DESCRIPTION
This work shall consist of furnishing and installing a Modify Existing Solar Power Supply System, at the locations shows in the plan and as directed by the Engineer.

MATERIALS
All materials furnished, assembled, fabricated, or installed shall be new, corrosion resistant, and in strict accordance with the standards set by the New York State Department of Transportation (NYSDOT) and shall be in the NYSDOT Transportation Management Equipment Qualified Parts List (QPL), June 2007 or as approved by the Engineer.

Materials furnished shall generally consist of the following:
1. Battery bank with capacity of 400 Ah, 12 V DC sealed gel cell lead acid batteries
2. Automatic sequencing charger (ASC) and monitoring unit, if required
3. Internal & external wiring cables and conductors

Battery
Battery type shall be for industrial hardness applications, including telecommunication applications. Battery shall be sealed, maintenance free, deep cycle, gel lead acid type 12V DC battery. The battery has valve-regulated design with self-discharge rate of less than 1% per month (at 25°C).

The battery shall support the following functions:
1. Maintenance-free
2. Sealed no leak design
3. Higher cranking amps
4. Lower self discharge
5. Vibration resistance
6. Heavy duty, no corrosion terminals
7. Front Access Terminals
8. Dimensions (Maximum): L (506 mm), W (152 mm), H (300 mm)
9. Weight: less than 36 kg.
10. Nominated Voltage: 12 VDC
11. Float Voltage: 13.5 V/Battery (2.25- 2.29 V/cell) nominal
12. Minimum Float Life: 10 year float life at 25°C (77°F)
13. Terminal: FLAG or as approved by the Engineer
14. Capacity: min. 90 to 120 AH for 8 hour rate (to comply with approved total battery storage capacity)
15. Minimum Discharge: 340 for 15 Amps output
16. All wiring and interconnects use #10AWG wire for less than 10% losses due to voltage drop.
17. Non-hazardous cargo for ground, sea and air transportation
18. Standard Compliant:
   - Telecordia certified life exceeded 10 years, Telecordia SR-4228 (or equal Standard as approved by the Engineer)
   - UL Compliant
   - NEBS Compliant
• EUROBAT, 10 year plus classification
• Tested in accordance with - BS6290 PART 4, 1987 - Bellcore, TR-NWT-000766 - ANSI, TI: 330

19. Flame arresting, one-way pressure relief valve for safety and long life
20. Flame-retardant case and cover, UL recognized component

Battery Charger/ Solar Panel Controller
The Panel controller shall provide fully operational control of the battery charging process and solar panel effects.

The controller shall support the following functions:
1. Prevent the solar panels from damaging a battery by overcharging it too much
2. Prevent the batteries from discharging back through the solar panel at night.
3. Optimize the charging of the battery bank
4. Use MPPT (Maximum Power Point Technology) or equivalent as approved by the Engineer.
5. Support 60 Amp 12/24/48 Volt Rating
6. Output Serves as 60 Amp Load Controller
7. Network interface for coordinating multiple panel controllers and sharing battery temperature sensor and remote monitoring display
8. Remote display capability to provide complete charge control and battery system monitoring, to eliminate the need for a separate battery monitoring device.

The panel controller/Battery Charger shall have:
1. Durable powder coat finish and conformal coated electronics resist corrosion
2. Standard five years Warranty

Battery Charger/ Solar Panel Controller Specification
1. Nominal Battery Voltages: 12, 24, 36, 48, or 60 VDC (Single model - selectable via field programming at start-up)
2. Maximum Output Current: 60 amps @ 40°C with adjustable current limit
3. PV Open Circuit Voltage (VOC): 150 VDC absolute maximum coldest conditions / 145 VDC start-up and operating maximum
4. Power Consumption: less than 1 watt (Power Conversion Efficiency more than 96%)
5. Charge Algorithm: Five Stages: Bulk, Absorption, Float, Silent and Equalization (Full charge can be based on net charge current matched to battery amp-hours)
7. Voltage Regulation Set points: 10 to 60 VDC user adjustable with password protection
8. Equalization Charging: Programmable Voltage Setpoint and Duration - Automatic Termination when completed
9. Battery Temperature Compensation: Automatic adjusts charge voltage set points based on measured battery temperature (with a Remote Temperature Sensor) as 5.0 mV per C° per 2V battery cell the temperature sensor range -40 to +60°C

10. Voltage Step-Down Capability: Charging capability for a lower voltage battery from a higher voltage Solar Panel array (Max 150 VDC input)

11. Programmable Auxiliary Control Output: 12 VDC output signal for programming different control applications (Maximum of 0.2 amps DC)

12. Status Display: 3.1” (8 cm) backlit LCD screen - 4 lines with 80 alphanumeric characters total

13. Aux. Battery charge: 2 Amp typical, same charge voltage as primary battery

14. Load Control: 60 Amp maximum; ON @ =12.6VDC / OFF @ =11.5VDC

15. Communication: Input/Output ammeters 35.0A ±0.50%, capability for multiple panel controllers to set up and operate as a single machine, share a common battery temperature sensor.


17. DC System Monitoring: The controller charger shall be furnish and installed with a DC Power System monitoring device with following specification:
   - Battery Status Screen- Monitoring and Display the DC system current conditions. This screen shall show an easy to interpret “fuel gauge” style status bar, current state-of-charge and charging or discharging the batteries status. The Battery Status data shall be remotely display at Traffic management Center.
   - Power Status Screen-Monitor and Displaying the amount of power Solar Panel Power Supply System is currently producing and consuming as well as the amount of power going IN and OUT of your battery bank. This screen also displays your battery bank’s voltage and current state-of-charge, providing you with real-time production monitoring of DC sources, including the Solar Panels as well as consumption by loads. The Power Status data shall be remotely display at Traffic management Center.
   - Energy Status Screen-Monitor the cumulative energy the Solar Panel Power Supply System has produced and consumed as well as the total amount of energy that has gone to charging your batteries today. This screen also displays today’s lowest state-of-charge and allows you to see how your overall system production compares to system consumption. The Energy Status data shall be remotely display at Traffic management Center.
   - System Log Screen-Review historical energy production/consumption data for the most recent 128 days, including the minimum battery state-of-charge reached for each day. This screen can be used to watch power system production and consumption trends. The System Log data shall be remotely display at Traffic management Center.

18. Power Management Device: The controller charger shall be furnish and installed with a power management device for advanced controlling the Solar Panel Power System controllers. This device shall provide the communication interface Type RS-232 or Ethernet for remote access and control of the Solar Panel Power System controllers. The Power Management Device shall have a built-in clock and calendar function enables
timer based programming of the power system operation and allow the user to a time of
day/week operation scheduling. All the power management settings shall be stored in
permanent memory to eliminate the need to reprogram in the event of a system shutdown
or battery replacement. The Power Management Device shall have a RS232 port with
DB9 for the communication interface or Ethernet 10 Base T communication interface.
The Power Management Device shall be equipped with necessary communication
interface hardware, a communication hub, for connection to the Solar Panel Power
System devices such as Controller, DC System Monitoring and inverter. The cost of this
communication hub should be included in the Solar Panel Power System. The
communication hub shall have minimum four ports for interfacing to different Solar
Panel Power System devices.

19. All necessary hardware for remote monitoring of the Controller Charger including, DC
system monitoring device, Battery Temperature and Ethernet Network Interface.
20. Remote Data Log Monitoring: Last 128 days of Operation - Amp Hours, Watt Hours,
Time in Float , Peak Watts, Amps, Solar Array Voltage, Max Battery Voltage Min
Battery Voltage and Absorb for each day along with total Accumulated Amp Hours, and
kW Hours of production, Remote Temperature Sensor monitoring data,
21. Environmental: -40 to 60°C, 10 to 90% RH non-condensing.
22. Controller Maximum Dimension: 380 mm (H), 160 mm (W), 150 mm (D)
23. The Battery Charger/ Solar Panel Controller shall be compatible and interpretable with
System monitoring Software shall be paid under Item: 683.50030208- Solar Panel Power
System.

The Contractor shall submit a cabinet layout of each type of cabinet specified for review by the
Engineer. Only cabinets with approved layouts will be accepted under this Contract.

CONSTRUCTION DETAILS

The Modify Existing Solar Power Supply System shall be installed as shown on the plans. The
batteries and associated equipment shall be installed in the existing cabinet and interconnected to
provide the required voltage to the field controller cabinet. All proposed power cables and
modifications to existing power cables shall be as shown in the contract documents, and shall be
completed using a sufficient length of cable that shall reach the equipment with one meter of
slack. The Modify Solar Power Supply System configuration and setup shall be set to assure
connection and electric power delivery to the field equipment as indicated in the plan.

Prior to cabinet and system modifications, the Contractor shall submit an approved cabinet
wiring schematic for each cabinet specified to the Engineer. The schematic shall depict the
wiring required for the equipment complement of that specific cabinet. No cabinet shall be
installed without an Engineer approved schematic.

All components supplied under this specification shall be warranted in accordance with Section
Each field cabinet modified shall be supplied with three (3) copies of the Final Cabinet Wiring Diagram. One (1) copy shall be placed in a clear plastic envelope and left in the cabinet. Two (2) copies shall be delivered to the Engineer.

**METHOD OF MEASUREMENT**
Each Modify Existing Solar Power Supply System will be measured as the number of complete units furnished, installed and tested.

**BASIS OF PAYMENT**
The unit price bid for each Modify Existing Solar Power Supply System shall include the cost of furnishing all labor, materials, tools, equipment and incidentals as necessary to complete the work.

Progress payments will be made as follows:

- Approval of Shop Drawings - 20%
- Assembly and Delivery to the Job Site - 30%
- System Type C Operational Test - 20%
- System Acceptance Test - 20%
- Project Closeout - 10%