

ATTACHMENT 6
ATLANTIC COUNTY UTILITIES AUTHORITY

Technical Specifications

1. System Design Specifications

1.1. Array Location and Layout

- 1.1.1. Array(s) shall be located in the designated area as shown on conceptual layout(s) in Attachment 6 of the RFP.
- 1.1.2. Array layout(s) shall account for obstructions, access to equipment, egress and OSHA safety perimeter clearances. Walking space shall be provided throughout the Solar PV array to facilitate installation, inspection and maintenance access to all modules.
- 1.1.3. Contractor shall perform a detailed shading assessment, which will be required to be included in their design package submittal.
- 1.1.4. Ground-mounted-array(s) shall be installed in such a way that site drainage is not affected.
- 1.1.5. Contractor shall furnish proposed array layout(s) to ACUA and or their representative for review and comment. The array layout(s) shall also show the size, number, location of all combiner boxes and DC disconnect switches if used. Proposed arrays using string inverters shall show the size, number and location of all inverters along with the location of AC recombiners if used. Once submitted ACUA and or their representative shall have ten (10) work/business days to review and comment.

1.2. System Design Criteria

- 1.2.1. System shall conform to all applicable building code standards including wind and seismic load requirements. Wind uplift resistance shall meet expected 3-second gusts as described in the latest version of the IBC, and be verified in writing, and signed and sealed by a Professional Engineer licensed in the state of New Jersey.
- 1.2.2. The Solar PV System will conform to all applicable Electrical codes and standards, as described in the NEC version in force in the state of New Jersey at the time of permitting, and signed and sealed by a Professional Engineer licensed in the state of New Jersey.
- 1.2.3. Engineered drawings for supporting steel work for the ground-mounted array shall be submitted prior to start of work. All drawings shall be signed and sealed by a Professional Engineer licensed in the state of New Jersey.
- 1.2.4. Soil-disturbance shall be kept to a minimum. Contractor shall not adversely affect soil drainage as a result of the installation.
- 1.2.5. The Solar PV system shall maintain the integrity and reliability of the facility's electrical system and the design of the Solar PV system shall ensure against harmonic distortion, fault protection and interconnect issues.

1.3. System Equipment Scope

- 1.3.1. System Equipment shall be supplied by Tier 1 manufactures and be suitable for the location and intended use. The system equipment shall include but is not limited to the below list:
 - a. Solar PV Panel/Modules
 - b. Solar PV Panel Support Equipment including posts, racking, and ballasting
 - c. Outdoor DC array combiner box/disconnection equipment

- d. DC Surge Arrestors
- e. DC Power Disconnecting Equipment
- f. AC power distribution panels
- g. AC and DC Raceways, Fittings, Support, and Wiring
- h. Grounding System
- i. Data Acquisition System (DAS)
- j. Inverters
- k. AC and/or DC fusing as required
- l. At each site, one 46" (or larger) LCD wall-mount flat screen display to display real-time system data

1.4. The Data Acquisition System

1.4.1. A web-based, real-time data acquisition system (DAS), DECK Monitoring or approved equal, that is capable of reporting 15-minute interval data shall be supplied for the installed Solar PV system.

1.4.2. DAS shall include the following items:

- a. Revenue grade (0.2% accuracy per ANSI C12.2008) AC kWh electric meter
- b. Web-enabled data logger
- c. Weather Station includes but is not limited to the following items:
 - 1. Anemometer
 - 2. Wind Vane
 - 3. Ambient Air Temperature measuring device
 - 4. Solar PV panel temperature measuring device
 - 5. Solar irradiance measure device (pyranometer)

1.4.3. Operating over standard HTTP and from behind network firewalls using either DHCP or static IP assignments, the DAS shall have the ability to collect data at a fifteen minute intervals, to communicate the collected data and to store the collected data until such time as the network allows the successful communication of the collected data. The DAS at no time shall lose collected data due to a communications failure.

1.4.4. DAS shall have configurable alerts with instantaneous notification via email and/or SMS text message as to network outages, device outages, or user defined system performance variances.

1.4.5. The DAS system shall record and maintain historical data for the life of the customer agreement.

1.4.6. The DAS shall provide a real-time, high-definition graphical display of the following updated at 15 minute intervals via the Internet. Each display shall include the current day, month, year and previous twelve months.

1.4.7. The DAS shall provide historical graphing and reporting of Solar PV system performance via the internet.

1.4.8. Contractor shall provide the required power connection(s) to the DAS enclosures and data ports at system devices for connection of the web based DAS to the internet.

1.4.9. The Contractor shall provide and install 46" (or larger) LCD wall-mount flat-screen display at each location as determined by ACUA. The display screen shall provide real-time system. Contractor shall furnish and install data cabling between the display and the monitoring device as well as AC power for the LCD screen.

1.5. Compliance with Codes and Standards

1.5.1. The Contractor and its sub-contractors shall be licensed in the State of New Jersey to design and install this type of construction project. The Contractor and its sub-contractors will be required to ensure that the System and all proposed components shall conform to all applicable codes and standards in force at the time of construction.

2. Permitting and Approvals

2.1. The Contractor will be responsible for obtaining, and maintaining in full force and effect, all required licenses, zoning, land use, electrical, environmental, soil erosion, storm runoff, drainage, and system construction and operation permits needed for this Project, including site plan approval if required. The Contractor shall provide ACUA and/or designated representatives with proof of such permits. All costs associated with obtaining and maintaining such permits are the responsibility of the Contractor, and must be included in the prices submitted in their proposal.

2.2. After the submission of drawings for permits, should the Authority Having Jurisdiction (AHJ) note discrepancies or perceived violations, Contractor shall schedule any necessary meetings for resolution of these issues. Contractor shall provide sufficient notice to ACUA so that they may be present during any meeting(s) to be held. ACUA reserves the right to provide input and/or comments regarding perceived violations or other discrepancies on drawings or specifications as noted by the AHJ.

3. Process Requirements

3.1. Project Management Process

3.1.1. Provide a list of subcontractors, their valid licenses and business permits, Certificate of Insurance naming ACUA and its representatives as additionally insured, and the work each sub-contractor shall perform.

3.1.2. Provide a statement of availability of key staff.

3.1.3. Provide three (3) sets and an electronic copy of the permit drawings along with “PV Watts”, “PVSyst” or similar industry accepted software results for estimated electric production, including the tilt, azimuth, and de-rate factor used in calculations prior to submission for construction permits for review and comment by ACUA and or its representatives. ACUA and or its representatives shall have ten (10) work/business days to review and comment on the submitted drawings. Once the ten (10) work/business days have passed without comment the Contractor shall consider ACUA and or its representatives have no comment on the permit drawings and may submit for construction permits.

3.1.4. Provide three (3) sets and an electronic copy of the construction drawings along with “PV Watts”, “PVSyst” or similar industry accepted software results for estimated electric production, including the tilt, azimuth, and de-rate factor used in calculations to ACUA and or its representatives at the preconstruction meeting.

3.1.5. Provide the name of the Project Manager for the project and ensure that such individual will maintain progress as required and attend all project meetings as mandated by ACUA. Contractor shall not change project manager during the course of the job without prior consultation with ACUA.

3.1.6. The Contractor shall be required to attend scheduled project meetings at intervals designated by ACUA. Such meetings shall review progress of work completed to date, projected work completion targets, status of project, inspection schedules and results, and other such project-related items as may be deemed important by ACUA.

3.2. Delivery, Storage, and Handling of Materials

3.2.1. Deliver Solar PV modules 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. Remove protection only after equipment is safe from such hazards.

3.2.2. Cranes shall be in compliance with all local codes and requirements.

3.2.3. Solar PV modules shall be free of dirt and construction debris prior to system start up procedures.

3.2.4. The Contractor, or its authorized representative, shall be on the site whenever materials are delivered. Neither ACUA nor its representatives shall be responsible for receiving or storing materials delivered to the Project. ACUA and/or its representatives shall have the right to refuse such deliveries to the site.

3.2.5. The Contractor shall be solely responsible for security of its equipment, tools, and materials on the site. The Contractor shall take all necessary and reasonable precautions to ensure that all materials, tools, and equipment are secure and not subject to theft, damage, or vandalism. Neither ACUA nor its representatives shall be responsible for loss or damage of contractor's tools, equipment, and materials while on site.

3.3. Construction Process

3.3.1. System Installation shall conform to Manufacturers Installation Manual, approved project drawings and specifications.

3.3.2. Installing contractor and subcontractors shall receive manufacturer authorized training prior to commencing operations, and provide proof of such authorized training prior to commencing operations. The Contractor shall ensure installing subcontractors are familiar with manufacturer's installation guidelines.

3.3.3. All national and local electric and building code requirements shall be met, as well as all requirements of the New Jersey Clean Energy Program (NJCEP) and the interconnection agreement with the local electrical distribution company.

3.3.4. AC output interconnection point(s) shall meet with approval of the local utility company and shall comply with all applicable sections of NEC Articles 690 and 705 for either line or load-side connections. Signage shall be applied in accordance with NEC Articles 690 and 705 and the local utilities Interconnect Agreement, as well as the local Authority Having Jurisdiction.

3.3.5. All required over-current protection devices shall be included in the system and accessible for maintenance.

3.3.6. All mounting equipment shall be installed to the manufacturer's specifications.

3.3.7. Installation should be organized and neat. Module connections and wiring should be neatly prepared and shall be readily accessible to qualified personnel.

3.3.8. All cables, conduit, exposed conductors, and electrical boxes shall be secured and supported according to code requirements.

3.3.9. System switching and metering equipment shall be readily accessible to qualified personnel for resetting or repair following electrical outages, and regular monitoring for data retrieval.

3.3.10. Interruption of electrical power to the facility for Solar PV system interconnection shall be kept to a minimum and shall be scheduled in advance at a time that will minimize impacts on the occupants, permitted times may be restricted to off-hours or night time only. Additional costs for utility company overtime or for local inspection shall be the sole responsibility of the Contractor.

3.3.11. Sites shall be maintained and kept secure, free of excessive debris and in safe condition during the construction period. Site should be left “broom clean” after work is complete at the end of each work day.

3.3.12. Soil-disturbance shall be kept to a minimum

3.4. System Commissioning and Acceptance

3.4.1. Commissioning Plan shall include checklists and verifications in the following Project Phases: Design, Installation, Operation (Function and Performance Checks), and Turn-Over.

3.4.2. All System Commissioning and Acceptance testing measurements shall be taken with calibrated equipment. Serial numbers and calibration expiration dates of the measurement equipment shall be recorded and provided as part of the report(s).

3.4.3. System inspection and safety checks: Contractor shall run through a checklist of startup requirements based on manufacturers’ standards and recommendations, and conduct a series of safety tests to ensure proper installation, safe operation and specified performance

3.4.4. String voltage and current readings.

a Measurements will be recorded and provided to ACUA in a clear, tabular format. Each voltage measurement will include the following ancillary data: the date; the time of day that the measurement was taken; the ambient temperature at the time; and the solar irradiation at the time. The strings that make up each sub-array will be clearly identified on a drawing by number.

b Voltages will be recorded for each string, each sub-array, and the entire array using calibrated instrumentation.

c After inverter startup, current shall be recorded for each string, each sub-array, and the entire array.

3.4.5. All inverter startup tests as specified by the inverter manufacturer in the inverter operation and/or commissioning manual and conducted by a factory-authorized technician.

3.4.6. System Performance Testing

a Contractor shall conduct a two hour performance test of each array to verify that rated performance is met.

b The test must be conducted between on a clear sunny day during peak sun irradiance periods (between 11 am and 1 pm). Test readings shall be manually recorded, including:

1. Sun irradiance (5 minute intervals)
2. Ambient air temperature (5 minute intervals)
3. Wind speed (5 minute intervals)
4. System kW AC output (5 minute interval)
5. Array DC voltage, current and power (5 minute intervals)
6. String currents (once over the two hour test)
7. Solar module surface temperature (minimum 4 locations – 5 minute intervals)
8. Inverter information (15 minute intervals)

c. From the data, the following shall be calculated:

1. kW (dc) output, corrected to PTC
2. System AC output, corrected to PTC
3. Inverter tested efficiency

3.4.7. If it is found, following the test procedures, that the system currently does not meet the stated performance requirements, contractor shall undertake (at its own expense) the necessary corrective actions to meet the stated performance requirements. Repeat performance testing

shall be required following these corrective measures. Repeat testing shall be verified and observed by ACUA.

3.4.8. Written documentation detailing the commissioning test results shall be provided to ACUA.

3.5. Project Close-Out

3.5.1. Contractor shall be required to restore ground areas in and around the arrays and shall be responsible for final grading, raking, and seeding of all areas following installation of the arrays.

3.5.2. Contractor shall be responsible for any necessary re-paving of disturbed areas necessitated by trenching for conduits.

3.5.3. Provide evidence of total kW (dc) installed

3.5.4. Provide anticipated and guaranteed annual kWh (ac) production for the built system

3.5.5. Provide as built "PV Watts, PVSyst" or similar industry accepted software estimated and guaranteed electric production results, including the tilt, azimuth, and de-rate factor used in calculations.

3.5.6. Provide supporting calculations for the following :

a Structural and wind load calculations sealed by a NJ licensed professional engineer for the Solar PV system

b Shading analysis

c DC, AC wiring and conduit sizing calculations for all electrical sub-systems including grounding

3.5.7. Provide evidence that an assessment was performed by an NJ licensed professional engineer of the Solar PV System and interconnections as well as the facilities existing electrical distribution system, to ensure that the Solar PV system may be interconnected safely and in a code compliant manner and meets the requirements of the local utility company.

3.5.8. Provide evidence that all Solar PV system components are approved for interconnection to the utility system

3.5.9. Conduct an onsite training class including a minimum two hours of instruction. Training must be provided by factory-authorized representatives of the System Equipment. Such training shall also include the local fire department and other interested first responders. Provide two (2) hard copies and one electronic copy in PDF format on a DVD, CD or thumb drive of the training manual for operation and maintenance of the Solar PV System. Such O&M manuals shall be subject to review and approval by interested parties.

4. Documentation Requirements

4.1. Engineering Design Package for each location

4.1.1. Provide a site layout indicating the location of all Solar PV system components

4.1.2. Solar PV array layouts shall account for obstructions, access to equipment, egress, and OSHA safety perimeter clearances.

4.1.3. PV array layouts shall include walking space throughout the Solar PV array to facility installation, inspection, and maintenance access to all modules.

4.1.4. Solar PV arrays and walking spaces shall be installed and designed so as not to impede the natural water flow and soil drainage

4.1.5. Array layouts shall show the size, number, and location of all combiner boxes and DC disconnect switches

- 4.1.6. Provide drawings with the proposed staging area for project equipment delivery and placement, traffic management plans, any other site disturbances that may arise from the installation of the Solar PV system
- 4.1.7. Engineering drawings for supporting steel work for the ground-mounted array shall be submitted prior to start of work
- 4.1.8. Provide two (2) hard sets and one (1) set in DWG and PDF file format on a DVD, CD, or thumb drive of revised “as-built” drawings for all sites within 30 days of completion

4.2. Final drawing submittals for each location shall be in accordance with the information below:

- 4.2.1. Product Data – Include data on features, components, ratings, and performance, which shall include but not limited to a dimensioned outline plan and elevation drawings of Solar PV arrays and other specified components, the physical and electrical characteristics of the individual solar panels, including manufacture and model numbers
- 4.2.2. Shop Drawings – Indicate fabrication details, installation details, dimensions, weight loads (including wind), required clearances, means and methods of field assembly, components, and location and size of each field connection
- 4.2.3. Field Test and Observation Reports – Indicate and interpret test results and inspection records relative to compliance with performance requirements
- 4.2.4. Factory Test Reports – Provide evidence of compliance with specified requirements to ACUA
- 4.2.5. Maintenance Data – Provide maintenance data to include in O&M Manuals and provide detailed operating instructions for all installed components
- 4.2.6. Final drawings and specifications shall be issued within ten (10) work/business days of the receipt of comments

4.3. O&M Manuals

- 4.3.1. For each location, prepare three (3) copies of operating and maintenance manuals in hard cover binders and one electronic copy in PDF format on a DVD, CD or thumb drive and deliver to ACUA. As a minimum the binders and electronic copy shall include:
 - a System narrative description of operation
 - b Proof of inspections and results
 - c Permission to Operate certificate from utility
 - d A complete set of all approved submittals including shop drawings and product literature.
 - e Manufacturer’s O&M data for each component
 - f Sealed As Built Drawings, including but not limited to, one-line diagrams, elevation drawings showing the final placement of the electrical equipment.
 - g Cleaning instructions for the Solar PV panels.
 - h Copies of all start-up procedure measurements.
 - i Copies of all testing data and reports.
 - j Troubleshooting Guidelines.
 - k System maintenance schedule and procedures.
 - l Contact information for technical assistance and parts ordering.
 - m Contact information for warranty issues
 - n Emergency response plan

4.4. Commissioning Plan

4.4.1. Provide a commissioning report and written logs of items that have been identified and resolved the commissioning process

4.5. Safety Plan

4.5.1. Provide a site specific Hazard Analysis and Safety Plan

4.6. Schedule

4.6.1. Develop and provide an implementation schedule including milestones such as final design, permitting, material delivery, inspections, etc.

5. Lifecycle Support

5.1. Operations Requirements

5.1.1. The PPA agreement will include Operations, Maintenance, and Support Services during the term of the agreement. These services must include but are not limited to:

a Monitoring of automatic alerts

b Report irregularities detected by the monitoring system within 24 hours, via email to the ACUA's representative

c Grass cutting inside the array area must be consistent with the ACUA Closure/Post-Closure Plan and the Bird Control Plan for the landfill

d For any site visit a comprehensive report detailing the systems performance, maintenance performed and recommendations shall be provided

5.2. Maintenance Requirements

5.2.1. At least once per year a full system re-commissioning with visual and mechanical inspections of Solar PV System components, field verification of information readings from the DAS and performance of all manufacturer recommended preventative maintenance and summarized in a report. All measurements taken during the re-commissioning shall be taken with calibrated equipment. Serial numbers and calibration expiration dates of the measurement equipment shall be recorded and provided as part of the report(s).

a. Record general site conditions

b. Inspection of all sensors and meters, including environmental instruments

c. Random checks of racking systems mechanical connections, correct as necessary

d. Random checks of electrical connections, correct as necessary

e. Visual inspection of all solar panels for damage, dirt or dust accumulation

f. Inspect and clean interior of all combiner boxes

g. Scan combiner wire terminals with infrared scanner, Re-torque where necessary

h. Perform and record for all combiner boxes:

1. Ambient temperature, time and irradiance at time of measurement

2. Output current

i. Perform and record for all strings:

1. Ambient temperature, time and irradiance at time of measurement

2. Voc

3. Vmp

- 4. Imp
- 5. IV curve tracing
- j. Annual production report of actual kWh vs. anticipated kWh

5.3. Warranties

5.3.1. The methods for implementing the Terms and Conditions of the warranty must be clearly established, and handled by the Contractor throughout the term of the warranty period. The Contractor must provide warranties on both the completed System and the individual components:

- a Special warranties specified in this Article shall not deprive ACUA of other rights it may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties and/or guarantees made by Contractor under requirements of the Contract Documents.
- b The entire system shall be warranted by the Contractor for a minimum period of five (5) years. Separate Manufacturer warranties will be passed through to ACUA.
- c Solar PV modules shall have a one-year workmanship warranty that guarantees full module replacement as a result of defective workmanship. Modules shall have, as a minimum, a power warranty that guarantees power output to be within 10% of original output during the first 10 years of operation and 20% of original output during years 11 through 25 of operation.
- d Mounting System – Manufacturer shall warrant the mounting system and all associated components thereof to be free from defects in material and workmanship for a period of five (5) years.
- e Inverters - Manufacturer shall warrant the inverter and its components to be free from defects in material and workmanship for a period of five (5) years. Proposer's proposal shall include pricing for optional extended warranties.