Regional Renewable Energy Procurement
REQUEST FOR PROPOSALS

Exhibit D.1: Solar PV Specifications and Requirements

September 18, 2013

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THROUGHOUT THIS DOCUMENT THE TERMS DESIGN-BUILDER SHALL MEAN SELLER UNDER A PPA FINANCING, AND PURCHASER-OWNER SHALL MEAN BUYER.

1. SITE ACCESS

Design-Builder shall conform to all Purchaser-Owner rules and requirements for accessing sites. Road usage, road closures, number of vehicles, access points, etc., may be regulated by the Purchaser-Owner. Site visits shall be approved and proper check-in requirements must be followed. Design-Builder shall provide signage and/or electronic notification of possible operational impacts upon request by Purchaser-Owner. Unless otherwise determined by Purchaser-Owner, Design-Builder shall be responsible for providing bathroom and storage facilities for all workers on-site, and shall be responsible for procuring, installing, securing, and removing temporary security fencing and scaffolding.

2. PROJECT MANAGEMENT

2.1 PROJECT MANAGER

Design-Builder shall assign a Project Manager from their firm upon execution of any Agreement awarded as a result of this RFP and upon receipt of Notice to Proceed. The Project Manager shall manage all design, procurement, construction, and commissioning phases of the Project. The construction of PV systems shall be accomplished by Design-Builder with an on-site construction management team. The Project Manager shall ensure that all contract, schedule, and reporting requirements of the Project are met and shall be the primary point of contact for the Purchaser-Owner.

2.2 PROJECT SCHEDULE

A Project Schedule is to be prepared and submitted to the Purchaser-Owner within fourteen (14) days of Agreement execution. The Purchaser-Owner will review and approve the Project Schedule prior to the initiation of work. Updates shall be submitted every other week, though the Purchaser-Owner may allow less frequent updates at their discretion. The submittal shall be a Critical Path Method (CPM) schedule describing all Project activities, dependencies, and sequencing of tasks. In particular, Design-Builder shall include Purchaser-Owner review of submittals on the Critical Path. The Project Schedule shall describe all elements of project design, equipment procurement, construction and commissioning, and shall be submitted in electronic format (MS Project, Primavera P6). Adobe Acrobat is not acceptable. The schedule shall also reflect the requirement that construction activities must be coordinated to minimize impacts on normal operations at each site, including ongoing construction activities.

Sufficient information shall be shown on the Project Schedule to enable proper control and monitoring of the Work. The Project Schedule shall show the intended time for starting and completing each activity; the duration of each activity; submittal and approval times; design; delivery of materials, equipment and software; all testing; and other significant items related to the progress of the Work. The Project Schedule shall include a CPM network diagram of sufficient detail to show how Mandatory Milestones are intended to be met. If a schedule submitted by Design-Builder includes changes affecting the achievement of Mandatory Milestones, Design-Builder should clearly identify and justify those changes.

Design-Builder is encouraged to phase the Work in a way that supports efficient and effective delivery of design and build services. The following Mandatory Milestones shall be reflected in the schedule and where applicable, represents the dates upon which each milestone is to be achieved for all sites in the Agreement.

Mandatory Milestones

Mandatory Milestone	Date
50% Schematic Design submittal	TBD
90% Design Development submittal	TBD
100% Construction Documents submittal for permitting	TBD
Approved Construction Documents – All Agency Sites	TBD
Notice to Proceed	TBD
Mobilization – All Agency Sites	TBD
Substantial Completion – All Agency Sites	TBD
Final Completion – All Agency Sites	TBD

2.3 SUBMITTALS

Design-Builder shall provide the following submittals as part of the performance of the Work. The cost of developing and providing submittals shall be included in the Project price.

Agreement Submittals

Submittal	Submittal Date	Exhibit D.1 Section
I. System Design		**TBD**
a. System Design Documentation	At each design milestone	TBD
b. Warranties	At Construction Documents milestone	TBD
c. Testing Plan	At Construction Documents milestone	TBD
d. Training Plan	At Construction Documents milestone	TBD
e. Power production modeling	At Construction Documents milestone	TBD
II. Procurements and Construction		**TBD**
a. Quality Assurance / Quality Control (QA/QC) Plan	30 days before commencement of construction	TBD
b. Safety Plan	30 days before commencement of construction	TBD
c. As-built Documentation	After completion of Proving Period	TBD
III. Testing		**TBD**
a. Acceptance Test Results	After Acceptance Test	TBD
b. Startup Test Results	After Startup Test	TBD
c. Monitoring Data (Proving Period)	Continually throughout Proving Period	TBD
d. Proving Period Report	30 days after System Startup	TBD
IV. Training		**TBD**
a. Training Materials	30 days before Training Session	TBD
b. Monitoring Manual	30 days before Training Session	TBD
c. Operations & Maintenance Manual	30 days before Training Session	TBD

2.4 SOLAR INCENTIVES

Design-Builder shall submit applications for all available energy production incentives (e.g., CSI, SGIP, etc.) or, should the Purchaser-Owner already have submitted such applications, assume responsibility for all future requirements (agreements, submittals, etc.) related to these programs. This includes actions necessary to ensure compliance with the PG&E's net metering program and all

interconnection agreements and related documents for Purchaser-Owner participation and utilization of the benefits of each applicable program. Design-Builder shall attend all site verification visits conducted by the applicable public utility or Governmental Authority and shall assist the Purchaser-Owner in satisfying the requirements of the incentive program. Design-Builder shall be responsible for providing updated documentation to incentive program administrators throughout the project, as required by rules of the relevant incentive programs. Incentives shall be paid to the Purchaser-Owner if the system is to be purchased and to the Design-Builder should the system be owned by a third-party.

2.5 INTERCONNECTION APPLICATIONS

Design-Builder shall be responsible for preparing, submitting, and procuring interconnection application to appropriate utility and department. Design-Builder shall accept responsibility for payment for utility interconnection studies and/or project management that are not anticipated but may be required. All anticipated utility work (e.g. transformer installation, meter addition) shall be the responsibility of the Design-Builder. Sites on secondary networks or that feature more than 1 MW of renewable energy generating capacity are likely to require protective relays or other additional interconnection studies and equipment. Such work shall be the responsibility of the Design-Builder. At project completion, Design-Builder shall confirm Permission To Operate with the utility, and shall verify most financially-beneficial rate schedule and billing.

3. SYSTEM DESIGN

3.1 DESIGN REVIEW PROCESS/ PHASES

The Purchaser-Owner will review and approve design documentation based on the requirements in this RFP and as detailed in Section 3.3 of this document. Additional documents may be requested by the Purchaser-Owner as needed. The precise organization and format of the design submittals shall be agreed upon by Design-Builder and the Purchaser-Owner prior to the first design submission. The Purchaser-Owner will review all submittals, provide written comments, and conduct Design Review Meetings for each stage of the process. Design-Builder shall provide additional detail, as required, at each successive stage of the Design Review. Design-Builder shall not order equipment and materials until Schematic Design submittals have been approved. Design-Builder shall not begin construction until Construction Documents have been approved and all required permits have been obtained. The Purchaser-Owner will formally approve, in writing, each phase of the design and is the sole arbiter of whether each phase of the design has been completed. The Design-Builder shall not enter a subsequent design phase without the approval of the Purchaser-Owner.

Design-Builder shall be held solely responsible for obtaining approvals from the Purchaser-Owner, including revising designs as necessary until they are given approval by the Purchaser-Owner and all other required entities and organizations. A description of requirements for each design phase is provided below. System design shall comply with all applicable laws, statutes, ordinances, codes, rules, and regulations for construction projects of jurisdictions with authority over the Purchaser-Owner. Design-Builder is responsible for providing designs approved by the appropriate professional engineers registered in the State of California. Costs for engineering reviews and approvals shall be borne by the Design-Builder. System designs must take into account Purchaser-Owner aesthetic issues and not conflict with any current Purchaser-Owner operations.

3.1.1 Schematic Design

Design-Builder shall prepare Schematic Design documents consisting of drawings and other documents illustrating the scale and relationship of Project components, including but not limited to, schematic design studies, site utilization plans, PV array layouts and design information, a shading

analysis, electrical single-line diagrams, wiring and conduit schedule, equipment lists and bills of material, and equipment cut sheets or specifications.

3.1.2 Design Development

Design Development documents shall consist of elevations, cross sections, and other drawings and documents necessary to depict the design of the Project. This submittal shall include architectural, structural, geotechnical, mechanical and electrical design documents and equipment specifications to illustrate the size, character, and quality of the Project and demonstrate that it meets the performance specifications defined in this RFP. The Design Development documents shall represent 100% of the intended scope for the Project.

3.1.3 Construction Documents

Design-Builder shall prepare Construction Documents (CDs) depicting the detailed construction requirements of the Project. CDs shall conform to all applicable governmental, regulatory, and code requirements, and all pertinent federal, state, and local permitting agencies. The CDs shall show the work to be done, as well as the materials, workmanship, finishes, and equipment required for the Project. CDs shall comply with and illustrate methods to achieve the performance specifications of this RFP. CDs shall be stamped by the engineer of record and any other required engineering disciplines.

3.2 DESIGN-BUILDERS' LICENSE CLASSIFICATION

In accordance with the provisions of California Public Contract Code §3300, the Purchaser-Owner requires that Respondents possess, at the time of submission of a Proposal, at the time of award of the Agreement and at all time during construction activities, a General Contractor License (B), Electrical Contractor License (C-10), or Solar Contractor License (C-46). It shall be acceptable for a Respondent that does not possess a C-10 or C-46 License to list a Subcontractor with a C-10 or C-46 License.

3.3 DESIGN SUBMITTALS

Design-Builder shall prepare a comprehensive submittal package for each phase of the Work that will be reviewed and approved by the Purchaser-Owner. At a minimum, each submittal package shall include the elements required to convey in sufficient detail the following for each phase of the design:

- Site Layout Drawings, with distances from roof edges and existing equipment, as applicable
- Construction Specifications (trenching, mounting, etc.)
- Equipment Layout Drawings
- Detailed Drawings
- Electrical Single-Line and Three-Line Diagrams
- Module Stringing Diagrams
- Electric Wire and Conduit Schedule
- Electrical Warning Labels & Placards Plans
- Lighting Plan (for carports)
- Network Connection Diagrams
- Architectural Drawings
- Structural/Mechanical Drawings including roof penetration details

- Geotechnical Drawings
- Manufacturer's Cut Sheets with Equipment Specifications
- Data Acquisition System (DAS) Specifications, Cut Sheets, and Data Specifications

Design-Builder shall include adequate time for Purchaser-Owner review and approval of submittals, as well as re-submittals and re-reviews. Minimum Purchaser-Owner review time shall be ten (10) days from the date of receipt of each submittal package during each phase of the Design Review.

3.4 PERMITS AND APPROVALS

Construction Documents must be reviewed and approved by all authorities having jurisdiction (AHJs) over the work, which may include, but are not limited to: the Purchaser-Owner, the City or County in which the work is being done, the utility, the Office of Statewide Health Planning and Development (OSHPD), and the California Solar Initiative Program Administrator. Design-Builder shall be responsible for obtaining all approvals and shall account for permitting requirements in their system designs, project pricing, and schedule. Design-Builder shall produce required documentation in sufficient detail to obtain all regulatory approvals requested for design, construction and operation of the system, including but not limited to all federal, state, and local permits. Design-Builder shall attend all site verification visits conducted by the applicable public utility or Governmental Authority and shall assist the Purchaser-Owner in satisfying the requirements of the incentive program. The Purchaser-Owner will not grant Design-Builder relief based on Design-Builder's incomplete or incorrect understanding of permitting and approval requirements.

3.5 TECHNICAL REQUIREMENTS

3.5.1 General Considerations

All documentation and components furnished by Design-Builder shall be developed, designed, and/or fabricated using high quality design, materials, and workmanship meeting the requirements of the Purchaser-Owner and all applicable industry codes and standards. Reference is made in these specifications to various standards under which the Work is to be performed or tested. The installations shall comply with at least, but not limited to, the latest approved versions of the International Building Code (IBC), National Electrical Code (NEC), Pacific Gas and Electric (PG&E) Interconnection Requirements, California Building Code (CBC) and all other federal, state, and local jurisdictions having authority.

3.5.2 Electrical Design Standards

The design, products, and installation shall comply with at least, but not limited to, the following electrical industry standards, wherever applicable:

- Electronic Industries Association (EIA) Standard 569
- Illumination Engineering Society of North America (IESNA) Lighting Standards
- Institute of Electrical and Electronics Engineers (IEEE) Standards
- National Electrical Manufacturers Association (NEMA)
- National Electric Code (NEC)
- Insulated Power Cable Engineers Association (IPCEA)
- Certified Ballast Manufacturers Association (CBMA)
- Underwriters Laboratories, Inc. (UL)

- National Fire Protection Association (NFPA)
- Pacific Gas and Electric Utility Requirements
- American National Standards Institute (ANSI)
- Occupational Health and Safety Administration (OSHA)
- American Disabilities Act (ADA)
- American Society for Testing and Materials (ASTM)
- National Electrical Contractors Association (NECA)
- National Electrical Testing Association (NETA)
- International Building Code (IBC)
- California Building Code (CBC)
- All other Authorities Having Jurisdiction

3.5.3 Modules

In addition to the above, the PV modules proposed by Design-Builder shall comply with at least, but not limited to, the following:

- IEEE 1262 "Recommended Practice for Qualifications of Photovoltaic Modules".
- System modules shall be UL1703 listed.
- Modules shall be new, undamaged, fully warranted without defect.
- Modules shall comply with the State of California SB1 Guidelines for Eligibility, listed at: http://www.gosolarcalifornia.org/equipment/pv_modules.php
- Modules shall have minimum maintenance requirements and high reliability, have a minimum 25-year design life, and be designed for normal, unattended operation.
- Acceptable mounting methods for unframed modules shall be provided by the manufacturer. Bolted and similar connections shall be non-corrosive and include locking devices designed to prevent twisting over the 25-year design life of the PV system.
- If PV modules using hazardous materials are to be provided, then the environmental impact of the hazardous material usage must be disclosed, including any special maintenance requirements and proper disposal/recycling of the modules at the end of their useful life.

3.5.4 Inverters

In addition to the above, inverters proposed by Design-Builder must comply with at least, but not limited to the following:

- Inverters shall be suitable for grid interconnection and shall be compliant with all PG&E interconnection requirements.
- Inverters shall comply with the State of California SB1 Guidelines for Eligibility, listed at: http://www.gosolarcalifornia.org/equipment/inverters.php
- IEEE 929-2000 – "Recommended Practice for Utility Interface of Photovoltaic Systems".
- Inverters must automatically reset and resume normal operation after a power limiting operation.
- The inverter shall be capable of continuous operation into a system with voltage variation of plus or minus 10% of nominal. The inverter shall operate in an ambient temperature range of -20°C to +50°C.

- Inverters shall include all necessary self-protective features and self-diagnostic features to protect the inverter from damage (in the event of component failure or from parameters beyond normal operating range due to internal or external causes). The self-protective features shall not allow the inverters to be operated in a manner which may be unsafe or damaging.
- Inverters shall be true sine wave high frequency PWM with galvanic isolation.
- Inverters shall be sized to provide maximum power point tracking for voltage and current range expected from PV array for temperatures and solar insolation conditions expected for Project conditions.
- Inverters shall be capable of adjusting to "sun splash" from all possible combinations of cloud fringe effects without interruption of electrical production.
- Isolation transformers shall be provided.
- Inverters shall be UL 1741 and IEEE 1547 compliant.
- Inverters shall have a THD < 5%.
- Enclosures shall be rated NEMA 3R when the inverter is located outdoors. For outdoor installations in corrosive environments, NEMA 4X series 300 stainless steel enclosures must be used.
- Power factor shall be 0.99 or higher.
- Inverter selection shall take into account anticipated noise levels produced and minimize interference with Purchaser-Owner activities.
- Inverters shall have a minimum efficiency, based on the device's power rating, of 96%.

3.5.5 Electrical Balance of System Components

- Each proposed PV system shall include, at a minimum, one (1) fused DC disconnect and one (1) fused AC disconnect for safety and maintenance concerns.
- String combiner boxes must include properly-sized fusing, and all metal equipment and components must be bonded and grounded as required by NEC.
- String combiner boxes shall be load-break, disconnecting types, such that opening the combiner boxes shall break the circuit between combiner box feeders and inverters.
- All system wiring and conduit must comply with NEC stipulations, and all indoor and outdoor wiring, outdoor-rated or otherwise, must be enclosed in EMT or RIGID conduit or covered raceway, except adjacent panel connections.
- All wiring materials and methods must adhere to industry-standard best practices, and all inter-module connections must require the use of a specialized tool for disconnecting.

3.5.6 Mounting Systems

The mounting systems shall be designed and installed such that the PV modules may be fixed or tracking with reliable components proven in similar projects, and shall be designed to resist dead load, live load, corrosion, UV degradation, wind loads, and seismic loads appropriate to the geographic area over the expected 25-year lifetime. The Design-Builder's design shall sufficiently respond to the design requirements imposed by Federal, State, and local jurisdictions in effect at the time of Agreement execution and any pending code decisions affecting the design shall be identified during Schematic Design. Design-Builder shall conduct an analysis, and submit evidence thereof, including calculations, of each structure affected by the performance of the scope described herein, and all attachments and amendments. The analysis shall demonstrate that existing structures are not

compromised or adversely impacted by the installation of PV, equipment, or other activity related to this scope. Mounting systems must also meet the following requirements at a minimum:

- All structural components, including array structures, shall be designed in a manner commensurate with attaining a minimum 25-year design life. Particular attention shall be given to the prevention of corrosion at the connections between dissimilar metals.
- Thermal loads caused by fluctuations of component and ambient temperatures shall be accounted for in the design and selection of mounting systems such that neither the mounting system nor the surface on which it is mounted shall degrade or be damaged over time.
- Each PV module mounting system must be certified by the module manufacturer as (1) an acceptable mounting system that shall not void the module warranty, and (2) that it conforms to the module manufacturer's mounting parameters.
- Final coating and paint colors shall be reviewed and approved by the Purchaser-Owner during Design Review.
- Painting or other coatings must not interfere with the grounding and bonding of the array.

3.5.7 Corrosion Control

In addition to the above, Corrosion Control proposed by Design-Builder must comply with at least, but not limited to the following requirements:

- Fasteners and hardware throughout system shall be stainless steel or material of equivalent corrosion resistance
- Racking components shall be anodized aluminum, hot-dipped galvanized steel, or material of equivalent corrosion resistance
- Unprotected steel not to be used in any components
- Each PV system and associated components must be designed and selected to withstand the environmental conditions of the site (e.g., temperatures, winds, rain, flooding, etc.) to which they will be exposed.

3.5.8 Roofing Requirements

The installation of PV modules, inverters and other equipment shall provide adequate room for access and maintenance of existing equipment on the building roofs. A minimum of three (3) feet of clearance will be provided between PV equipment and existing mechanical equipment and other equipment mounted on the roof. A minimum of four feet of clearance shall be provided between PV equipment and the edge of the roof. Clearance guidelines of the local fire marshal shall be followed. The installation of solar or thermal systems will be reviewed for code compliance and adherence to the *State Fire Marshal Solar Photovoltaic Installation Guideline*. The PV equipment shall not be installed in a way that obstructs air flow into or out of building systems or equipment.

Proposed roof top mounted systems may be ballasted, standing seam attachment, or penetrating systems and must meet or exceed the following requirements:

- Systems shall not exceed the ability of the existing structure to support the entire solar system and withstand increased wind uplift and seismic loads. The capability of the existing structure to support proposed solar systems shall be verified by Design-Builder prior to design approval.
- Roof penetrations, if part of the mounting solution, shall be kept to a minimum.
- Design-Builder shall perform all work so that existing roof warranties shall not be voided, reduced, or otherwise negatively impacted.

- No work shall compromise roof drainage, cause damming or standing water or cause excessive soil build-up.
- All materials and/or sealants must be chemically compatible.
- Thermal movement that causes scuffing to the roof must be mitigated as part of the mounting solution.
- All penetrations shall be waterproofed.
- Detail(s) for the sealing of any roof penetrations shall be approved in writing to the Purchaser-Owner, as well as the manufacturer of the existing roofing system, as part of system design review and approval – prior to Design-Builder proceeding with work. The Purchaser-Owner will make available the roofing manufacturer for each building for consultation with Design-Builder as part of the design process.
- All roofing penetrations and waterproofing shall be performed or overseen by a licensed roofing contractor who is certified by the roofing materials manufacturer for the specific materials or systems comprising each roof upon which a solar system will be installed. The roofing contractor shall also be safety prequalified by the Purchaser-Owner.
- As part of the design submittals, Design-Builder shall include signed certificates from the roofing manufacturer stating:
    - The roofing contractor is certified installer of Complete Roofing System.
    - The manufacturer's Technical Representative is qualified and authorized to approve project.
    - Project Plans and specs meet the requirements of the warranty of the Complete Roofing System for the specified period.
    - Existing warranty incorporates the new roofing work and flashing work.
- Any damage to roofing material during installation of solar systems must be remedied by Design-Builder.
- The installation of PV modules, inverters and other equipment on building roofs will be designed to minimize visibility of the equipment from the ground.

3.5.9 Shade Structure Requirements

Design-Builder will be responsible for incorporating the following elements in the design and construction of the System:

- Minimum height: all shade structures shall be designed to have a minimum clear height of ten (10) feet, unless specified in a Site's Specification Sheet to be taller to accommodate larger vehicles at the site.
- All shade structures shall be installed with a fascia surrounding the exposed edge of the structure's purlins.
- Shade structures located in parking lots shall have a concrete bollards installed on support posts. The bollards shall extend up to a minimum elevation of thirty-six (36) inches above finished grade. This requirement may be waived at the Purchaser-Owner's sole discretion.
- Shade structure columns, beams, and fascia shall be painted to match site colors or to a color of the Purchaser-Owner's approval.

3.5.10 Ancillary Equipment Enclosures

Design-Builder will be responsible for incorporating the following elements in the design and construction of the System:

- Fencing: all ancillary equipment be grouped to a single location per site and shall be surrounded by a fence to prevent access by unauthorized personnel. The fence shall be a six (6) foot high chain link fence with vinyl privacy slats. This requirement may be waived at the Purchaser-Owner's sole discretion.
- Location: all ancillary equipment shall be located in a manner that minimizes its impact to normal Purchaser-Owner operations and minimizes the visual impacts to the site.

3.5.11 Placards and Signage

- Placards and signs shall correspond with requirements in the National Electric Code and the interconnecting utility in terms of appearance, wording, and placement.

- Permanent labels shall be affixed to all electrical enclosures, with nomenclature matching that found in As-Built Electrical Documents.

3.5.12 Infrastructure for Ground Mount Systems

Design-Builder will be responsible for incorporating the following elements in the design and construction of the System:

- Fencing: the site shall be surrounded by a fence to prevent unauthorized personnel from gaining access the site. The fence shall be a eight (8) foot high chain link fence with vinyl privacy slats.
- Gates shall be installed to enable site access for trucks.
- A pathway a minimum of ten (10) feet wide passable by a maintenance truck shall be provided within the array fence to allow for access to all equipment enclosed within the fence area.
- Access to water for maintenance (module cleaning) purposes, as determined adequate by Design-Builder and approved by the Purchaser-Owner.
- Access to low voltage (120V) AC power to power maintenance equipment and miscellaneous equipment.
- Design-Builder shall install and ensure activation of sufficient security cameras on site to monitor array area, connected to the site's security system, in collaboration with the Purchaser-Owner.
- Design-Builder will be responsible for installing an acceptable surface cover material under and around the modules and throughout the site that provides appropriate weed control, erosion and dust management.
- Design-Builder will be responsible for creating an access road to any ground mount system for maintenance and fire access purposes. The access road shall be passable under all weather conditions.

3.5.13 Lightning and Surge Protection

- Design-Builder shall utilize lightning arrestors to protect appropriate equipment from lightning strikes.
- Design-Builder shall utilize surge suppressors to protect the appropriate equipment from electrical surges.

3.5.14 Short Circuit Coordination

- As part of their design submittals, Design-Builder shall identify overcurrent protective devices installed on the project (AC/DC fuses and AC/DC circuit breakers). Design submittals shall

include calculations and demonstrate that the devices installed as part of the PV project are coordinated with the rest of each site's distribution, preventing an unintentional outage due to an isolated PV system fault.

3.5.15 Wiring and Cabling Runs

- Design-Builder shall install all AC conductors in conduit.
- Direct burial wire will not be acceptable. Conduit buried underground shall be suitable for the application and compliant with all applicable codes. PVC shall be constructed of a virgin homopolymer PVC compound and be manufactured according to NEMA and UL specifications. All PVC conduit feeders shall contain a copper grounding conductor sized per NEC requirements and continuity shall be maintained throughout conduit runs and pullboxes. Minimum conduit size shall be ¾". A tracing/caution tape must be installed in the trench over all buried conduit.
- Conduit installed using horizontal directional boring (HDB), shall include tracer tape or traceable conduit. The minimum depth of the conduit shall be per NEC 2011 Article 300.5. The Design-Builder is responsible for demonstrating that all conduits installed utilizing horizontal boring meets the minimum depth requirement and is solely responsible for any remediation costs and schedule impacts if the specification is not met. The HDB contractor must provide documentation of final depth and routes of all conduit installed in horizontal bores.
- Conduit installed on building roofs shall not be installed near roof edges or parapets to reduce visibility. Any conduit penetrations through roof surfaces shall not be made within five (5) feet of the roof edge to reduce visibility. If conduit is installed on the exterior face of any building, it shall be painted to match the existing building color. In all cases, the visible impact of conduit runs shall be minimized and the design and placement of conduit shall be reviewed and approved by the Purchaser-Owner as part of Design Review.
- Electro-metallic tubing (EMT) shall be used in indoor, above grade locations and where conduit needs to be protected from damage. EMT shall not be installed underground, outdoors, or embedded in concrete. EMT shall be cold-rolled zinc coated steel and be manufactured to UL and ANSI standards. Fittings shall be watertight and malleable gripping ring compression type. Pressure cast material for nuts of compression ring type fittings and set-screw type connections are not acceptable.
- Unless specified otherwise by Purchaser-Owner, Galvanized Rigid Conduit (GRC) shall be used where exposed to weather or where subject to physical damage in exposed areas. GRC shall be continuous hot-dipped galvanized manufactured per UL and ANSI requirements. Rigid aluminum conduit is not acceptable. Conduit bodies for use with steel conduit, rigid or flexible, shall be manufactured per UL requirements and shall be cast metal with gasketed closures. Fittings for GRC conduit shall be malleable iron or forged steel with cadmium or zinc coating. Union couplings for joining rigid conduit at intermediate runs shall be of the same material as the conduit. Couplings shall be threaded concrete-tight to permit completing conduit runs when neither conduit can be turned and to permit breaking the conduit run at the union. Set screw connectors are not acceptable.
- All conduits, boxes, enclosures, etc. shall be secured per NEC 690 requirements.
- All conductors shall be insulated copper rated for 600V, minimum. DC conductors shall be PV Wire or USE-2 600V UL Listed Sunlight resistant wire.
- All items shall be U.L. listed and shall bear the U.L. label.
- All spare conduits shall be cleaned, mandrelled, and provided with a pullwire. Spare conduits shall be required for security cameras for ground mount systems.

- All feeders and branch circuits shall be sized to minimize voltage drop and losses and shall be in compliance with NEC requirements.
- Design-Builder shall furnish, install, and connect combiners and recombiners as necessary to complete the System. Enclosures for combiners and recombiners shall be NEMA 3Rrated or higher.
- All systems, conduit, boxes, components, etc. shall be grounded and bonded per NEC requirements and in accordance with Section 3.5.16.
- All exposed conduit runs over 100-feet in length or passing over building connection points shall have expansion joints to allow for thermal expansion and building shift.
- Design-Builder will be responsible for locating, identifying and protecting existing underground utilities conduits, piping, substructures, etc. and ensuring that no damage is inflicted upon existing infrastructure.
- Design Builder shall install and secure the exposed string cable homeruns along the beams or structure where the combiner box is installed.
- All exposed string wiring must be installed above the lower surface of the structural purlins and beams. Wire loops under framing members are not acceptable.
- Acceptable wire loss in DC circuits is < 1.5% and acceptable wire loss in AC circuits is < 1.5% as well.

3.5.16 Grounding and Bonding

- Module ground wiring splices shall be made with irreversible crimp connectors.
- All exposed ground wiring must be routed above the lower surface of any structural framing.
- For shade structure installations, grounding electrode conductors shall be bonded to structure columns either just below grade or below the top surface of concrete bollards.

3.5.17 System Security Requirements

- Design-Builder shall utilize tamper-resistant PV module to rack fasteners for all PV module mounting.

3.5.18 Shade Structure Lighting

- Installation of shade structure PV systems in all locations shall include the installation of new high efficiency lighting. Installation of shade structure PV systems shall include the removal of existing security light poles, foundations, and fixtures that are no longer effective.
- Lighting shall be LED lighting or other similar energy efficient lighting system.
- New parking lot fixtures shall be installed to provide parking lot illumination compliant with IESNA requirements or recommendations for illumination and safety.
- Minimum horizontal illuminance of one (1) foot-candle shall be maintained at ground level with a uniformity ratio (maximum to minimum) of 15:1.
- The new lighting is required to illuminate the entire parking area and adjacent pedestrian walkways affected by the removal of existing lights, not just the area under the PV modules.
- A photometric illumination plot must be submitted for each parking lot showing all existing lighting and proposed new SSS canopy lighting.
- Submit California Title 24 Outdoor Lighting calculations with all lighting drawings and show evidence of compliance.

Photocell controls shall be used in conjunction with a lighting control system for all exterior lighting and energize lighting when ambient lighting levels fall below two (2) foot-candles measured horizontally at ground level. Lighting shall also be required to operate manually without regards to photocell input. Replacement parking lot lighting shall be served from an existing parking lot lighting circuit and any existing circuits and existing control function shall be maintained, or if replaced, done so at the approval of the Purchaser-Owner.

3.5.19 Monitoring System, DAS, and Reporting

Design-Builder shall design, build, activate and ensure proper functioning of Data Acquisition Systems (DAS) that enable the Purchaser-Owner to track the performance of the PV Systems as well as environmental conditions through an online web-enabled graphical user interface and information displays. Design-Builder shall provide equipment to connect the DAS via Ethernet cable, existing Wi-Fi network or cellular data network at all locations. The means of data connection will be determined during design. The Purchaser-Owner will pay for the cost of cellular data service if needed, but not for the modem or other equipment needed to connect to the cellular network.

The DAS(s) shall provide access to at least the following data:

- Instantaneous AC system output (kW)
- PV System production (kWh) over pre-defined intervals that may be user configured
- AC and DC voltage
- In-plane irradiance
- Ambient and back-of-cell temperature (at least two (2) sensors for each, at different positions in the array)
- Inverter status flags and general system status information
- System availability
- Site Load information. Available load data for the meter the system is connected to shall be collected by the solar monitoring solution as part of the DAS.

Environmental data (temperatures and irradiance) shall be collected via an individual weather station installed for each site

Data collected by the DAS shall be presented in an online web interface, accessible from any computer through the Internet with appropriate security (e.g., password controlled access). The user interface shall allow visualization of the data at least in the following increments: 15 minutes, hour, day, week, month, and year. The interface shall access data recorded in a server that may be stored on-site or remotely with unfettered access by the Purchaser-Owner for the life of the Project. The online interface shall enable users to export all available data in Excel or ASCII comma-separated format for further analysis and data shall be downloadable in at least 15 minute intervals for daily, weekly, monthly and annual production. Historical data from the full lifetime of the PV system shall be available through the online interface.

The Monitoring system shall enable Purchaser-Owner staff to diagnose potential problems and perform remediating action. The monitoring system shall provide alerts when the system is not functioning within acceptable operating parameters. These parameters shall be defined during the design phase of the Project and specified in the DAS design document. At a minimum, Purchaser-Owner shall have the ability to compare irradiance to simultaneous power production measurements through linear regression analysis.

Additionally, Design-Builder shall make available, at no additional cost, the following reports for a term of five (5) years after Final Completion of the project:

- Monthly Production report shall be available online to the Purchaser-Owner personnel.
- System performance data shall be made available electronically to the Purchaser-Owner in a format and at a frequency to be determined during the Design Review process.
- Additional reports shall be made available to the Purchaser-Owner to assist the Purchaser-Owner in reconciling system output with utility bills and the production guarantee, as determined in the Design Review process.

A Monitoring Manual shall be provided to the Purchaser-Owner in printed or on-line form that describes how to use the monitoring system, including the export of data and the creation of custom reports.

3.5.20 FAA Requirements

Design-Builder shall be responsible to submit the appropriate FAA Form 7460-1, along with any other required forms and documentation, for all proposed PV systems within the approach or takeoff paths or on the property of airports as defined by the Code of Federal Regulations Title 14 Part 77.9.

3.5.21 Interconnection

Design-Builder is responsible for obtaining all necessary PG&E interconnection approvals for each PV system being installed. Design-Builder must comply with all interconnection requirements, such as CPUC Rule 21 for the PG&E service territory. Design-Builder is responsible for the proper planning and scheduling of interconnection approvals and any potential interconnection study. Systems installed as part of this project will take advantage of Net Energy Metering (NEM), unless specified otherwise by Purchaser-Owner or its agents. Design-Builder shall be responsible for ensuring the system design and interconnection qualifies for NEM, as applicable. Sites on secondary networks or that feature more than 1 MW of renewable energy generating capacity are likely to require protective relays or other additional interconnection studies and equipment. Such work shall be the responsibility of the Design-Builder.

3.5.22 Production Modeling

Production modeling of the PV systems shall be performed using PVSYST or equivalent modeling software using TMY3 weather data for the location closest to the site. The simulations shall accurately simulate energy production for proposed system layouts, sizes, and orientation. It is critical that PV production models are accurate with all methodology and assumptions described. The Purchaser-Owner will independently verify production models are accurate to the designed systems and utilize simulation results for economic evaluations. Design-Builder shall be responsible for updating the production models each time sufficient changes are made to the proposed system designs that will impact production.

3.5.23 Shading

Design-Builder shall adhere to the following requirements in order to avoid excessive shading on modules. For any object near an array that is higher than the lowest point of that array by height H, Design-Builder shall locate the array farther from the object than:

- 2H to the North of the object
- 2H to the East or West of the object

- 2H to any non-cardinal direction of the object

Any Design-Builder whose system design does not adhere to these rules shall perform a shading analysis justifying the basis for their design, including any proposed tree removal, and explaining why shading does not create an adverse performance and/or economic impact.

Any trees that are in the footprint of systems to be installed by the Design-Builder shall be removed by the Design-Builder at their expense, subject to the approval of the Purchaser-Owner. A tree shall be considered to be in the footprint of a system if its canopy would extend over any part of the system, including structural components or modules. The Purchaser-Owner will remove or prune, at its discretion, trees planted outside of the work area that shade PV systems (at present time or in the foreseeable future), provided the Design-Builder identifies these trees during the design process. The Design-Builder shall be responsible for any required tree remediation efforts resulting from tree removal that is deemed the Design-Builder's responsibility.

3.6 WARRANTIES

Design-Builder shall provide a comprehensive ten (10) year warranty on all system components against defects in materials and workmanship under normal application, installation, and use and service conditions.

Additionally, the following minimum warranties are required:

- PV Modules: The PV modules are to be warranted against degradation of power output of greater than 10% of the original minimum rated power in the first ten (10) years and greater than 20% in the first twenty (20) years of operation.
- Inverters: Inverters shall carry a minimum ten (10) year warranty (direct purchase price must include a twenty (20) year warranty).
- Meters: At minimum, meters shall have a one (1) year warranty. For meters integrated in inverters, the meter warranty period must match the inverter.
- Mounting system: twenty (20) year warranty, covering at least structural integrity and corrosion.
- Balance of system components: the remainder of system components shall carry manufacturer warranties conforming to industry standards.

All work performed by Design-Builder must not render void, violate, or otherwise jeopardize any preexisting Purchaser-Owner facility or building warranties or the warranties of system components.

4. PROCUREMENT/CONSTRUCTION

4.1 SCOPE OF SUPPLY

Design-Builder shall provide all necessary labor, materials, equipment, and services required to install complete integrated turnkey PV systems. Design-Builder shall supply all solar modules, mounting equipment, inverters, AC and DC disconnect switches, metering, related wiring, monitoring equipment, and all ancillary equipment necessary to install the PV system and interconnect it to the Purchaser-Owner electrical distribution system. The PV system installations shall comply with all contract requirements, technical specifications, approved design documents, and applicable regulatory codes and requirements. Design-Builder shall submit As-Built Construction Drawings in hard copy with two (2) sets and an electronic copy in DWG format on compact disc to the Purchaser-Owner after completion of the Proving Period for each system at each site.

4.2 MATERIALS AND EQUIPMENT

Materials and equipment incorporated in the Work shall be new and suitable for the use intended. No material or equipment shall be used for any purpose other than that for which it is designed, specified or indicated.

Design-Builder shall use means necessary to protect the materials and equipment before, during and after installation. Design-Builder shall promptly replace lost or damaged materials and equipment with equal, or Purchaser-Owner-approved, replacements, or repair them, at no additional cost to the Purchaser-Owner.

4.3 LINE LOCATION

Design-Builder will be responsible for locating, identifying and protecting existing underground utilities conduits, piping, substructures, etc. and ensuring that no damage is inflicted upon existing infrastructure. In addition to USA Dig and utility line-locating, a private line-locator must be used for any project requiring underground work.

4.4 QUALITY ASSURANCE AND QUALITY CONTROL

Design-Builder shall implement a Quality Assurance / Quality Control (QA/QC) plan for construction activities on Purchaser-Owner sites. At least 30 days prior to the planned commencement of construction, Design-Builder shall submit a copy of the QA/QC Plan for review and approval by the Purchaser-Owner.

To ensure the highest quality of the installation, Design-Builder shall:

- Implement policies and procedures to ensure proper oversight of construction work, verification of adherence to construction documents and contractual requirements, and rapid identification and mitigation of issues and risks.
- Utilize best practice methods for communicating progress, performing work according to the approved Project schedule, and completing the Project on-time.
- Keep the Site clean and orderly throughout the duration of construction. All trash and rubbish shall be disposed of off-site by licensed waste disposal companies and in accordance with applicable Law.
- Provide equipment marking, as well as labeling and signage for the Project that shall be removed after Project completion.
- Fully comply with all applicable notification, safety and Work rules (including Purchaser-Owner safety standards) when working on or near Purchaser-Owner facilities.
- Provide Special Inspection for trenching, rebar, concrete, welding, and roof attachment work, according to AHJ requirements.
- Route all electrical collection system wiring and conduits in a neat and orderly fashion and in accordance with all applicable code requirements. All cable terminations, excluding module-to-module and module-to-cable harness connections, shall be permanently labeled.
- Torque all mechanical and electrical connections and terminations according to manufacturer specifications, with marking/sealing of all electrical terminations at appropriate torque point.
- Provide all temporary road and warning signs, flagmen or equipment as required to safely execute the Work. Street sweeping services shall also be provided as required to keep any dirt, soil, mud, etc. off of roads. Comply with all state and local storm water pollution prevention (SWPP) ordinances.

4.5 REMOVAL AND REMEDIATION

Design-Builder shall remove all construction spoils, abandoned footings, utilities, construction equipment and other byproducts of construction. All disturbed areas including landscaping, asphalt, and concrete shall be remediated to be in equal or better condition than found. Parking lots shall be re-striped if affected by construction operations.

The site shall be left clean and free of debris or dirt that has accumulated as a result of construction operations.

5. TESTING

Following completion of construction, Design-Builder shall provide the following services related to startup and performance testing of the PV systems:

- Acceptance Testing
- System Startup
- Proving Period

A detailed Testing Plan covering each of the phases above shall be submitted and approved by the Purchaser-Owner prior to substantial completion of construction. A detailed description of each phase is provided below.

5.1 ACCEPTANCE TESTING

Design-Builder shall perform a complete acceptance test for each PV System. The acceptance test procedures include component tests as well as other standard tests, inspections, safety and quality checks. All testing and commissioning shall be conducted in accordance with the manufacturer's specifications.

The section of the Testing Plan that covers Acceptance Testing shall be equivalent or superior to the CEC (California Energy Commission) "Guide to Photovoltaic (PV) System Design and Installation", Section 4 and shall cover at least the following:

- Detailed test methods, including sample calculations and reference to standards as required or applicable, and list of tested equipment.
- Pre-test checklist to ensure readiness and any safety measures are in-place.
- Detailed list of all items to be inspected and tests to be conducted.
- Acceptance Criteria: For each test phase, specifically indicate what is considered an acceptable test result.

The Acceptance Testing section of the Testing Plan shall include (but not be limited to) the following tests:

- String-level voltage (open circuit) and amperage (under load) testing for all PV strings. Amperage testing shall be performed concurrently with irradiance testing.
- Inverter testing for all inverters. The inverters shall be commissioned on-site by a qualified technician and shall confirm that the inverter can be operated locally per specification and that automatic operations such as wake-up and sleep routines, power tracking and fault detection

responses occur as specified. Performance testing shall be performed concurrently with irradiance testing.

- Testing of all sensors of the DAS.
- Testing of the Data Presentation interface of the DAS.

After Design-Builder conducts all Acceptance Testing based on the Testing Plan approved by the Purchaser-Owner prior to substantial completion, Design-Builder shall submit a detailed Acceptance Test Report to the Purchaser-Owner for review.

The Acceptance Test Report shall document the results of the tests conducted following the Testing Plan, and include additional information such as the date and time each test was performed. It shall also make reference to any problem and deficiencies found during testing. If there was troubleshooting done, the Report shall describe the troubleshooting methods and strategy. Design-Builder shall be responsible for providing the labor and equipment necessary to troubleshoot the System.

5.2 SYSTEM STARTUP

Following Purchaser-Owner approval of the Acceptance Test Report, Design-Builder shall conduct tests over twenty-four (24) hours and at a time resolution of fifteen (15) minutes, recording the following data:

- Average AC output (kW)
- Average DC output (kW)
- Hourly PV system production (kWh)
- AC and DC voltage
- In-plane irradiance
- Ambient and cell temperature
- Inverter status flags and general system status information

These data points shall be presented in a manner that best depicts the actual performance of the system for Purchaser-Owner review and approval and shall be submitted as part of the Startup Test Report.

5.3 PROVING PERIOD (30 DAYS)

Upon completion of Acceptance Testing and System Startup, and approval by the Purchaser-Owner, Design-Builder shall monitor the system during a thirty (30) day Proving Period and submit a report for Purchaser-Owner review and approval prior to final acceptance by the Purchaser-Owner. This includes monitoring system output and ensuring the correct functioning of system components over this time. The values for the following data shall be acquired every fifteen (15) minutes over thirty (30) days:

- AC system output (kW)
- PV system production (kWh)
- AC and DC voltage
- In-plane irradiance
- Ambient and cell temperature
- Inverter status flags and general system status information
- System availability

Design-Builder shall utilize calibrated test instruments and the DAS and monitoring system to collect the test data described above, which shall be made available to the Purchaser-Owner for access throughout the Proving Period. Design-Builder shall determine through analysis of data from the Proving Period whether the PV system delivers the expected production as determined by the final approved design (i.e., Construction Documents). Actual production shall be compared against expected production using actual weather data and other system inputs (such as module cell temperature factor, module mismatch, inverter efficiency, and wiring losses) for calculating expected production. The production figures for all meters, whether existing or installed by or on behalf of the IOU or by or on behalf of the Respondent, shall be correlated during this test to verify their accuracy in measuring system production.

All data and reports required in Section 3.5.20 shall be fully functional and available to the Purchaser-Owner at the commencement of the Proving Period. Data and reporting requirements are included in the testing scope of the Proving Period and deficiencies in these areas (including missing data, inaccurate reports, and other issues that make validation of system performance inconclusive) shall be grounds for denying approval of the Proving Period Report.

If the PV system does not perform to design specifications, diagnostic testing shall be performed by Design-Builder, deficiencies shall be identified with proposed corrective actions submitted to the Purchaser-Owner, and the Proving Period test repeated. Design-Builder shall be responsible for providing the labor and equipment necessary to troubleshoot the system. The Proving Period Report shall be submitted after the successful completion of this phase and submitted to the Purchaser-Owner for review and approval. The report shall contain, but not be limited to, the following information; calculations shall be provided in Excel format with formulas visible to allow for peer review:

- System description
- Test period
- Test results
- Anomalies identified during test
- Corrective action performed
- Actual measured performance
- Calculations detailing expected performance under TMY conditions

5.4 CLOSE-OUT DOCUMENTATION REQUIREMENTS

Close-Out documents prepared by Design-Builder must include at minimum, but not limited to, the following items:

- Final As-Built Drawing Set with accurate string diagram
- Megger test results
- Module flash-test results with serial numbers
- Component warranties
- Signed inspections cards from AHJ and required Special Inspections
- Interconnection agreements and Permission To Operate
- Owner's Manual

6. OPERATIONS AND MAINTENANCE

For systems structured as a direct purchase, Design-Builder shall offer Operations and Maintenance services for ten (10) years with their Proposal, with an option to extend the Contract for up to an additional ten (10) years. The Purchaser-Owner reserves the right to not execute the Operations and

Maintenance services agreement. For third-party owned systems, Operations and Maintenance services will be performed for the life of the contract at the expense of the Design-Builder.

In offering such services, Design-Builder shall perform all necessary preventive and corrective maintenance, which includes routine maintenance adjustments, replacements, and electrical panel/transformer/ inverter cleaning (interior and exterior) with supporting documentation delivered to the Purchaser-Owner after the Work has been performed. Maintenance by Design-Builder shall ensure that all warranties, particularly inverter warranties, are preserved. The frequency and timing of panel wash-downs shall be determined by Design-Builder based on system monitoring data. Environmental sensors such as pyranometers shall be tested and recalibrated at least once every three (3) years.

Design-Builder shall perform the following maintenance services, at a minimum, as described in the following sections:

6.1 PREVENTIVE MAINTENANCE

Preventive Maintenance shall be performed at least annually and include:

- System testing (voltage/amperage) at inverter and string levels
- System visual inspection and necessary corrections:
  - Inspect for stolen, broken or damaged PV modules, record damage and location. Report to the Purchaser-Owner and wait for the Purchaser-Owner to authorize a course of action.
  - Inspect PV wiring for loose connections and wire condition. Resolve issues as needed or report larger issues to the Purchaser-Owner.
  - Inspect for wires in contact with the structure or hanging loose from racking and resolve issues as needed.
  - Check mechanical attachment of the PV modules to the racking and resolve issue as needed.
  - Check attachment of racking components to each other and the structure and resolve issue as needed.
  - Verify proper system grounding is in place from panels to the inverter and resolve issue as needed.
  - Check conduits and raceways for proper anchorage to structures and resolve issue as needed.
  - Inspect all metallic parts for corrosion and resolve issue as needed.
  - Check combiner boxes for proper fuse sizes and continuity and resolve issue as needed.
  - Inspect all wiring connections for signs of poor contact at terminals (burning, discoloration, etc) and resolve issue as needed.
  - Inspect disconnects for proper operation and resolve issues as needed.
  - Survey entire jobsite for debris or obstructions and resolve issues as needed.
  - Inspect fasteners for proper torque and corrosion and resolve issues as needed.
  - Inspect inverter pad for cracking or settling and resolve issues as needed.
  - Inspect electrical hardware for proper warning and rating labeling and resolve issues as needed.
  - Review as built documentation as needed.
  - Inspect alignment of arrays and racking to identify settling foundations or loose attachments and resolve issues as needed or report issues to the Purchaser-Owner.
  - Inspect operation of tracking hinges, pivots, motors and actuators if present and resolve issues as needed.

  - Check for proper operation and reporting of monitoring hardware and resolve issues as needed.
  - Inspect sealed electrical components for condensation buildup and resolve issues as needed.
  - Inspect wiring and hardware for signs of damage from vandalism or animal damage and resolve issues as needed.
- Routine system maintenance to include correction of loose electrical connections, ground connections, replacement of defective modules found during testing, other minor maintenance repair work.
- Module cleaning, at a frequency to be determined by the ongoing monitoring of the system such that effect on production is no more than 5%, but not less often than twice a year.
- Routine DAS maintenance to include sensor calibration and data integrity check.

6.2 Troubleshooting, Inspection and Additional Repairs

- Dispatch of field service resources within two (2) business days of notification (via automated or manual means) for repairs as necessary to maintain system performance.
- Any corrective action required to restore the system to fully operational status shall be completed within twenty-four (24) hours of the service resources arriving on-site.
- Major system repairs, not to include mid-voltage switchgear or transformers.

6.3 CUSTOMER SERVICE SUPPORT

- Support telephone line made available to Purchaser-Owner staff to answer questions or report issues.
- Support line shall be staffed during operational hours from 8 am – 6 pm California Standard Time. During times outside of this operational period, an urgent call shall be able to be routed to a supervisor for immediate action.

6.4 MAJOR COMPONENT MAINTENANCE AND REPAIR

- Inverter repair and component replacement and refurbishment as required in the event of inverter failure.
- Inverter inspection and regular servicing as required under inverter manufacturer's warranty specifications. Those include but are not limited to the following annually:
  - Check appearance/cleanliness of the cabinet, ventilation system and all exposed surfaces.
  - Inspect, clean/replace air filter elements
  - Check for corrosion on all terminals, cables and enclosure.
  - Check all fuses.
  - Perform a complete visual inspection of all internally mounted equipment including subassemblies, wiring harnesses, contactors, power supplies and all major components.
  - Check condition of all the AC and DC surge suppressors.
  - Torque terminals and all fasteners in electrical power connections.
  - Check the operation of all safety devices (E-stop, door switches).
  - Record all operating voltages and current readings via the front display panel.
  - Record all inspections completed.
  - Inform inverter manufacturer of all deficiencies identified.

  - Oversee inverter manufacturer performance of In-Warranty replacement of failed inverter components.
- Customer advocacy with vendors.

6.5 OTHER SYSTEM SERVICES

- O&M Manuals – Design-Builder shall provide three (3) copies of O&M Manuals. Updated editions of O&M Manuals shall be sent electronically to the Purchaser-Owner as they become available.
- Management of long term service and warranty agreements, ongoing.
- Design-Builder shall log all maintenance calls and document all maintenance activities. These activities shall be presented in a report, which is to be submitted to the Purchaser-Owner on a minimum monthly basis.

O&M services shall be priced separately from the design and construction of the PV system. Design-Builder shall submit a detailed description of their O&M services, detailing the activities and the intervals at which they will be performed, with their Proposal.

7. PRODUCTION GUARANTEE

Design-Builder shall offer a Production Guarantee as part of their Proposal. The Production Guarantee shall comply with the PPA Terms and Conditions and Design-Build Terms and Conditions included as Exhibits E.1 and E.2 of the RFP.

8. TRAINING

The Respondent shall provide four (4) hours of on-site training for Purchaser-Owner personnel in all aspects of operation, routine maintenance, and safety of the PV systems, DAS, and monitoring solution.

At a minimum, training topics shall include the following:

- PV system safety, including shut-down procedures
- PV module maintenance and troubleshooting
- Inverter overview and maintenance procedures
- Calibration and adjustment procedures for the inverters and tracking systems (if any)
- DAS and monitoring solution, including standard and custom reporting

Design-Builder shall submit a proposed Training Plan during the design process for approval and provide all training materials and manuals to support on-site training in advance of scheduled training sessions (see schedule of submittals in Section 2.3, “Submittals”). The on-site portion of the training program shall be scheduled to take place at the jobsite at a time agreeable to both the Purchaser-Owner and Design-Builder.