oil pressure gage (inlet).
7. Running-time meter.
8. Ammeter-voltmeter, phase-selector switch(es).
9. Generator-voltage adjusting rheostat.
10. Mode selector switch (Auto-On-Off/Reset).
11. Emergency Power Off (EPO) switch.
12. Fuel oil filter differential.
13. Fuel oil pressure to the engine (inlet).
14. Engine-coolant temperature to the engine (inlet).
15. Lubricating oil filter differential.
16. Air filter differential.

E. Engine Protective Devices: The following protective devices shall be provided:
1. Engine Overspeed: An overspeed device which shall shutdown the engine if the engine speed exceeds the normal synchronous speed by 10%. This device shall be entirely independent of the governor and shall be other than an electrical device. Overspeed device shall require manual resetting after tripping.
2. Engine Oil Pressure: A device that shall shutdown the engine in the event of loss of lubricating oil pressure. This device shall be positive and direct in action and shall be independent of the governor.
3. Coolant Temperature: A device that shall shutdown the engine in event of high cooling system temperature. This device shall be positive and direct in action. It shall have an adjustable setting set at 10 degrees F above the thermal alarm in the jacket coolant discharge piping.

F. Supporting Items: Include sensors, transducers, terminals, relays, and other devices, and wiring required to support specified items. Locate sensors and other supporting items on engine, generator, or elsewhere as indicated. Where not indicated, locate to suit manufacturer's standard.

G. Supervisory Alarm Contacts: The engine shall be equipped with the following alarm and status sensors that shall provide Form C dry contact for supervisory alarm circuits. A separate terminal block, factory wired for each alarm and status indication, shall be provided.
1. Approach low oil pressure (alarm).
2. Low oil pressure alarm (shutdown).
3. Approach high coolant temperature (alarm).

4. High coolant temperature alarm (shutdown).
5. Low coolant temperature (alarm).
6. Engine overspeed (shutdown).
7. Engine overcrank (shutdown).
8. Low battery voltage.
9. Battery charger malfunction.
10. Controls not in automatic (status).
11. Engine running (status).
12. Low fuel at the day tank.
13. Critical low fuel at the day tank (shutdown)
14. Day tank rupture basin containment breach.

H. Remote Alarm and Status Annunciation: A remote monitoring panel shall be provided as a means of observing critical operating parameters at a remote location. The following shall be provided:
1. Approach low engine oil pressure.
2. Low engine oil pressure and shutdown.
3. Approach high engine coolant temperature.
4. High engine coolant temperature and shutdown.
5. Low engine coolant temperature.
6. Engine overspeed.
7. Engine overcrank.
8. Battery charger malfunction.
9. Low battery voltage.
10. Controls not in automatic.
11. Low fuel supply at the day tank.
12. Day tank rupture basin containment breach.
13. Engine running.

2.11 GENERATOR OVERCURRENT AND FAULT PROTECTION

A. Generator Circuit Breaker & Load Bank Breaker: Molded-case, electronic-trip type; 100 percent rated; complying with UL 489.
1. Tripping Characteristics: Adjustable long-time and short-time delay and instantaneous.
2. Trip Settings: Matched to generator thermal damage curve as closely as possible.
3. Shunt Trip: Connected to trip breaker when generator set is shut down by other protective devices.
4. Mounting: Adjacent to or integrated with control and monitoring panel.

B. Ground-Fault Indication: Comply with NFPA 70, Article 700-7(d). Integrate ground-fault alarm indication with other generator-set alarm indications.

2.12 GENERATOR, EXCITER, AND VOLTAGE REGULATOR

A. General: The generator shall be engine-driven, synchronous, salient pole, permanent magnet exciter, brushless rotating rectifier exciter, copper form wound coils, copper amortisseur winding.

B. Standards: Comply with NEMA MG 1 and specified performance requirements.

C. Drive: Generator shaft shall be directly connected to engine shaft. Exciter shall rotate integrally with generator rotor.

D. Electrical Insulation: The insulation system shall be vacuum pressure impregnated and designed for a 150 C temperature rise by resistance with an ambient of 40 C.

E. Stator-Winding Leads: Brought out to terminal compartment to permit future reconnection for other voltages if required.

F. Construction: Construction shall prevent mechanical, electrical, and thermal damage due to vibration, overspeed up to 125 percent of rating, and heat during operation at 110 percent of rated capacity.

G. Terminal Compartment: The stator-windings shall be arranged for connection with the phase and neutral leads brought out the bottom of the generator frame and the phase leads shall be connected to bus bars located in the terminal compartment. Provide compression type lugs for load connections. A terminal shall be provided for the neutral and frame ground bonding. The power termination housing shall be designed for top or bottom connection of phase, neutral, and ground leads, and for top or bottom entry of load raceways. All power lead connections shall be labeled for proper identification at each end, and connection sequences shall be consistent. As required, provide an oversized terminal compartment to mount differential current transformers, generator surge protection and cable terminations.

H. Enclosure: Drip proof.

I. Automatic Digital Voltage Regulator with PWM: Solid-state type, separate from exciter, providing performance as specified. Adjusting rheostat on control and monitoring panel provides plus or minus 5 percent adjustment of output- voltage operating band.

J. Windings: Two-thirds pitch stator winding and fully linked amortisseur winding.

2.13 OUTDOOR GENERATOR-SET ENCLOSURE

A. Description: Factory type, vandal-resistant, weatherproof, soundproof steel housing, wind resistant up to 150 mph. Multiple panels are lockable and provide adequate access to components requiring maintenance. Panels shall be removable by one person without tools. Instruments and control are mounted within enclosure.

B. Description: Prefabricated or pre-engineered enclosure with the following features:
   1. Construction: Skin type, galvanized steel, metal-clad, integral structural-steel-framed.
   2. Structural Design and Anchorage: Adequate to resist loads imposed by 150-mph wind.
   3. Hinged Doors: With padlocking provisions.
   4. Ventilation: Louvers equipped with insect/rodent screen and filter arranged to permit air circulation while excluding exterior dust and rodents.

5. Thermal Insulation: As required to maintain winter interior temperature within limits required by components.
6. Lights and Receptacles: Within the enclosure provide a minimum of one (1) convenience receptacles (GFCI) and one (1), lighting fixtures.
7. Conduit and Pipe Penetrations: Provide adequate clearance for conduit and piping stub-ups. All stub-up locations shall provide for adequate clearances as previously specified. Provide weatherproof passage for all piping and conduit penetrations including, but not limited to, fuel system vents, exhaust piping, drains, etc.

C. Muffler Location: Internal to enclosure.

D. Acoustical Treatment: The enclosure shall reduce the ambient noise level of the engine generator system to 65dBA or less, at three (3) feet from the enclosure. Acoustical treatment of the cooling air intake and exhaust shall be achieved with straight-through type, full height vertical baffles (sound attenuators). The sound attenuators shall have galvanized steel skin and include louvers and automatic dampers as herein specified.

E. Engine Cooling Airflow through Enclosure: Adequate to maintain temperature rise of system components within required limits when unit operates at 110 percent of rated load for two hours with ambient temperature at top of range specified in system service conditions.

F. Louvers: Fixed-engine cooling air inlet and discharge. Louvers shall be equipped with insect/rodent screen and prevent entry of rain or snow.

2.14 FINISHES

A. Indoor Enclosures and Components: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible standard primer.

B. Outdoor Enclosures: Manufacturer's standard enamel over corrosion-resistant pretreatment and compatible standard primer.

2.15 OPTIONS

A. Seismic vibration isolators for entire package.

B. All fluids, filters, and startup consumables; fuel by Owner.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation by Owner.

3.2 FIELD QUALITY CONTROL

A. Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Assist in functionality and operational tests.

C. Tests and Inspections:
1. Battery charger test to verify specified rates of charge in both floating and equalizing conditions.
2. Voltage and frequency transient stability test to measure voltage and frequency during transient conditions.
3. Harmonic content tests to measure content of output voltage under 25 percent and at 100 percent load.
4. Critical alarm and warnings.
5. Operational test for rotation and unit functionality.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain package engine generators.

3.4 GENERATOR STARTUP REQUIREMENTS

A. Engine supplier shall provide all equipment and labor to complete the following startup requirements as a minimum:

Test 1 - NO LOAD TESTS				
Step	**Action**	**Result**	**Comments**	**Time**
1	**Verify coolant level**			
2	**Verify oil level**			
3	**Verify fuel level**			
4	**Record ambient temp**			
5	**No alarms on generator**			
6	**Open output breaker**			
4	**Battery voltage**	**VDC**		
5	**Battery charging current**	**A**		
6	**Oil Pressure**	**psi**		
7	**Coolant Temp**	**F**		
8	**Simulate battery fail at GEN, verify alarms**	**loc. rem.**		
9	**Simulate fuel high-level at GEN, verify alarms**	**loc. rem.**		
10	**Simulate fuel leak at GEN, verify alarms**	**loc. rem.**		
11	**Simulate low coolant alarm at GEN, verify alarms**	**loc. rem.**		
12	**Simulate low coolant shutdown at GEN, verify alarms**	**loc. rem.**		

Test 1 - NO LOAD TESTS				
Step	**Action**	**Result**	**Comments**	**Time**
13	Simulate high coolant temp alarm at GEN, verify alarms	loc. rem.		
14	Simulate high coolant temp shutdown at GEN, verify alarms	loc. rem.		
15	Simulate low oil pressure alarm at GEN, verify alarms	loc. rem.		
16	Simulate low oil pressure shutdown at GEN, verify alarms	loc. rem.		
17	Simulate overspeed alarm at GEN, verify alarms	loc. rem.		
18	Simulate overcrank alarm at GEN, verify alarms	loc. rem.		
19	Battery voltage	VDC		
20	Battery charging current	A		
21	Switch controller to "OFF" at GEN, verify "Not-in-auto" alarm	loc. rem.		
22	Manually start generator			
23	Running Voltage Output	Vab Vbc Vca		
24	Running Frequency / RPM	HZ RPM		
25	Activate emergency stop, verify alarms	loc. rem.		
26	Reset E-stop and place in auto			
27	Start generator from ATS, verify no alarms			
28	Run for 15 minutes			
29	Oil Pressure	psi		
30	Coolant Temp	F		
31	Stop generator from ATS, verify cool-down			

Test 2 - LOAD TESTS				
Step	**Action**	**Result**	**Comments**	**Time**
1	Record ambient temp			
2	Connect load bank to GEN			
3	Verify position of MTS			
4	Close GEN output breaker			
5	Manually start GEN, verify at operating temp and pressure			
6	Step to 25% load for 15 minutes, take readings			

Test 2 - LOAD TESTS				
Step	**Action**	**Result**	**Comments**	**Time**
7	**Step to 50% load for 15 minutes, take readings**			
8	**Step to 75% load for 15 minutes, take readings**			
9	**Step to 100% load for 60 minutes, take readings**			
10	**Reduce load to 0%**			
11	**Step to 75% load for 15 minutes, take readings**			
12	**Reduce load to 0%**			
13	**Step to 100% load for 15 minutes, take readings**			
14	**Step to 25% load for 15 minutes, take readings**			
15	**Reduce load to 0%**			
16	**Perform burn-in test. Apply 100% load for 120 minutes, take readings at GEN. IR scan GEN, panels, and feeders.**			
17	**Reduce load to 0%**			
18	**Place GEN in auto, verify cool-down**			
19	**Open output breaker**			
20	**Check gen for leaks**			
21	**Check gen for issues**			
22	**Record fuel consumption**			
23	**Record run hours**			
24	**Remove load bank**			

END OF SECTION

SECTION 16621

AUTOMATIC TRANSFER SWITCHES

PART 1 - GENERAL

1.1 WORK INCLUDES

A. Packaged automatic transfer switches for standby power generators.

1.2 QUALITY ASSURANCE

A. Installer qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this project.

B. Comply with NFPA 70.

C. Comply with NFPA 110.

D. Comply with UL 1008.

1.3 WARRANTY

A. The package ATS shall be provided with a minimum two year warranty for all defects and failure, labor and materials.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. ASCO, Inc.

B. Approved Equal.

2.2 AUTOMATIC TRANSFER SWITCH

A. General

1. Model: 7000
2. Voltage: 13,800 volt
3. Amperage: 1200 amp
4. Configuration: 3-phase, 4-pole/4-wire, overlapping Neutral
5. Enclosure: NEMA 3R outdoor application on concrete pad
6. Transition: Closed
7. Interrupting: 25kA

B. Metering

1. LCD screen shall be provided and display the following data:

a. Both sources of voltage, current and frequency.

b. ATS position.

c. Source availability and sequence indication.

C. Control

1. Functions:

a. Adjustable time delays.

b. Adjustable generator exercise schedule.

c. Generator start at loss of utility.

d. Generator shut down at return of utility.

e. Voltage and frequency monitoring.

2. Options:

a. Generator control wires.

b. Status indicator lights.

D. Communications

1. Provide a modbus gateway to provide modbus communication protocol from ATS to client SCADA System.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Installation by Owner.

3.2 DEMONSTRATION

A. Engage a factory-authorized service representative to train owner's maintenance personnel to adjust, operate, and maintain ATS.

3.3 ATS STARTUP REQUIREMENTS

A. Engine supplier shall provide all equipment and labor to complete the following startup requirements as a minimum:

Test 1 - LOAD TESTS				
step	**Action**	**Result**	**Comments**	**Time**
1	**Verify no alarms**			
2	**Verify generator to auto mode**			
3	**Verify source 1 is available and feeding load**			
4	**Thermal scan connections**			
5	**Enable test switch**			
6	**Verify generator start and source 2 is available.**			
7	**Disable test switch**			
8	**Verify ATS in auto**			
9	**Open source 1 input breaker**			
10	**Record transfer time**			
11	**Verify generator start and source 2 is available.**			
12	**Verify transfer to source 2**			
13	**Thermal scan connections**			
14	**Close source 1 input breaker**			
15	**Verify time delay to transfer back to source 1**			
16	**Override time delay**			
17	**Verify transfer back to source 1**			
18	**Verify generator shutdown**			
19	**Verify ATS in auto**			
20	**Verify Generator in auto**			

END OF SECTION