ITEM 683.0310008 - SOLAR POWERED ASSEMBLY FOR CCTV

DESCRIPTION:

This work shall consist of furnishing and installing Solar Powered assembly for CCTV in accordance with the contract documents and as directed by the Engineer.

Under this item, the Contractor shall furnish and install a complete photovoltaic (PV) solar powered unit for CCTV site as shown in the contract documents. Each solar powered unit shall consist of solar photovoltaic panels, solar panel mounting hardware, solar charger/regulator, inverter, 12V gel batteries, ground mounted battery / equipment cabinet and wiring/conduit necessary to make a functional unit. A built in AC to DC battery charger system with minimum 100 A rated shall be included in the system to charge during insufficient solar power. Additional items necessary to complete the work such as poles, pole mounted frame and foundations shall be paid for under separate contract items.

MATERIALS:

General

The solar powered assembly shall power a NYSDOT CCTV assembly and wireless CDMA communication unit twenty-four (24) hours a day, seven (7) days a week. The total power load not to exceed 100 watt. The solar array shall consist of four to five solar panels, each separately mounted and equally spaced onto a fifty (50) foot camera pole as shown on the plans. 12-volt batteries assembled in a series-parallel array will power the 24 volt camera assembly and shall have a minimum of five (5) day back-up energy supply. An external solar charger/regulator controller shall be provided to regulate and monitor the charge between the solar panel and the solar battery. An inverter to convert the stored power from DC to AC to power the CCTV assembly. A NEMA 3R ground mounted cabinet will house the battery and electrical equipment.

The camera pole shall be designed for the camera assembly, pole mounted camera cabinet and solar panel loads meeting the requirements of Section 724-03 Traffic Signal Poles of the Standard Specifications and paid for under a separate contract item.

Foundations for the camera pole and cabinets bases shall meet the requirements of Section 723-45 Precast Reinforced Concrete Pullboxes and paid for under a separate contract item.

Solar Panels:

Each solar panel shall be a high-performance outdoor commercial solar panel with a minimum output power rating of 130W. The solar system shall have a nominal operating voltage of 12V or 24V, and output match the camera system power needs. The PV panel shall be UV stabilized, able to withstand high wind loads and snow loads. The panels shall be capable of being installed in a side-by-side configuration, offset vertically on the structure, or as shown on the documents to fit field limitations.

Solar Panel Frame and Mounting:

The entire solar panel support assembly consisting of a solar panel frame and solar panel mounting hardware shall be rated for the combined weight of the solar panels, extend the panel from the pole at an adjustable tilt from 45° to 65° degrees angle and also allow for 30° rotation as shown in the plans. It shall meet the latest ASSHTO highway sign and pole criteria. The solar panel frame and mounting hardware shall be constructed of galvanized steel unless otherwise called for in the plans.
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All brackets, pipe, and hardware shall be rated for outdoor environments that are subjected to salt spray. The assembly and all necessary hardware shall be mounted at locations as shown on the contract documents. When mounted on (tapered) poles the bracket shall accommodate the pole diameter at the mounting height. Each location and diameter pole should be inspected to ensure the correct pole mount is used. Solar panel mounting hardware shall be paid for under this item. The solar panel frame shall be paid for under item 564.51001 structural steel as shown on the plans.

Solar Charger/Regulator:

An external solar charger/regulator controller shall be provided to regulate and monitor the charge between the solar panel and the solar battery. The controller shall have visual indicators which show the current state of the battery and shall allow for charging/recovery of a dead battery. The charger shall be rated 120 VAC to 12/24 VDC @ 100 A for 12 VDC system and 60 A for 24 VDC system. The charger must have float option to prevent over charging of the batteries.

In addition, the charger/regulator shall conform to the following requirements:

- Series design (not shunt);
- True 0 to 100% PWM duty cycle;
- 4-stage Charging: Bulk, Absorption, Float, Equalize;
- Fully encapsulated in epoxy potting;
- Marine rated terminals / anodized case including protective terminal cover;
- Temperature compensated charging;
- Sealed / Flooded battery select;
- Temperature rating of –40°F to +140°F;
- Epoxy encapsulation for protection against humidity and dust ingress.

Inverter:

The inverter shall be provided to supply the solar power from the battery array to the camera assembly and up to 300% of the camera load. The Power Inverter converts the low voltage 24VDC to 120 volts AC in a high efficient manner. Power Inverters shall run on 12 volt or 24 volt battery bank configurations. The inverter shall produce a pure sine wave, run practically any type of AC equipment, is computer controlled and will automatically turn on and off as AC loads ask for service.

Batteries:

The batteries shall be sized to power the camera assembly for a minimum of five (5) days of twenty-four (24) continuous hours of use. The batteries shall have an additional 20% excess storage capacity beyond the five (5) day requirement. Reduced battery capacity due to environmental temperature effects shall not exceed 20%. The batteries shall be self-contained gel type or AGM deep cycle, type rated for solar applications and tolerable for extended low temperature operation with forged terminals, maintenance free and provide power at 12 VDC. The batteries shall be installed in a series / parallel configuration for 12 or 24 volt service as needed. The solar panel and batteries shall be provided with similar operating voltages maximizing the panel capacity to charge the batteries. The camera assembly and batteries shall be provided with
similar operating voltages.
The batteries shall be housed with the controller in the ground mounted cabinet.
The solar batteries shall have a nominal voltage of 12V, wired to provide 24 volt to the camera and will have a minimum of 5 days of reserve capacity and conform to the following:

- A minimum 20 hour Amp-Hr (Ah) C/20 rating of 104Ah or better (per battery);
- Dimensions not to exceed 13”(L) x 8” (W) x 11”(H), nominally;
- Each battery not to exceed 80 lbs.

Under-Voltage Disconnect:
A DC under-voltage disconnect shall be install with the system to disconnect the load during under voltage condition. The under-voltage cut shall be at 11 VDC for 12 VDC system and 22.5 VDC for 24 VDC system.

Battery Equipment Cabinet:
Battery equipment Cabinets shall be installed at the locations shown by the contract documents. These NEMA 3R cabinets shall house batteries and solar control equipment. Each cabinet shall be provided complete with all internal components and all mounting hardware necessary to provide for the installation of batteries and solar control equipment. Interconnections and wiring between the batteries, solar control equipment and solar panels shall be included.

All cabinets shall be of welded sheet aluminum construction, 3/16 inch thickness 5052-H32 sheet aluminum. Cabinets shall be furnished with suitable vents and louvers properly designed to provide natural ventilation to the interior. Filters shall be provided on all louvers.

Cabinet wiring shall be provided for the equipment complement for a complete operational solar power electrical system. Wiring between the batteries, solar control equipment and solar panels shall be provided. The surge protectors shall be provided for all incoming and outgoing connections.

All doors shall be securely gasketed to prevent the entrance of dust and moisture. The main door of all cabinets shall include substantially the full area of the front of the cabinet. The door shall be provided with a catch to hold the door open at 135 degrees, plus or minus 25 degrees. The catch shall hold the door securely open until released. Doors shall be hinged on the right-hand side by means of three (3) butt hinges with ¼ inch (minimum) stainless steel hinge pins and shall be furnished with a 3 point positive locking door.

The lock for the door shall be of the self-locking heavy duty (5) five pin tumbler cylinder rim type. Locks shall be keyed identical to existing Region 8 ITS field cabinets or a Corbin #2 key.

Environmental Specifications:
The system shall be able to withstand and operate at temperature extremes of -40° F to +140° F. All exterior components such as conduit, junction boxes, wiring, etc. that are part of the complete solar assembly shall be made weatherproof, UV protected, and resistant to salt corrosion.

Electrical Standards:
All electrical components and wiring shall be approved to all current CSA and/or UL standards and shall be FCC certified to comply with all 47 CFR FCC Part 15 Subpart B Emission
requirements.

CONSTRUCTION DETAILS:

The Contractor shall submit to the Engineer for approval, prior to purchase, the complete solar power panel and battery array calculations and drawings for the equipment demonstrating the proposed solar powered assembly can power a load of 100 watts, twenty-four (24) hours a day, seven (7) days a week and have a minimum of five (5) days battery back-up energy supply.

The Contractor shall submit to the Engineer for approval complete shop drawings, detailed specifications, catalog cuts, parts lists, instruction sheets, and wiring diagrams for the equipment to be installed.

The Contractor shall, in accordance with the manufacturer’s recommendations, mount the solar assembly as shown in the contract documents. The Contractor will be required to install the solar panels, wiring, battery, and charger regulator at each site designated on the contract plans. All modifications necessary to a new or an existing cabinet to accept the equipment included in this specification shall be included in this bid item.

The Contractor shall submit design computations for the CCTV poles in the contract and include the solar panel load per the requirements of Section 724-03 TRAFFIC SIGNAL POLES. The design computations must be approved, stamped and signed by a professional engineer licensed in New York State. The Engineer shall have twenty (20) working days to review the design computations for one traffic signal pole, and an additional two (2) days for each additional signal pole.

The Contractor shall orient the solar array so that the maximum amount of energy is captured over the entire year. Documentation specifying the correct TILT angle and ORIENTATION (bearing) shall be given to the Engineer for inspection and verification prior to any installation. The Contractor shall also have the appropriate tools, such as a compass and protractor, to verify that the panels have been correctly installed per manufactures recommendation for a given location. Any natural vegetation such as trees, bushes, or brush that may block the solar array shall be cleared and paid for under other contract items. The installation shall comply with the NEC and have an approved method to safety de-energize any portion of the solar powered system for safe maintenance.

Testing Requirements

After installation of the equipment in the field and prior to integration of the equipment into the system, the Contractor shall perform an Operational Test in the field for each of the solar powered assemblies installed. The test shall demonstrate as a minimum the ability of the panels to store power to the batteries, power the camera from the solar array under normal operating conditions, and power the camera with rated load from just the batteries for a period of 5 days without under voltage disconnect in the field. Test the charger operation showing it works under rated load. Under-voltage test shall be done in the field.

If the Operational Test fails, the equipment shall be repaired and the test shall be rerun for that site. If a component has been modified as a result of a failure, that component shall be replaced in all like units and the test shall be rerun for each unit.
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Warranties and Guarantees
The Contractor shall provide warranties and guarantees to the State of New York Department of Transportation in accordance with Section 105-18 of the Standard Specifications.

Documentation:
The Contractor shall submit two (2) copies of the shop drawings and as-built wiring schematics to the Engineer once the installation is completed.

METHOD OF MEASUREMENT:
This work will be measured as the number of Solar Powered Assembly for CCTV satisfactorily furnished and installed.

BASIS OF PAYMENT:
The unit price bid shall include the cost of furnishing all labor, materials, and equipment necessary to satisfactorily complete the work including, but not limited to, solar panel(s), wiring, battery, charger/regulator, mounting brackets and hardware, and any wire necessary between solar panel, batteries and equipment cabinet.