# Attachment B1: Drawings and Site Notes

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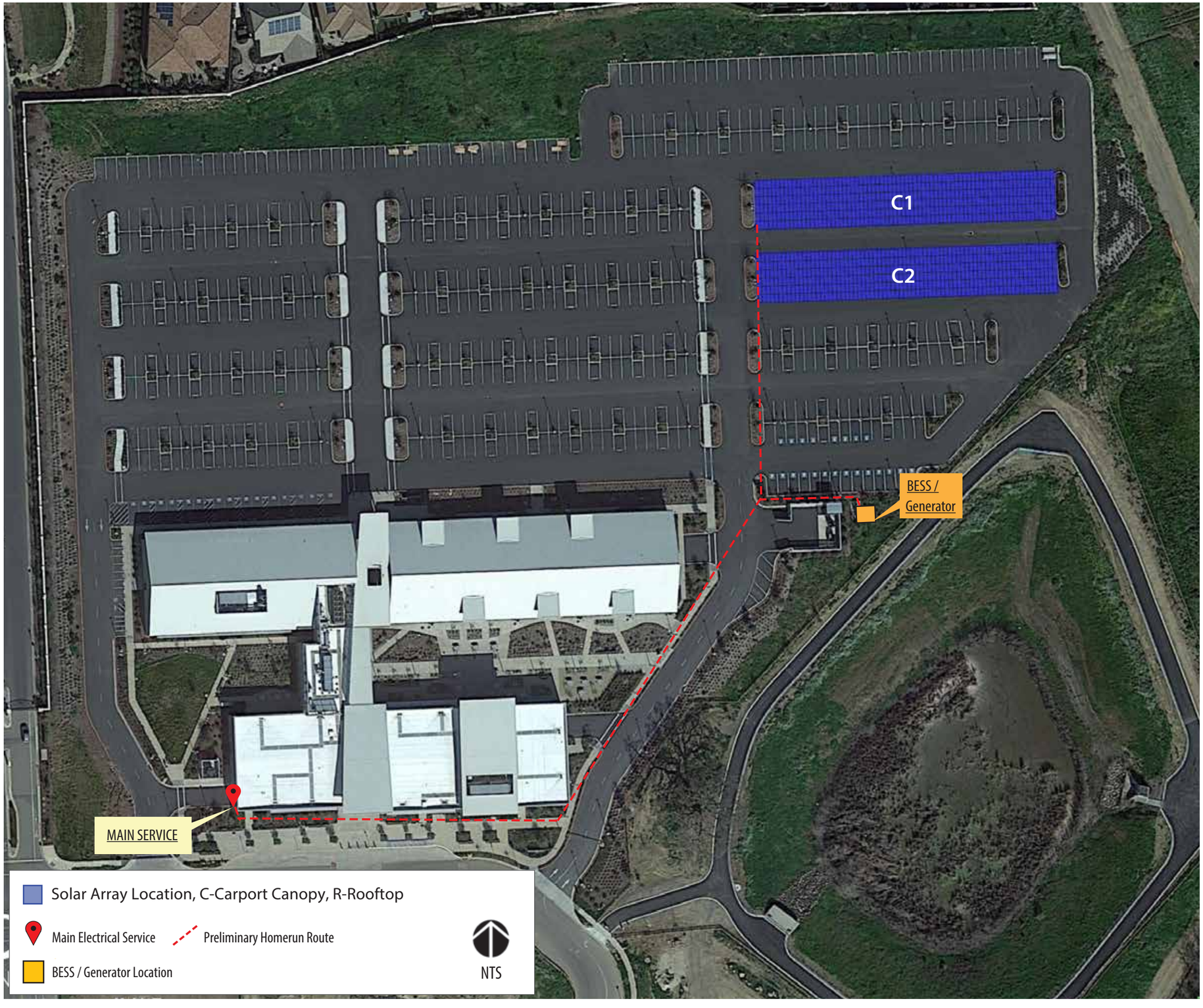
## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# 4CD Brentwood Center

1351 Pioneer Square, Brentwood, CA 94513




Contra Costa Community College District Approved Array Locations

11/21/2022

SAGE ENERGY CONSULTING an NV5 company

# Site Details

### PV SYSTEM

1. C1 and C2, southern aspect, carport canopies on northeast end of the parking lot. Shown as 6-module wide.
2. Minimum clear height for canopies is 12'.

### MAIN SERVICES/POINT OF INTERCONNECTION

1. Existing Main Service Board (MSB) is located in south-western corner of southern building.
2. Interconnection Application (IA) filed for up to 463 kW-AC.

### HOMERUN & SPARES

1. Preliminary homerun from canopies to main service through asphalt concrete along east side of building. Homeruns between arrays and buildings to be below grade.
2. Contractor to utilize survey and GPR to finalize homerun route prior to design.
3. Preliminary spare conduit and termination requirements are included in Attachment B. Final requirements will be discussed with and approved by District.

### GENERATOR/BATTERY ENERGY STORAGE SYSTEM (BESS)

1. Generator or BESS to be located on eastern side of campus near trash enclosure. Generator or BESS shall be housed in exterior shelter.
2. Easement runs adjacent to proposed Generator/BESS location.
3. Preliminary panel information for critical load is available in Attachment D3.

### SHADING/VEGETATION

1. C1 and C2 may have shading from existing trees in parking lot. Contractor to include removal of trees and light posts that pose current or future shading issue.

### ACCESSIBILITY

1. Contractor to determine and ensure any ADA and AHJ compliance requirements are met for the parking lot including path of travel and any parking lot re-stripping. New concrete work must match existing concrete requirements as outlined in Attachment D6.

### LIGHTING

1. Under canopy lighting shall be shrouded to prevent direct line of sight from neighboring buildings.
2. Additional lighting requirements to be discussed with and approved by District.

## Site Photos

Figure 1. Electrical Room (View 1)

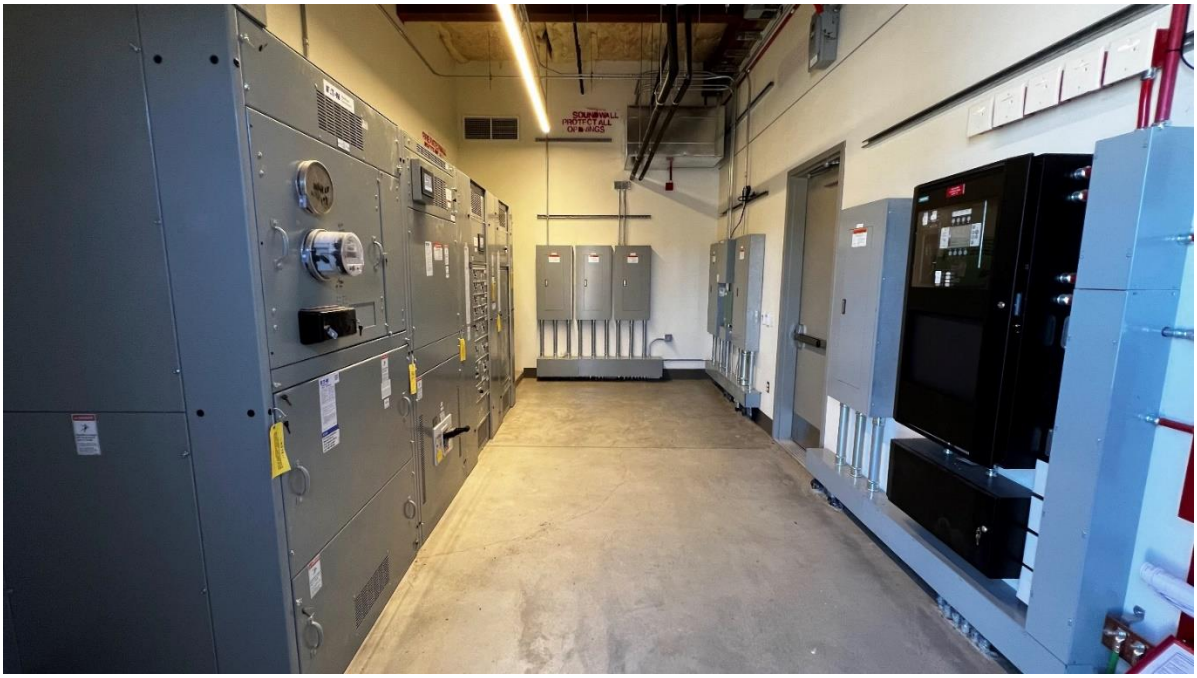


Figure 2. Electrical Room (View 2)

Figure 3. MSB


NOTICE
DANGER
NOTICE
LOOSE PARTS ENCLOSED
DO NOT DISCARD
DANGER

Figure 4. Switchboard

Figure 5. Name Plate

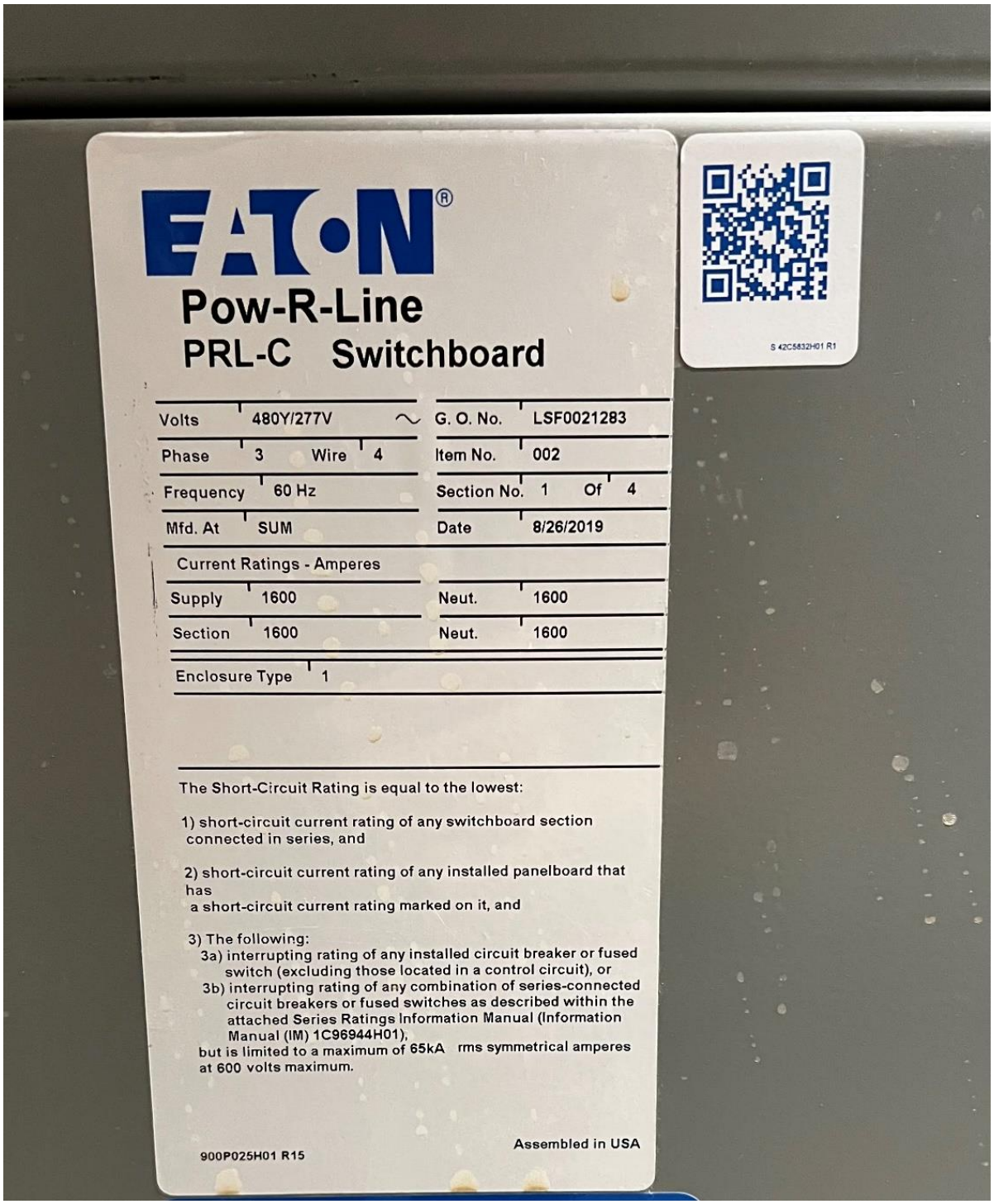


Figure 6. Example of Brentwood Center Parking Lot

Figure 7. Example of Brentwood Center Parking Lot

# Attachment B2.1: 01 10 00 Summary of Work

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 01 10 00
# SUMMARY OF WORK

## PART 1 - GENERAL

1.01 SUMMARY

A. Project Location is 1351 Pioneer Square, Brentwood, CA 94513

B. This section describes the Summary of Work for the Project. Requirements provided in this section may be addressed in further detail elsewhere in the Contract and Bridging Documents.

C. This specification applies to a design-build project and includes the scope for design, construction, commissioning, and operation of a complete energy system as described here and elsewhere in the Contract and Bridging Documents.

D. In this document, "Owner" shall refer to the owner of the site where project will be located, and includes any representative of the site owner, such as independent engineers, consultants, or inspectors. "Contract" refers to the design-build and/or construction contract and any associated Bridging Documents, inclusive of requirements outlined in the request for proposals (RFP). "Contractor" refers to the entity performing the work, inclusive of Engineer(s) and Architect(s) of Record for design-build contracts.

E. Contractor shall perform all work and provide submittals consistent with this specification, Section 01 33 01: Design-Build Process & Submittals, other technical specifications, and the Contract and Bridging Documents for all stages of work.

F. Bridging Documents may be amended or supplemented to include elements or ideas from Contractor’s Proposal or other proposals, but only to the extent Owner expressly agrees in writing. Contractor is solely responsible for confirming the extent of any changes to the Contract and Bridging Documents.

1.02 RELATED DOCUMENTS

A. The Contract and any design-build Bridging Documents.

B. 01 13 00: Supplementary Criteria

C. 01 33 01: Design-Build Process & Submittals

D. 05 90 02: Solar Photovoltaic Canopy Structures

E. 26 00 00: General Electrical

F. 26 32 13: Diesel Generator

G. 48 14 00: Solar Photovoltaic System

H. 48 17 13: Battery Energy Storage System

I. Other technical bridging specifications

J. Where this specification and the Contract or other Bridging Documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended changes or procedures with the Owner.

## PART 2 - SUMMARY OF WORK

2.01 SUMMARY OF WORK

A. Perform site due diligence sufficient to design, engineer, permit and construct the energy systems described.

B. Design, engineer and obtain permits from DSA and other relevant AHJs, for solar photovoltaic (PV) canopies and other energy systems, if selected, including racking, inverters, wiring and all balance of system (BOS) components, including spare conduits described in the bridging documents.

C. Obtain and provide all materials and construct the PV, other energy systems, monitoring and metering systems, including cloud-based monitoring platform and other ancillary equipment.

D. Provide site work where required, including accessible path of travel and parking spaces, fencing removal or upgrades, landscaping and irrigation work.

E. Initiate if required, manage and complete all interconnect process with the electrical utility (PG&E) and achieve permission to operate (PTO).

F. Provide coordination with any roofing work, including ensuring waterproofing of any penetrations and that all work maintains roof warranty.

G. Commission the PV system and provide first-year full-wrap warranty.

H. Contractor shall provide all incidentals required, such as permits, approvals, environmental compliance, freight, procurement, monitoring, inspection, billing, and incidentals as necessary to design, construct, and commission the energy systems.

2.02 DESIGN PHASE SCOPE

A. Design Team

1. Contractor shall provide Electrical, Structural and all other required licensed engineers and/ or architects [Engineers of Record and Architect of Record] to complete the work. All designers shall be licensed in the state where the Project is located. Designers shall provide all progress designs and a complete stamped design set as required to permit and construct a complete energy project.

2. Contractor shall perform design services using the designers listed in its Proposal. Contractor may substitute Designers identified in the Proposal only with Owner's written consent.

3. Contractor shall fully coordinate all engineering and architectural disciplines and Designers involved in completing the Work. All Designers shall fully coordinate with Contractor and all architectural and engineering disciplines and Designers involved in completing the Work.

4. Contractor shall require each Designer's written agreement (1) to be bound to the terms of Contract Documents, and (2) to assume all the obligations and responsibilities that Contractor assumes toward Owner under the Contract Documents.

B. Contractor shall identify the regulatory agencies that have jurisdiction over essential building and design elements and coordinate with and implement the requirements of the regulatory agencies or their authorized agents, including, without limitation, Division of the State Architect

(DSA), including DSA Fire/Life Safety, DSA Access Compliance Section, DSA Structural Safety; State and City Fire Marshals; County and City Health Inspectors; and any regulatory office or agency that has authority for review and supervision of school district construction projects.

C. Contractor shall produce progress designs for Owner review and hold regular meetings per Section 01 33 01 requirements. Drawings and design shall include Schematic Design (30%), Design Development (60%), Construction Documents (90%) and Final Permitted Design Documents for Construction.

D. The design shall incorporate all energy systems described in the Contract, including, but not limited to:

1. Solar Photovoltaic System(s) (PV)
2. Racking Systems, including canopies
3. Metering and monitoring systems
4. Spare conduits
5. Battery Energy Storage System(s) (BESS), if selected
6. Generator, if selected
7. Microgrid System, if selected
8. All ancillary equipment, infrastructure and site improvements to implement these systems.

E. DUE DILIGENCE. Contractor shall identify and perform all necessary due diligence to design and implement the Project. Due diligence shall include, but not be limited to:

1. Geotechnical investigations and geohazard documentation to design and construct canopies as shown on the Bridging Documents
2. Performing additional geotechnical or survey work where required by the Designer(s) of record
3. Structural investigations, and surveying as-needed
4. Electrical equipment inspection and testing
5. Underground utility location (including Ground-Penetrating Radar (GPR)), potholing/hand-digging to verify critical UG constraints
6. Utility coordination, such as interconnection applications and all other process required to achieve permission-to-operate (PTO)
7. Electrical equipment inspection and testing
8. Identification of all Authorities Having Jurisdiction (AHJs) and the requirements applicable to design, approval, and construction.
9. Any other due diligence required to meet the engineer(s) of record requirements to design and stamp the drawings, to meet AHJ requirements to permit the project and to safely install a complete and functional energy project.

F. SCHEMATIC DESIGN (SD)

1. Contractor shall produce SD plans that accurately describe, at a schematic level, all energy systems proposed for the project, their siting and size on the site, and the physical and electrical configuration of the systems sufficient for presentation and discussion with the Owner. Work shall include design calculations, engineering, modeling and drawings of energy systems to meet the operational and functional requirements of the Bridging Documents. SD Documents shall be sufficient to present the complete concept of the Project, including all major elements of the system(s), machinery, equipment, structure(s), and site design(s).
2. Contractor shall size Solar PV, and any other energy systems subject to production or performance targets, to meet the target production or target system size identified in the Bridging Documents. Where site constraints do not allow for a system sized to meet these requirements, Contractor shall maximize production within the footprint identified in the Bridging Documents and explore alternatives with the Owner. Sizing shall include accurate and detailed modeling of production for each system and site based on site constraints (e.g. shading, code constraints, etc.) using industry standard modeling tools (for Solar PV: PVSyst or Helioscope) for each phase of design.
3. Contractor shall also include sizing and design of all other energy systems to meet the functional and operational requirements of the Project. This shall include electrical switchgear and any balance of system equipment required for a complete and operational energy system.

G. DESIGN DEVELOPMENT (DD)

1. Contractor shall provide DDs that describe in detail all energy systems included in the Project. DDs shall include all ancillary equipment and work, required to secure permits and construct the system.
2. Contractor shall provide plans sufficient to fix and illustrate project's scope and character in all essential design elements including, without limitation, site plans; demo plans; civil, architectural, structural, mechanical, and electrical plans; elevations; cross sections and other mutually agreed upon plans deemed necessary to describe the developed design; single line electrical and mechanical plans; and structural plans with schematic sizing of major structural elements.
3. Contractor shall provide recommendations for scheduling and phasing of construction.
4. Contractor shall provide updated energy system performance modeling and operational/functional descriptions for the energy systems included in the Project.

H. CONSTRUCTION DOCUMENTS (CD)

1. Contractor shall provide CDs that fully describe in-detail all aspects of the Project and Work to be performed. CDs shall include drawings, specifications, calculations, control plans, etc. as-needed for construction and AHJ/Owner approval.
2. CDs shall be prepared in compliance with all relevant codes, standards, regulations, AHJ Requirements, and Contract and Bridging Document requirements. CDs must meet the approval of the Owner and the Authority(ies) Having Jurisdiction (AHJs) over the project, including the Local Fire Authority.

3. CDs shall include, but not be limited to: grading, landscape modifications, demolition plan, excavations, directional boring/trenching, racking and mounting systems, pads, other structural elements, electrical systems, electrical system upgrades, signage, foundations, fencing, fire and safety, lighting, conduits/spare conduits (including above and below grade), vault locations, equipment mounting details, wall mount conduit routing, accessibility improvements, etc. as required or implied by this specification, the Contract/Bridging Documents, AHJs and applicable codes, standards, and regulations.
4. Following receipt of Owner's comments, Contractor shall complete final Construction Documents. Such complete Construction Documents may then, with Owner's approval, be submitted by Contractor to the AHJ(s). Contractor shall produce a final CD design set upon securing permit(s), incorporating final AHJ and Owner comments.
5. Warranty. Contractor shall warrant to Owner that the final design, as expressed in the Construction Documents:
    a. Will be constructible, workable, and buildable within Contractor's detailed Project schedule; and
    b. Will comply with all DSA requirements.
    c. Will comply in all respects with the requirements of the Contract/Bridging Documents;
    d. Will not call for the use of hazardous or banned materials; and
    e. Will fully comply with applicable building codes, ordinances, standards, governmental regulations, and private restrictions applicable to the Work; and
    a. Meets all utility interconnect requirements.

I. PERMITS

1. Contractor shall identify and obtain all required permits. Permitting shall include all required coordination and submittals with the AHJ(s), including DSA and the utility the project is interconnected with. Contractor shall take all steps to secure AHJ approvals and all other required reviews and approvals of the Construction Documents.
2. Where a permit process was begun prior to the Contract (e.g. Interconnect Applications with the utility), Contractor shall take over the permitting process from the Owner upon Contract execution.
3. Contractor shall pay all permitting fees required for the project, inclusive of utility interconnect costs, except where expressly identified as an Owner-cost in the Contract.
4. For California Environmental Quality Act (CEQA) permitting, Contractor shall assume that the Owner will conduct the initial required CEQA permitting and documentation. Contractor shall support the Owner in preparing any required CEQA documentation (including any exemption materials).
5. The Contractor shall be responsible for adhering to all permit requirements, including all costs associated with adherence. This shall include all CEQA requirements, including mitigation requirements.

J. INCENTIVES

1. Where incentives are available for energy systems that are a part of the scope of work and applicable to Owner, Contractor shall be responsible for all requirements to ensure full incentives are received for the Project, including but not limited to: incentive management,

design and construction of the Project to meet incentive requirements, documentation, coordination with the entity providing incentives, proper closeout of Project/incentive documentation, reporting and performance requirements during operation, etc.

2. Where an incentive process was begun prior to the Contract (e.g., Self-Generation Incentive Program (SGIP)), Contractor shall take over the incentive process from the Owner upon Contract execution.

2.03 CONSTRUCTION PHASE

A. Contractor shall provide complete Construction Phase oversight, inclusive of onsite construction management and management of all sub-contractors.

B. Solar Photovoltaic Systems (Solar PV).

1. Contractor shall provide and install all equipment necessary for a complete, interconnected and operational PV system, with components including, but not limited to:

a. Solar PV modules
b. Inverters
c. Transformers
d. Combiner boxes and disconnects
e. Fuses
f. Circuit breakers
g. All electrical switch gear or substations, including any modification necessary to existing gear, required for a utility grid-connected PV system
h. All electrical conductors, conduits & components necessary for a complete PV system
i. All mounting systems, including canopy structures, ground or roof racking, anchorage, adhesives, ballast and flashings
j. All metering, monitoring and communications equipment, software and subscriptions required by the Contract and the utility.
k. All grounding and arc-fault protection.
l. Any balance of system items for a complete, interconnected, grid-tied and operational solar PV system
m. Contractor shall provide ancillary work as required by the Contract, Bridging Documents, Construction Documents, DSA, the District and any other relevant AHJs
n. Permanent fencing for all ground mounted equipment, matching other enclosures on the site.
o. Permanent or removable bollards around all equipment vulnerable to vehicle strikes.
p. Installation of accessible hardscape (concrete slabs) under canopies where required by DSA and any other AHJ for access to shade.
q. All lighting, security or other ancillary equipment described in the Contract documents

C. DIESEL GENERATOR

1. Contractor shall provide all modeling, sizing, engineering, design, permitting, installation, equipment, ancillary equipment, modifications to existing equipment, control systems, pads, conductors and conduits, enclosures, metering, commissioning, and all other necessary items for a complete and operational diesel generator.

2. A secure enclosure, matching existing enclosures.

D. Battery Energy Storage System(s) (BESS)

1. Contractor shall provide all modeling, sizing, engineering, incentive management, design, installation, equipment, ancillary equipment, modifications to existing equipment, control systems, pads, conductors and conduits, enclosures, complete utility interconnection management, metering, commissioning, and all other necessary items for a complete and operational BESS.
2. A secure enclosure, matching existing enclosures.
3. Energy storage system shall include monitoring with similar capabilities and data availability as PV production monitoring for full life of BESS system with sufficient detail for Owner to verify system performance.
4. BESS shall have a control system that optimizes energy consumption and solar production for the retail tariff at each site, including real-time tariff updates and learning algorithms to continually optimize savings.
5. Where grid services are or will be provided by BESS, all required metering, monitoring, telemetry, and software shall be provided to provide grid services.

E. Microgrid System(s)

1. Contractor shall provide all modeling, sizing, design, control descriptions, installation, associated equipment, modifications to existing equipment, control system, enclosures, complete utility interconnection management, commissioning, and all other necessary items for a complete and operational microgrid system at the site.
2. Microgrid shall meet all operational and functional requirements for the Project site(s), including automated islanding and supply of critical load panels for resiliency scenarios identified in the Contract and Bridging Documents. Where such definitions are limited or missing, Contractor shall assist Owner in clearly defining microgrid operational and functional requirements.

F. Spare Conduits. Contractor shall install spare conduits with appropriate rated pull tape/strings and terminations at each site as follows (See technical bridging specifications for further detail):

1. BESS. Install (2) x 3-in and (1) x 1.5-in from the main service to the future BESS location identified on Bridging Documents or as determined with Owner. Where PV system is >500 kWp or BESS system is greater than 300 kW, increase spare conduit size from 3-in to 4-in.
2. Data/Security. At all Canopies: (1) x 1.5-in conduits from nearest existing Site data connection to each canopy.
    a. Conduit at the canopies shall extend from grade inside of foundations and up column to the level of the structural cross-member. Conduit shall terminate in an 8" x 8" x 3" NEMA 4X junction box. Pathways to multiple canopies may be combined into a single 2" conduit.
3. EVSE. At all Carport Canopies, in addition to data spares, (1) x 3-in conduit for future EV charging, including additional spares if needed for accessibility purposes, from the main service to carport canopy locations identified on Bridging Documents.

a. In the absence of a designated termination point(s) at the canopies, one conduit shall terminate in a pull box at the first column of a canopy in the vicinity of ADA spaces. If the canopy only includes ADA stalls, a second conduit and pull box shall be installed. The conduit shall be routed from the first pull box to the second pull boxes. The second pull box shall be located at the next closest canopy that includes non-ADA stalls.
b. At the EVSE location, the spare conduit shall terminate in a flush grade-mounted pull box. Spare conduit shall have a minimum of two sufficiently rated pull strings or wires inside each conduit for future wire pull.

G. Any changes to Owner property required for the Project, including, but not limited to: grading, tree or vegetation removal, repair of damage caused by Contractor, light standard removal, new lighting, parking islands, ADA improvements, re-striping of parking areas, etc. are the sole responsibility of the Contractor.

H. Where a project is installed in a parking lot, Contractor shall ensure that parking lot striping designs meet current AHJ, City and/or County standards. Where designs are out of compliance and corrective work has not been included in the Contract, Contractor shall identify corrective measures and provide a Request for Information (RFI) to Owner whether to include re-design in Project scope.

I. Contractor shall coordinate with, and provide support to, the Owner, all Inspectors, and Owner's Representatives during all phases of work.

J. SCHEDULE & MEETINGS

1. Contractor shall coordinate and schedule weekly project meetings from Notice to Proceed (NTP) through project closeout with all stakeholders.
2. Contractor shall maintain formal meeting minutes and agendas, submitted to the Owner prior to the next meeting for review.
3. Contractor shall maintain a detailed master project schedule and three-week look ahead. Master schedules and three-week look ahead schedules shall be distributed to all attendees the day prior to the next scheduled project meeting. Master project schedules shall be promptly provided to Owner upon request throughout the project life cycle.
4. Frequency of meetings are allowed to change upon the stakeholder availability and approval from the Owner.

K. UTILITY COORDINATION & INTERCONNECTION

1. Contractor shall manage and be responsible for all work and costs for the Project to be interconnected with the utility.
2. Contractor shall prepare interconnection applications and manage the interconnection process, including tariff change requests, processing costs, coordination with the local utility(ies), shutdowns, inspections, testing, etc. necessary to achieve interconnection and permission to operate for all energy systems.
3. In the event that the Owner has already submitted initial interconnection applications prior to the Contract being executed, the Contractor shall promptly review any past applications and take over coordination with the Utility, including making any proposed modifications to the system design.

4. The Contractor should note that tariff grandfathering is key to District's project strategy and the financial performance of the project. The Contractor shall ensure that any tariff grandfathering, including NEM 2.0, or other milestone achieved by the initial interconnect application is maintained.
5. Should an issue arise that may jeopardize the initial interconnection scheme, tariff grandfathering, some other utility milestone, substantially increase interconnection costs or the ability to interconnect the project, the Contractor shall promptly notify the Owner and seek approval from Owner before making any changes to the interconnect application.

L. AMERICANS WITH DISABILITIES ACT (ADA).

1. Contractor shall be responsible for the identification all ADA deficiencies at the Project site that will require upgrades as a result of the Project.
2. Contractor shall design all required improvements during detailed design in order to secure permits from the AHJ(s).
3. Contractor shall be responsible for implementation of all ADA work detailed on the drawings and required by the permit, including, but not limited to: parking lot restriping, covered parking space ratios, signage, path of travel, etc.
4. The Contractors contracted cost shall include the cost for any improvements within the footprint of any canopies and any improvements identified in the Contract or Bridging Documents.
5. The Contractor shall receive a change order for the additional cost of any ADA improvements required by permit outside of the canopy footprints not identified in the Contract or Bridging Documents.

M. MISCELLANEOUS. Contractor shall provide:

1. Secure storage facility at job site for all equipment and supplies, including any required security.
2. Legal toilet and hand wash sink facilities at job Site.
3. Daily cleanup to "broom clean" conditions.
4. Implementation and management of all Stormwater Pollution Protection Plan (SWPPP) and other permit required measures for construction.
5. Return of disturbed areas to pre-construction conditions including repair of all pavement and concrete, street sweeping & cleaning, restriping, and removal of survey marks, equipment track marks & scuffs on finished concrete surfaces.
6. Remediation of all fields, turf, landscaping and irrigation to restore to pre-construction conditions.
7. Provide temporary ADA parking stalls during construction, if construction activities make existing facility ADA parking stalls unusable. Quantity and location of temporary stalls shall be coordinated with Owner.
8. Provide temporary lighting in place of removed overhead lighting until under-canopy or other permanent lighting is fully operational.

9. Installation of Owner approved project information signage and removal at completion of project.

2.04 COMMISSIONING & CLOSEOUT

A. See Section 01 33 01, Design-Build Process and Submittals, and other technical sections for further details regarding commissioning and closeout.

B. Commissioning and closeout shall follow industry best practices and applicable codes and standards identified in the Contract and Bridging Documents.

C. Startup, Testing and Commissioning.

1. Contractor shall provide complete startup, testing, commissioning and documentation of these activities for all energy systems installed or modified as part of the Project.

2. Commissioning shall include all associated tasks and documentation required to successfully commission the system per Contract/Bridging Document requirements and industry best practice.

3. Contractor shall assist Owner and any third-party commissioning agents/inspectors, including provision of licensed electricians to interact with energy systems and provision of documentations.

4. Contractor shall perform performance testing to confirm that all energy systems are performing per the design and operational/functional requirements of the Contract and Bridging Documents.

D. Undertake punchlist walks with Owner, ensure completion of punchlist work and provide comprehensive labeled, time stamped photo library of complete items.

E. Contractor shall ensure successful interconnection with the Utility and achieve permission to operate (PTO) from the Utility. Contractor shall coordinate with the Owner to ensure the interconnected service has been placed on the intended and appropriate Utility tariff.

F. RECORD DOCUMENTS. Contractor shall provide final, “as-built” Construction Documents clearly conformed with all changes made during construction, at a minimum in CAD and PDF formats, including all underground trenching/boring routes and depths.

G. CLOSEOUT DOUMENTS. Contractor shall provide a comprehensive set of closeout documents per Section 01 33 01, including an Operations & Maintenance Manual for each site that includes all energy systems.

H. TRAINING. Conduct a training for Owner staff, with orientation to the energy systems, monitoring platforms, safety procedures, and Operations & Maintenance Manuals.

I. Permit Closeout. Contractor shall ensure that all permit requirements have been met and ensure closeout of all permits required for the Project.

J. DSA Closeout. Contractor shall obtain DSA closed and certified status for all project-associated DSA applications.

2.05 OPERATIONAL PHASE

A. FIELD TESTING AND EVALUATION. At a minimum, Contractor shall provide the following testing and evaluation for the first year of operation of the PV system. See Specification 01 33 01 and other technical specifications for further requirements for the various energy systems.

1. The Contractor shall coordinate with the Owner on the development of a 12-month Measurement and Verification (M&V) Plan.
2. The Contractor shall provide the Owner (or its representatives) access to monitoring points/devices, as well as access to information on the System over the 12-month testing and evaluation period, per the M&V Plan.
3. The Contractor shall install the data monitoring and metering system per the Contract documents in coordination with the Owner.
4. The Contractor shall monitor the System using an automated system and provide the Owner with data on performance. This data will include solar output and other functions to be defined in coordination with the Owner.

B. Contractor shall provide a one-year full wrap warranty, including all troubleshooting and repair of all work and equipment installed as part of the Project to meet functional, operational and performance requirements. All work in the one-year extended commissioning period shall be at no cost to the Owner, except for damage or misuse by Owner or others not under the control of the Contractor.

C. All work required by the Warranty detailed in the Contract.

D. All work required by any Operations and Maintenance Agreement executed with the Contractor.

E. All warranty and work required of the installation Contractor by utility interconnection rules.

END OF SPECIFICATION SECTION 01 10 00

# Attachment B2.2: 01 13 00 Supplementary Conditions

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 01 13 00
# SUPPLEMENTARY CRITERIA

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This specification applies to a design-build project and includes the design, construction and commissioning of a complete energy system as described here and elsewhere in the Contract and Bridging Documents.

B. In this document, "Owner" shall refer to owner of the site where project will be located, regardless of system ownership, and include any representative of the site owner, such as independent engineers, consultants, or inspectors. "Contract" refers to the design-build and/or construction contract and any associated design-build bridging documents, inclusive of requirements outlined in the request for proposals (RFP). "Contractor" refers to the entity performing the work, inclusive of Engineer(s) and Architect(s) of Record for design-build contracts.

C. Contractor shall perform all work and provide submittals consistent with this specification, other specifications, and the Contract and Bridging Documents for all stages of work.

D. Bridging Documents may be amended or supplemented to include elements or ideas from Contractor's Proposal or other proposals, but only to the extent Owner expressly agrees in writing. Contractor is solely responsible for confirming the extent of any changes to the Contract and Bridging Documents.

### 1.02 RELATED DOCUMENTS

A. The Contract and any design-build Bridging Documents.

B. 01 11 00: Summary of Work

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E. 26 00 00: General Electrical

F. 26 32 13: Diesel Generator

G. 48 14 00: Solar Photovoltaic System

H. 48 17 13 Battery Energy Storage System

I. Other technical bridging specifications

J. Where this specification and the Contract or other Bridging Documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended changes or procedures with the Owner.

## PART 2 - SUPPLEMENTARY CONDITIONS

### 2.01 APPLICABLE CODES & STANDARDS

A. Contractor shall be responsible for compliance with all applicable laws, codes, regulations, industry best practices, etc. applicable to any and all design, construction, operations, sales of

electrical energy, or other work related to delivering a complete energy project as described by the Contract and Bridging Documents.

B. The Contractor shall comply with all requirements of the following that apply to the energy systems for the Project (most recent version unless stated otherwise). The following list is not exhaustive. Contractor shall be responsible to ensure compliance with all codes, regulations, AHJ requirements, etc. that apply to the Project.

1. Americans with Disabilities Act (ADA)
2. American National Standards Institute (ANSI)
3. American Society of Civil Engineers (ASCE)
4. American Society for Testing and Materials (ASTM)
5. California Building Code (CBC).
6. California Building Standards Code, Title 20/Title 24
7. California Dept. of Industrial Relations (DIR)
8. California Division of the State Architect (DSA)
9. California Electrical Code (CEC)
10. California Environmental Quality Act (CEQA).
11. California Geological Survey (CGS)
12. California Office of the State Fire Marshall
13. California Public Utilities Commission (CPUC)
14. California Labor Code
15. Federal Communications Commission (FCC)
16. Institute of Electrical and Electronics Engineers (IEEE)
17. International Electrotechnical Commission (IEC)
18. International Electrical Testing Association (NETA)
19. International Fire Code
20. Local Fire Jurisdiction Requirements
21. National Electric Code (NEC)
22. National Electrical Manufacturers Association (NEMA).
23. National Fire Protection Association (NFPA)
24. National Environmental Protection Act (NEPA)
25. Occupational Safety and Health Administration (CAL-OSHA)
26. Storm Water Pollution Prevention Plan (SWPPP) Requirements
27. Underwriters Laboratories (UL) Standards
28. Utility Requirements
29. Uniform Solar Energy Code (ICC).
30. All other applicable State and Local Codes and Ordinances.
31. Owner Specifications and Requirements.
32. DSA IR-16-8 (most recent) Guidelines.
33. DSA PL 07-02 (most recent) Guidelines.

C. Contractor shall be solely responsible for any and all tax law compliance, including, without limitation, compliance with the requirements related to any use of the Investment Tax Credit. Owner shall not make, or cause to be provided any legal guidance or opinions related to taxation matters.

D. Contractor shall ensure that all work conform to the Utility's Distribution Interconnection Handbook and PG&E Wholesale Distribution Tariff requirements. Contractor shall ensure all

design, equipment and workmanship complies with the requirements of the local electrical utility. The Contractor must ensure all proposed equipment is acceptable to the local electrical utility and meets the interconnection and code requirements.

E. Contractor shall ensure that no hazardous materials are used on the Project. If hazardous materials are proposed, Contractor shall clearly identify any hazardous materials that are included in the Project and seek Owner's approval to use such materials during design. Contractor shall ensure that the environmental impact of the hazardous material usage is disclosed, including any special maintenance requirements and proper disposal/recycling of the equipment at the end of its useful life. Equipment containing hazardous materials must comply with the EPA Landfill Disposal Requirements. Any additional costs related to equipment containing hazardous materials shall be clearly identified.

F. Contractor shall ensure all design, equipment and workmanship complies with the requirements of the local fire department and code requirements.

G. Contractor shall ensure wind uplift requirements per ASCE 7 are met per design wind speed requirements established by the local AHJ for the Project site(s).

2.02 CONTRACTOR REQUIREMENTS

A. Contractor License. Each Contractor providing any work on the Project shall be properly licensed pursuant to the Business and Professions Code and shall be licensed in the following appropriate classification(s) of Contractor's license(s), for the Project, and must maintain the license(s) throughout the duration of the Project: 1) Class A and 2) Class B and/or C-10.

B. Bonding. The Contractor will be required to furnish the Owner with a Payment and Performance Bond equal to 100% of the installation contract price, prior to commencement of project work for all financing options. All bonds are to be secured from a surety that meets all of Contract bonding requirements. The cost of all bonds shall be included in the Contract price.

C. Drugs Tobacco, and Alcohol - Contractor shall take such steps as are reasonably necessary to ensure that employees of Contractor or any of its subcontractor's employees do not use, consume, or work under the influence of any alcohol, tobacco or illegal drugs while on the project. Likewise, Contractor shall prevent its employees or subcontractor's employees from bringing any animal onto the project. Contractor shall not violate any written Owner policies provided to Contractor.

D. All Contractor staff and sub-contractors are to wear identifying clothing, safety vests, which includes at-minimum the name or logo of the Contractor, at all times when on-site. The identification shall be distinguishable in all types of weather.

E. Badging Policy.
   1. Contractor shall provide their workers and all of Subcontractors' workers with identification badges. These badges shall be worn by all members of the Contractor's staff and all of Subcontractors' staff who are working in a District facility.
   2. Badges must be filled out in full and contain the following information:
      - Name of Contractor
      - Name of Employee
      - Contractor's address and phone number

Badges must be worn when Contractor or his/her employees are on site and must be visible at all times. Contractors must inform their employees that they are required to allow District employees, the Architect, the Construction Manager, the Program Manager, or the Project Inspector to review the information on the badges upon request.

3. Failure to display identification badges as required may result in the assessment of fines against the Contractor.

F. All onsite staff or subcontractors will be required to adhere to all applicable and existing federal, state, and/or local statutes, orders, rules, regulations, ordinances, and/or directives relating to construction site safety in connection with COVID-19, and/or any similar virus or derivative strain as well as fingerprinting requirements of Education Code section 45125.1. It is the responsibility of the Contractor to ensure that these statuses are maintained through the entirety of the project.

2.03 COMMUNICATIONS REGARDING THE WORK

A. Authorization: No directions or information regarding the Work shall have a contractual effect unless directed to the Contractor and by the Owner. The following representatives shall be used for the project:

| Owner | Contractor |
|---|---|
| Contra Costa Community College District<br>500 Court Street<br>Martinez, CA 94553 | Organization<br>Department<br>Street Address<br>City, State Zip<br>Phone \| Email |

B. Prioritization: The Contractor shall prioritize all communications regarding the Work that require a response by the Owner. The Contractor shall initiate all communications regarding work as far in advance as is practical to permit timely Owner response.

C. Standard Communication Forms: Owner and Contractor shall establish standard communication forms that shall be used by the Contractor in communications regarding the Work unless otherwise directed by the Owner.

2.04 OWNER REVIEW TIME

A. Contractor shall allow at least the following review time periods:

| | |
|---|---|
| 1. Design Review | Fourteen (14) calendar days, for each phase of design |
| 2. Requests for Information (RFIs) | Seven (7) calendar days unless stated otherwise in the Contractor Documents. |
| 3. Submittals | Twenty-one (21) calendar days unless stated otherwise in the Contract Documents. Resubmittals shall be allowed the same for review as the time permitted for the initial submittal. |

| | |
|---|---|
| 4. Substitution Requests | Fourteen (14) calendar days unless stated otherwise in the Contract Documents. |
| 5. Other Requests | Fourteen (14) calendar days unless stated otherwise in the Contract Documents. |

2.05 ACCESS AND SITE COORDINATION

A. Construction Work Zone plans shall be developed and approved by the District prior to any construction on site.

B. Staging Areas: The Contractor's staging area for trailers, construction vehicles, construction equipment and materials is restricted to the approved staging and laydown area. Refer to Construction Work Zone plans for proposed staging and laydown areas upon final District approval.

C. Parking

1. Working trucks may be parked in the staging or public parking areas.

2. All other parking on Campus requires the purchase of a daily or monthly parking pass. Campus police will issue parking tickets for anyone using campus parking lots or roadways without a parking pass.

D. Access and Deliveries:

1. Contractor may accept normal deliveries inside the construction staging areas.

2. Contractor shall schedule deliveries outside the construction staging areas in advance with approval from the District.

3. Submit a traffic control plan to the District for large deliveries unloaded outside the construction staging areas for coordination and approval by the District.

4. Access to the Brentwood campus is one-way and a fire lane. The Contractor is cautioned not to attempt to drive the wrong way on this road. Campus police will issue tickets for driving the wrong direction or blocking the fire lane.

5. Material and equipment deliveries on this one-way road to the construction site shall be closely monitored and controlled by the Contractor to avoid any delays to other vehicles using this road. The Contractor shall include delivery milestones in its Project critical path method (CPM) Design-Build Schedule, and provide written notice at least two (2) workdays to the District and to the Police Services for all deliveries. Any material or equipment deliveries that could potentially delay traffic on this one-way road will have to be delivered after normal business hours, unless otherwise approved by the District. Contractor truck deliveries that stop traffic on this road or other roads on Campus could be subjected to being ticketed by the Police Services.

E. The Contractor is responsible for maintaining fire lane access and clearances at all easements at all times.

F. The Contractor shall coordinate closely with the Owner to ensure all construction activities minimize impact on Owner operations at the sites.

G. The Contractor and Owner will mutually agree in writing on site access policies prior to the beginning of work. Policies will cover allowable times or schedules for entry, support for testing and inspections, access to utility meters and lockable disconnect, vehicle entry and access, use of site utilities or amenities, fencing requirements, and access points.

H. The Contractor shall schedule its operations on the job site to provide for:

1. Pedestrian/vehicle ingress and egress from site at all times, except if otherwise approved in writing by the Owner.

2. Driveways, Walkways and Entrances: Keep driveways, parking lots, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.

3. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

I. The construction schedule shall show the start and end of any partial closures to any site access points. Contractor shall notify the Owner **forty-eight (48) hours** in advance of any closures.

1. Contractor shall notify Owner immediately upon any change in project schedule or operation that may affect access. Owner will be responsible for notification to affected parties.

J. Contractor, Contractor's employees, and all subcontractors shall adhere to applicable Owner requirements as well as all Federal, State, and County Public Health and Owner COVID-19 protocols.

K. All active work areas must be fenced off from start of work at that area until completion or until area is safe for entry, whichever is longer. Temporary fencing and access control layouts shall be submitted to the Owner and approved for each site prior to commencing construction. Temporary fencing shall also be installed to protect trees and vegetation adjacent to work areas from construction damage. For roof installation, fall protection shall be provided and utilized by the Contractor.

L. Contractor acknowledges that adjacent facilities will remain in operation during all or a portion of the Work, and it shall take all reasonable precautions to minimize noise as required by applicable laws and the Contract Documents. Notice of proposed noisy operations, including without limitation, operation of pneumatic demolition tools, concrete saws, and other equipment, shall be submitted to Owner a minimum of forty-eight (48) hours in advance of their performance. Contractor shall further prevent any of its employees or its subcontractor employees from playing any recorded music devices or radios or wearing any radio headphone devices for entertainment while working on the project.

M. If deliveries must be made when people are present on site, two (2) or more ground guides shall lead the vehicle across the area of travel. The speed limit on-the Premises shall be five (5) miles per hour (maximum) or less if conditions require. Owner shall designate a construction entry point to each site. Forty-eight (48) hour advanced notice must be coordinated with the Owner.

N. During the operational phase, all staff or subcontractors must provide twenty-four (24) hours advanced notice to Owner and check in with the Owner upon arrival at the site.

## 2.06 PERMITS

A. Contractor is responsible for obtaining, implementing and adhering to all permit requirements. The Contractor shall be responsible for permit closeout and certification of all project-related permit applications. All permit related costs shall be the responsibility of the Contractor.

B. The Owner will act as the lead agency for CEQA, Contractor is responsible for supporting the Owner with CEQA documentation and implementing any mitigation requirements. The responsibility for the cost of CEQA mitigation shall be per the Contract.

C. Contractor shall prepare Storm Water Pollution Prevention (SWPPP) as applicable based on disturbance. Contractor shall ensure implementation and monitoring of a Storm Water Pollution Prevention Plan (SWPPP) for the purpose of preventing the discharge of pollutants from the construction site as required by the local Authority(s) Having Jurisdiction (AHJs).

D. Contractor is to meet applicable codes and specifications with regard to dust during construction and seek to minimize dust migration from the construction site.

## 2.07 TESTS AND INSPECTIONS

A. Compliance.

1. Tests, inspections, and approvals of portions of the Work required by the Contract Documents will comply with Title 24, and with all other laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction.

B. Independent Testing Laboratory.

1. The District will select and pay an independent testing laboratory to conduct all tests and inspections required by regulatory agencies. Selection of the materials required to be tested shall be made by the laboratory, and not by the Contractor. All costs for all other tests shall be included in the proposal cost and shall be paid for by the Contractor. Any costs or expenses of inspection or testing required by regulatory agencies, incurred outside of a fifty (50) mile radius from the Project Site or not located in a contiguous county to the Site, whichever distance is greater, shall be paid for by the District, invoiced by the District to the Contractor, and deducted from the next Progress Payment.

C. Contractor Responsibilities.

1. Make samples available to the Independent Testing Laboratory. Samples shall be selected by laboratory personnel. Allow proper time for selecting samples, and making tests or considerations.

2. Cooperate with laboratory personnel, and provide access to work and to manufacturer's facilities.

3. Provide incidental labor and facilities to provide access to work to be tested, to obtain and handle samples as selected by laboratory personnel at the site or at source of products to be tested, to facilitate tests and inspections, and for storage and curing of test samples.

4. Schedule all tests and inspections with the testing and inspections firm and to notify Construction Manager and Project Inspector a minimum of 3 working days prior to expected time for operations requiring inspection and testing services. Do not allow work to be covered prior to inspection and testing.

5. Cooperate fully with the testing laboratory's personnel and with special inspectors in inspection any part of the construction and in taking any samples of materials required to be tested. Provide access to the work. The Contractor's personnel shall furnish and cut or prepare all samples in the presence of either the testing laboratory personnel or the special inspectors and secure the witness's initial on each sample prepared.
6. Notify the testing laboratory to pick up the initialed samples the same day the samples were prepared. Alert the testing laboratory three (3) working days in advance as to the times and location of the required sampling, tests and inspections so as to not delay the work of the project, and make sure that the required sampling, tests inspections are promptly completed.

D. Contractor Paid Test/Inspection Reports not required by regulatory agencies:
1. Reports will comply with Section 4-335(d), Part 1, Title 24, CCR.
2. Include every test and inspection made regardless of whether such tests and inspections indicate that the material and procedures are satisfactory or unsatisfactory.
3. Include records of special sampling operations as required.
4. Indicate that materials were sampled and tested in accordance with requirements of CCR regulations and Construction Documents.
5. Indicate specified design strength of materials such as masonry, concrete and steel.
6. State whether or not materials and procedures comply with requirements of the Construction Documents.
7. Submit copies of reports to District, Architect, Project Inspector, Structural Engineer, Civil Engineer, Soils Engineer and Contractor within fourteen (14) days of tests. Submit copies of reports of non-complying materials and procedures immediately.

E. Advance Notice to Inspector.
1. The Contractor shall notify the Inspector a sufficient time in advance of its readiness for required observation or inspection so that the Inspector may arrange for same, but no less than two (2) workdays.
2. The Contractor shall notify the Inspector a sufficient time in advance, but no less than two (2) workdays, of the manufacture of material to be supplied under the Contract Documents which must, by terms of the Contract Documents, be tested in order that the Inspector may arrange for the testing of the material at the source of supply.

F. Testing Off-Site.
1. Any material shipped by the Contractor from the source of supply, prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said Inspector that such testing and inspection will not be required, shall not be incorporated in the Work.

G. Additional Testing or Inspection.
1. If the Inspector, the Architect, the District, or public authority having jurisdiction determines that portions of the Work require additional testing, inspection, or approval not otherwise included, the Inspector will, upon written authorization from the District, make

arrangements for such additional testing, inspection, or approval. The District shall bear such costs except as otherwise noted.

H. Costs for Retesting.

1. If such procedures for testing, inspection, or approval reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs arising from such failure, including those of re- testing, re-inspection, or re-approval, including, but not limited to, compensation for the Architect's services and expenses. Any such costs shall be paid by the District, invoiced to the Contractor, and deducted from the next Progress Payment.

I. Retesting Covered Work.

1. Re-examination of previously tested and inspected work may be ordered by the District, Architect, or by the Project Inspector. The Contractor shall uncover such work if retesting is ordered. If work is found in accordance with Contract Documents, the District will pay costs of uncovering, removing, retesting and replacing. If work is found not in accordance with Contract Documents, the District will deduct the cost of retesting from the Contract Sum by Change Order and the Contractor will bear the costs of uncovering, removing and replacing work.

J. Costs for Premature Test.

1. In the event the Contractor requests any test or inspection for the Project and is not completely ready for the inspection, the Contractor shall be invoiced by the District for all costs and expenses resulting from that testing or inspection, including, but not limited to, the Inspector's and Architect's fees and expenses, and the amount of the invoice of shall be deducted from the next Progress Payment.

2.08 EXISTING FACILITIES, PROTECTION AND REPAIR

A. Contractor shall protect and maintain all the existing facilities within the project limit.

B. The Contractor shall be responsible for specifying and conducting vegetation removal or trimming, including tree removal and/or trimming as needed. All tree stumps shall be ground or removed to a minimum of twelve (12) inches below grade. Disturbed area shall be repaired to match surrounding area.

C. Areas with trees eligible for removal or trimming will be identified with Owner approval, or as noted in the Bridging Documents, and should be confirmed by the Contractor during the site walk. Trees to be removed shall be identified on the Contractor's proposal layouts and design drawings. The Contractor shall be responsible for obtaining any required permits from AHJs for tree or vegetation work.

D. Contractor shall be responsible for identifying and specifying vegetation trimming, including tree trimming prior to construction mobilization. Owner shall be responsible for completing vegetation trimming, including tree trimming identified by Contractor.

E. During the operational phase of the project, Contractor shall be responsible for ongoing vegetation trimming, including tree trimming as-needed to maintain production guarantees. Contractor shall utilize Owner's arborist, or another Owner approved arborist, to conduct all tree trimming.

F. Contractors are responsible for ensuring Americans with Disabilities Act (ADA) compliance for the Project. This shall include design work necessary for AHJ plan check and all construction to meet permitted design. Cost for ADA work shall be per the Contract.

G. Contractor is responsible for identification and removal of light poles that are in conflict with the Project. Light poles shall be removed to maintain reusability by the Owner and transported to the location identified by the Owner. Light pole foundation shall be chipped to a sufficient depth so as to allow for existing conduit to be contained in a concrete traffic rated box that is flush with the surface and for resurfacing of areas surrounding any boxes to match existing surface. Chipping shall be a minimum of 6" below grade. Existing conduit that is not reused shall be capped and placed in a concrete, traffic rated box. Existing lighting controls may be reused, if available. Light poles to be removed shall be identified on the Contractor's proposal layouts and design drawings. Disturbed area shall be repaired to match surrounding area. Light poles shall be provided in good condition to the Owner or disposed of at the Owner's option.

H. Contractor is responsible for restoring, and irrigating until vegetation is established, all vegetated areas disturbed by construction. Vegetation should be planted to match existing. Any irrigation disturbed during construction is to be repaired to original condition by the Contractor. The Contractor shall coordinate all landscaping and irrigation plans with the Owner. The Contractor shall initiate a pre-construction survey with the Owner to review the condition of irrigation systems prior to start of construction. Any such survey must be done with a Owner representative.

2.09 UNDERGROUND UTILITIES

A. The Contractor is responsible for locating and protecting all underground utilities. Contractor shall utilize Ground Penetrating Radar (GPR) for all areas with underground construction. Where critical underground facilities exist, Contractor shall perform potholing/hand digging to locate the utilities.

B. Known existing utilities, improvements have been located with as much care as possible with the aid of Owner records. However, the Owner assumes no responsibility as to their exact location. Contractor shall take measures necessary to protect existing utilities and improvements. Any damages to existing utilities and improvements not included for demolition shall be repaired and or restored by the Contractor without cost to the Owner.

C. The Contractor shall contact the regional notification center, "Underground Service Alert," and schedule work required to allow for ample time for the center to notify its members and, if necessary, for any member to field locate and mark facilities as directed in Government Code Sections 4216 to 4216.9. Every person planning to conduct any excavation shall contact the appropriate regional notification center at least two (2) working days, but no more than fourteen (14) calendar days prior to commencing the excavation.

D. Contractor is directed to and shall comply with Section 4216 et seq of the California Government Code, and Article 5.3.16, "EXISTING UTILITIES, IMPROVEMENTS AND OBSTRUCTIONS" of the General Conditions of this Contract and this Section.

## 2.10 CLEANUP

A. Contractor is responsible for patching and repairing all building penetrations performed by the Contractor during installation. Conduit installed on the exterior of Owner structures shall be painted to match.

B. Contractor is responsible for disposing of all generated trash. Owner owned dumpsters and trash bins may not be used for storage or disposal.

C. Contractor shall clean all work areas on a daily basis and equipment after project completion. Contractor shall ensure that work areas are clear of construction debris, spoils and that all demolition and repair has been completed prior to releasing work areas to public access.

D. Contractor shall provide the necessary personnel, equipment, and materials needed to maintain cleanliness. Conduct daily inspection to verify that requirements of cleanliness are being met.

E. Use cleaning materials and equipment, which are compatible with the surfaces being cleaned. Such cleaning materials and equipment shall be approved by the Owner. The Contractor shall use broom and vacuum cleaner to remove gravel and other loose materials generated by the Contractor operations to keep job site surfaces clean. The Owner reserves the right to withhold approval of payment requests for failure on the part of the Contractor to regularly clean the project site in conformance with the requirements of this section. The Owner also reserves the right to clean any work areas that have not been acceptably cleaned by the Contractor and charge the Contractor for the Owner's cleaning costs.

F. Upon completion of Work, and prior to final acceptance, the Contractor shall remove from the vicinity of work and dispose of all surplus materials and equipment used by the operations and completes all the cleaning and removal of rubbish and debris.

G. The Contractor shall submit documentation to demonstrate the disposal site for all materials, equipment and debris is in compliance with all federal, state, and local regulations.

## 2.11 WARRANTIES

A. Contractor shall provide a one-year full wrap warranty, including troubleshooting and repair of all work and equipment installed as part of the Project to meet functional, operational and performance requirements. This shall include administration and physical replacement of all RMAs (inverter, PV module, DAS or other equipment). All work in the one-year period shall be at no cost to the Owner, except for damage or misuse by Owner or others not under the control of the Contractor.

B. The Contractor shall be required to provide the following minimum warranties consistent with Net Energy Metering requirements and the California Public Utility Code 387.5(d)(4):

1. A warranty of not less than 10 years to protect against defects and more than a 15% degradation of electrical generation output that may occur as a result of faulty installation.
2. At least twenty-five (25) years for any PV modules
3. At least ten (10) years for all inverters

C. Meters shall have a 1-year warranty to ensure against defective workmanship, system or component breakdown, or degradation in electrical output of more than 15% from their

originally rated electrical output during the warranty period. For meters that are integrated into the inverter, the meter warranty period shall be 10 years.

D. Warranties for other energy systems shall be provided per the Contract and Bridging Documents. Where warranty requirements are in conflict, the more stringent shall apply.

2.12 ENERGY SYSTEM CRITERIA

A. Designs shall meet all performance criteria (e.g., production, storage, resiliency, etc.) outlined in the Bridging Documents. Should a site have insufficient area or be otherwise constrained in such a way that limits ability to meet targets, Contractor shall notify Owner and provide recommended alternatives.

B. All homerun routes identified in the Bridging Documents are preliminary. The Contractor shall be responsible for identifying the appropriate conduit/conductor routes in coordination with the Owner. Contractor shall adhere to the number of tie-ins at each site as required in the Bridging Documents. Any changes to interconnection schemes identified in the Bridging Documents shall be approved in writing by the Owner.

C. Contractor is responsible for assuming all utility coordination and interconnection related responsibilities, including completing and/or modifying all interconnection applications and completing all work required to achieve Permission to Operate (PTO) with the local utility.

D. The Contractor shall work with the Owner as needed to provide assessment of potential noise. The maximum sound level generated from the energy systems and any associated equipment under any output level within the energy system operating range shall be limited to 65 dBA at 50 feet in any direction.

E. Systems shall be designed to perform in the ambient temperature conditions where they are installed. The Contractor shall ensure that all equipment is rated for sustainable operating temperatures over the ambient temperature range at the Project site(s).

F. Measurement and metering shall meet requirements stated in the Contract. Data acquisition and storage systems shall meet 99.5% data recovery—i.e., no more than 0.5% data loss.

G. Contractor shall work with the Owner to ensure that monitoring and alarm systems are sufficient to ensure safety and to safely mitigate hazards, if hazardous conditions should arise.

2.13 PAYMENT FOR STORED MATERIALS

A. General.

1. Contractor may request payment for materials and equipment which will be incorporated into the Work and are delivered to the Project or stored on the Site.

2. The material must meet the Contract requirements. Submit the required test results and certifications with the Owner.

3. Materials cost must be evidenced by manufacturer's paid invoice bearing the statement that Contractor has paid all previous invoices.

4. The Owner will consider only non-perishable materials for major items of the Work or Materials provided each such individual item has a value of more than 1% of the Contract Price and will become a permanent part of the work.

5. Contractor must provide the Owner, upon request and prior to any partial payment, documentation which transfers absolute legal title to such materials to the Owner conditional only upon receipt of Final Payment. Neither such transfer of title nor any partial payment shall constitute acceptance by the Owner of the materials, nor void the right to reject materials subsequently found to be unsatisfactory Article 5.3.5, “Materials and Samples”, or in any way relieve Contractor of any obligation arising under the Contract Documents.
6. The payments for materials on hand are subject to retention.
7. Contractor must assume all risks associated with the loss or damage to the stored products for which payment has been received or not.
8. Materials and equipment must be stored in accordance with manufacturer’s recommendations. The stored products shall be in a form ready for installation. The Owner will not pay for raw materials or parts and pieces of equipment.
9. Any and all surplus materials that are not incorporated in Work will become Contractor’s property at no additional cost to the Owner.
10. Unless specifically provided in the contract, payment for materials on hand is not included when determining the percentage of Work completed.

B. Payment for Stored Materials Off Site.

1. Payment for materials and equipment delivered and stored off-site shall be contingent upon Contractor’s compliance with the storage and protective maintenance requirements set forth in the Contract Documents and all other requirements necessary to preserve equipment warranties for the benefit of the Owner.
2. The Owner reserves the right to refuse approval for payment for any equipment or materials suitably stored off-site in its sole discretion, regardless of whether all conditions herein have been met.
3. Costs associated with delivery to and storage at an off-site facility shall be assumed by Contractor regardless of the Owner’s approval to deliver and store the materials.
4. Contractor shall provide written evidence to the Owner of having made arrangements for unrestricted access by the Owner and the Owner’s authorized representatives to the materials wherever stored, including provision for the Owner to take control and possession of such materials at any time and without restriction.
5. The material shall be clearly marked and identified as being specifically fabricated, produced, and reserved for use on the Project.

2.14 PUBLIC PROJECT REQUIREMENTS

A. Public Works Compliance. The Contractor shall be required to comply with all applicable California public works and project requirements

B. Department of Industrial Relations Notice and Registration. This project subject to compliance monitoring and enforcement by the Department of Industrial Relations (DIR):

1. No Contractor or subcontractor may perform any work in relation to a Proposal or resulting Contract unless registered with the Department of Industrial Relations pursuant to Labor

Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

2. No Contractor or subcontractor may perform any work in relation to a Proposal or resulting Contract unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 throughout the time such Contractor or subcontractor performs any work. The Owner shall have the right to terminate any agreement in the event of non-compliance with this requirement, or require termination of any Contractor or subcontractor not in compliance with this requirement.

3. Every Contractor or subcontractor performing any work in relation to a Proposal or resulting Contract will be required to comply with all certified payroll recording and reporting requirements, including, without limitation, entering certified payroll reports directly into the DIR electronic eCPR system for any "new" projects awarded after the effective date, April 1, 2015.

C. Prevailing Wages. Pursuant to Section 1720.6 and Section 1771 of the Labor Code, the Project is subject to the payment of prevailing wages. The Director of Industrial Relations has determined the general prevailing rate of per diem wages in the locality in which this work is to be performed for each craft or type of worker needed to execute the Contract which will be awarded to the Contractor, copies of which are on file and will be made available to any interested party upon request at the Owner's Records Management Department at or online at http://www.dir.ca.gov/dlsr. A copy of these rates shall be posted by the Contractor at the job site. The Contractor and all subcontractors shall comply with all applicable Labor Code provisions, which include the payment of not less than the required prevailing rates to all workers employed by them in the execution of the Contract and the employment of apprentices.

D. Ineligible Contractors. Pursuant to Public Contract Code § 6109, a Contractor, who is ineligible to perform work on the public works project pursuant to Section 1777.1 or 1777.7 of the Labor Code, may not perform any work on this Project.

E. Bonding. The Contractor will be required to furnish the Owner with a Payment and Performance Bond equal to 100% of the installation contract price, prior to commencement of project work for all financing options. All bonds are to be secured from a surety that meets all of the State of California bonding requirements, as defined in Code of Civil Procedure Section 995.120. Proposals shall include the cost of obtaining such bonds.

F. Non-Collusion Declaration. Contractors shall execute a "Non-Collusion Declaration".

G. Fingerprinting Requirements. The Contractor, all of its employees and Sub-Contractors shall comply with the applicable requirements of California Education Code Section 445125.2 with respect to fingerprinting of employees who may have contact with the Owner's students. In no event shall any employees of the Contractor or any of its Sub-Contractors come into contact with the Owner's students before complying with the fingerprinting requirements of California Education Code section 45125.2. The Contractor shall ensure the safety of the pupils by one or more of the following methods:

1. The installation of a physical barrier at the worksite to limit contact with pupils. None of Contractor's or Sub-Contractors' personnel may interact or converse with students.

2. Submission to the California Department of Justice of fingerprints of all employees of the Contractor and Sub-Contractors who will have more than limited contact with the students.

3. Continual supervision and monitoring of all employees of the Contractor and its Sub-Contractors by an employee of the Contractor whom the Department of Justice has ascertained has not been convicted of a violent or serious felony. For purposes of this paragraph, an employee of the Contractor or its direct Contractor may submit his or her fingerprints to the Department of Justice pursuant to subdivision (a) of Education Code Section 45125.1 and the Department shall comply with subdivision (d) of Section 45125.1. Prior to allowing worker contact with students, the Contractor or its direct Contractor shall receive a determination from the Department of Justice that the employee has not been convicted of a violent or serious felony as defined in Education Code section 45122.1.

H. All other applicable California Public Works Code requirements.

2.15 SUBMITTALS

A. Provide submittals in the format, and as described below:

1. Submittals shall be submitted to the District, electronically in PDF format that is searchable and bookmarked, within three (3) Calendar Days from the Notice to proceed, except as otherwise noted. Refer to specifications for further submission procedures.

2. Submittals that require local and State agency approval, shall conform to this Specification and the requirements of the local or State agency.

3. District will review and provide a response to submittals within eight (8) workdays (excluding holidays). Submittals that include design documents prepared by a licensed California Engineer will be submitted for the District's records. Any District review and response to the Contractor's design documents by a licensed California Engineer will be for format and general compliance only.

B. Provide submittals for all equipment, if any, listed on the drawings and performance documents.

C. The Schedule of Values shall be submitted to the District within seven (7) calendar days after the Notice of Award. The Schedule of Values shall include the following minimum categories and be coordinated with the agreement language:

1. Bonds & Insurance

2. Special Conditions and Requirements

3. Design Documents

4. Design DSA Approved Documents

5. Mobilization at Site

6. Construction Submittals

7. Construction

   a. Per AHU & VAV
   b. Abatement
   c. Demo
   d. Install

e. Controls
f. Commissioning (Performance Verification)

8. Closeout Documents
    a. O&M and Warranties
    b. As-Built Drawings
    c. Training

The District will only pay for Work installed at the Site for items 5 through 8.

D. CPM Schedule shall be submitted within three (3) workdays from the Notice to Proceed of the Contract electronically in Adobe PDF format and Microsoft Project file format. District and Contractor shall meet and review the schedule. The CPM Schedule is required to demonstrate that the work can be performed within the Term of the Agreement, and for the District's adequate monitoring of the progress of the Work. The District may disapprove or require modification to the schedule if, in the opinion of the District, adherence to the schedule will not cause the Work to be completed in accordance with the Agreement. Below are the minimum activity types that shall be included in the schedule:

1. Contractor Submittals at 30%, 60% and 90%
    a. Include Submittal Reviews by District Performance Criteria Engineer and District
2. DSA Approval
3. Construction Submittals
4. Procurement and Fabrication
5. Mobilization at Site
6. Installation activities corresponding to the Schedule of Values
    a. Temporary interruptions or shutdown of any utilities
    b. Proposed class move coordination.
7. Substantial Completion Milestone
8. Project Closeout activities
9. Final Completion Milestone

Submittals are for review of conformance with the requirements of the Contract.

Development of schedules, and schedule updates, and project status reporting requirements of the Contract shall employ computerized Critical Path Method (CPM) scheduling utilizing Microsoft Project. All activities shall have predecessors and successors to generate a project critical path and total float for each activity.

Contractor must submit a monthly update in Microsoft Project file format along with payment requisition.

## 2.16 SUMMARY OF STAGING AND WORK RESTRICTION REQUIREMENTS

A. Prior to the start of Work, Contractor shall familiarize itself with the Work Restrictions as they relate to all Work required by the Contract Documents.

B. Temporary Work Activity Plan shall include:

1. Full size drawing (36”x42”) and email Adobe PDF format of site plan showing the proposed locations and dimensions of temporary facilities and activities, including but not limited to, all proposed trailers, equipment and material storage areas on the Project Site; safe and ADA complaint access (ingress/egress) for pedestrians and vehicles around the construction areas; proposed haul routes; all temporary construction, and way-finding signage; temporary fenced area(s), noise and safety barriers, and dust partitions; and temporary measures to maintain continuous and uninterrupted code compliant use of all occupied and surrounding areas impacted by construction activities. Identify any areas that require temporary paving for stabilization or prevention of tracking of mud, and for ADA complaint ingress and egress. Indicate if the use of supplemental or other staging areas might be required. Also see performance documents for Temporary Facilities and Control for additional requirements.

2. Prior to starting work the Contractor shall provide a proposed schedule of temporary interruptions or shutdown of any utility or electrical/mechanical systems to the District Representatives as part of the Temporary Work Plan. The Work Activity Plan shall be prepared in conjunction with the Contractor’s Schedule and include dates for tasks that limit building use, impact utilities and/or services, and/or require College personnel assistance.

3. Contractor shall submit two (2) hard copies at the pre-construction meeting, and email Adobe PDF Format of the initial submittal of the Temporary Work Activity Plan for review by the District and District Representatives and by personnel from the Campus (e.g., Buildings & Grounds, Police Department, and other representatives).

4. Contractor shall provide written request (10) working days prior to the desired time for the proposed interruption(s). Work shall be performed at times other than the Campus’s normal hours of operation, or as directed by the District’s Representatives. Temporary interruptions shall be completed prior to the start of the next business day at the Campus to maintain continuous and uninterrupted use of Campus facilities and utility systems

C. Contractor shall perform and complete all Temporary Work Activities to ensure the following:

1. Protection of students, staff, faculty and personnel in occupied areas and surrounding and adjacent areas from the hazards and dust associated with construction.

2. The work areas, roads, parking lots, and streets are to be kept clear, clean, and free of loose debris, construction materials and partially installed work which would create a safety hazard or interfere with subcontractor and personnel duties and traffic. Contractor shall sweep the areas clean at the end of each workday and make every effort to keep dust and noise to a minimum at all times.

3. Contractor shall construct dust partitions and other barriers as required prior to the start of abatement or demolition activities, whichever may occur first, and they must remain in place until the completion of that activity where required.

a. Corridor and Classroom zones shall be left clean and ready for occupancy whenever work occurs in those zones. The Contractor shall provide a professional cleaning service for this purpose. The District may clean these areas at the Contractor's expense if the area is not ready for class after the work by the Contractor.

2.17 SUMMARY OF WORK RESTRICTIONS

A. General: All Temporary Work Activities must be completed within the timelines, work shift times, and the scheduled time period as required by the Contract Documents. Comply with the following:

1. The Temporary Work Activity Plan shall be approved by the District prior to any Work starting on the Project Site.
2. Contractor shall have all temporary fencing, signage, ADA compliant pathways and other temporary measures described in Paragraph 1.2 above installed, operational and accepted by the District prior to starting demolition or other Work as applicable.
3. The Contractor will be working in an existing building which will be occupied. Existing buildings and their contents must be kept secure at all times.
4. Provide temporary closures as required to maintain security as directed by the Campus Police Services.
5. Provide dust covers or protective enclosures to protect existing work, equipment and materials during the construction period.
6. Relocate movable furniture [approximately [ 1.8 m (6 feet)] away from the Design- Builder's working area; protect the furniture and replace the furniture in [its] [their] original location[s] upon completion of the work. Existing equipment that is to remain attached in place, must be protected against damage, or temporarily disconnect, relocate, protect, and reinstall at the completion of the work.

B. Time Related Work Restrictions within the Contract Time

1. Contract Time is as articulated in the Agreement, and Work by the Design Builder is restricted and limited to those specific time periods at specific locations during this contract duration. Design Builder is responsible for scheduling work at mutually agreed hours. The majority of Contractor's work shall occur so as not to cause any disruption to College operations (e.g. classes, programs, and related activities, etc.). Work may have to occur before 7am or after 5pm and on weekends in certain circumstances to reduce the effect on College operations. No additional cost beyond cost proposal in the RFQ/P will be incurred by District due to work done outside normal work hours. Contractor shall also be responsible for coordinating scheduling with the District, College Police, and Buildings & Grounds.
    a. **All Work at the Campus Project Sites**: Physical activities which occurs on the College Campus must be coordinated around College operations and event schedules. Project activities which are non-invasive; silent and do not impact College operations (e.g. classes, programs, and related activities, etc.) may be conducted during instruction but must be shown as such on the Work Activity Plan.
    b. **Weekend and Holiday Work**: Contractor shall include in its base bid the cost to work weekends as stated so within the performance specifications. All overtime work for

critical and near critical path schedule activities at the Project Site to ensure that physical activities are completed to mitigate any disruption to the campus will be accounted for and made part of the total contract price. (i.e., near critical path schedule activities include any schedule activity with less than five (5) workdays of total float). Contractor shall not include in its base bid the cost to work holidays.

The Academic Calendar for session dates for each term are available at the following link: https://www.4cd.edu/hr/academic-calendars/index.html. The academic calendar provides the recesses which both District and Campus are closed; e.g. Winter Break, Spring Recess and the interval between Spring and Summer terms.

c. Stay out dates may be subject to change.

2. Contractor is responsible for its own means and methods to comply with these work restrictions, and to submit a schedule in accordance with schedule requirements in the Agreement.
3. During periods of darkness, lighting used for the Work shall not be aimed towards residential areas.
4. Utility Cutovers and Interruptions
5. Make utility cutovers after normal working hours or on Saturdays, Sundays that do not impact College operations, and Campus holidays unless otherwise approved.
6. Ensure that new utility lines are complete, except for the connection, before interrupting existing service.
7. Interruption to water, sanitary sewer, storm drain, communications, data, electric service, air conditioning, heating, fire sprinkler alarm, compressed air, and are considered utility cutovers pursuant to the paragraph Time Related Work Restrictions
8. Work plans must include mitigations for hazards and their controls during the interruptions of service.
9. Such delays must be incorporated into the Contractor's construction schedule and will be at no additional cost or time to the District.
10. The Contractor is responsible for its own means and methods to comply with these work restrictions, and to submit a schedule in accordance with schedule requirements in the agreement.

C. Other Project Requirements to Meet the Contract Time

1. Staging Areas: The Contractor's staging area for trailers, construction vehicles, construction equipment and materials is restricted to the approved staging and laydown area. Refer to Construction Work Zone for proposed staging and laydown areas upon final District approval.
2. Parking (refer to the Construction Work Zone plans)

a. Working trucks may be parked in the staging as show on the Construction Work Zone or public parking areas. Space is limited and fire lanes shall be kept open.

b. All other parking on Campus requires the purchase of a daily or monthly parking pass. Campus police will issue parking tickets for anyone using campus parking lots or roadways without a parking pass.

3. Access and Deliveries:

a. Contractor may accept normal deliveries inside the construction staging areas.
b. Contractor shall schedule deliveries outside the construction staging areas in advance with approval from the District.
c. Submit a traffic control plan to the District for large deliveries unloaded outside the construction staging areas for coordination and approval by the College.
d. Access to the Brentwood Center is one-way and a fire lane. The Contractor is cautioned not to attempt to drive the wrong way on this road. Campus police will issue tickets for driving the wrong direction or blocking the fire lane.
e. Material and equipment deliveries on this one-way road to the construction site shall be closely monitored and controlled by the Contractor to avoid any delays to other vehicles using this road. The Contractor shall include delivery milestones in its Project CPM Design-Build Schedule, and provide written notice at least two (2) work days to the District and to the Police Services for all deliveries. Any material or equipment deliveries that could potentially delay traffic on this one- way road will have to be delivered after normal business hours, unless otherwise approved by the District. Contractor truck deliveries that stop traffic on this road or other roads on Campus could be subjected to being ticketed by the Police Services.

**PART 3 - NOT USED**

END OF SPECIFICATION SECTION 01 13 00

# Attachment B2.3: 01 33 01 Design-Build Process & Submittals

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 01 33 01
# DESIGN-BUILD PROCESS AND SUBMITTALS

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This specification applies to a design-build project and includes the design, construction and commissioning of a complete energy system as described here and elsewhere in the Contract and Bridging Documents.

B. In this document, "Owner" shall refer to owner of the site where project will be located, regardless of system ownership, and include any representative of the site owner, such as independent engineers, consultants or inspectors. "Contract" refers to the design-build and/or construction contract and any associated design-build bridging documents, inclusive of requirements outlined in the request for proposals (RFP). "Contractor" refers to the entity performing the work, inclusive of Engineer(s) and Architect(s) of Record for design-build contracts.

C. Contractor shall follow the design-build process and submittal requirements of this specification, Section 01 10 00: Summary of Work, other technical specifications, and the Contract and Bridging Documents for all stages of work.

D. Bridging Documents may be amended or supplemented to include elements or ideas from Contractor’s Proposal or other proposals, but only to the extent Owner expressly agrees in writing. Contractor is solely responsible for confirming the extent of any changes to the Contract and Bridging Documents.

### 1.02 RELATED DOCUMENTS

A. The Contract and any Design-Build Bridging Documents.

B. 01 10 00: Summary of Work

C. 01 13 00: Supplementary Criteria

D. 05 90 02: Solar Photovoltaic Canopy Structures

E. 26 00 00: General Electrical

F. 26 31 13: Diesel Generator

G. 48 14 00: Solar Photovoltaic System

H. 48 17 13: Battery Energy Storage System

I. Other technical bridging specifications

J. Where this specification and the Contract or other Bridging Documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended changes or procedures with the Owner.

**PART 2 - PROCESS & SUBMITTALS**

2.01 DESIGN PHASE

A. The Owner shall review and approve design documentation based on the requirements in this Specification, the Contract and the Bridging Documents. The design drawings and associated documents shall represent 100% of the intended and agreed upon scope for the Project. The Contractor shall be solely responsible for providing complete design and engineering, compliant with all applicable laws and the requirements of the Contract and Bridging Documents, by and through appropriately licensed design professionals, including, without limitation, licensed architects and registered professional engineers employed by, or under direct contract with Contractor. The design professionals so engaged shall serve as the Engineer(s) of Record and Architect of Record (for projects requiring an AOR).

B. Upon Contract Execution, the Owner will be provide the Contractor a Notice to Proceed (NTP) for the design phase of the project. Contractor shall submit executed NTP to the Owner prior to commencing due diligence and site discovery. Upon Design NTP, Contractor shall begin due diligence and site discovery as detailed in 01 10 00, Summary of Work. Contractor shall ensure close coordination with Owner for site access and scheduling.

C. The Contractor shall organize and conduct weekly meetings during the design process, including providing formal meeting minutes. Three phases of formal design submittal are required as listed below, as well as a final Construction Document (CD) set following AHJ approval. For each phase of submittal, Contractor shall conduct design review meetings and maintain and distribute formal meeting minutes for each stage.

The following is an estimated schedule for each design phase submittal:

| **Design Stage** | **Time from Contract Execution** |
|---|---|
| 30% Schematic Design (SD) | within 6 weeks |
| 60% Design Development (DD) | within 10 weeks |
| 90% Construction Documents (CD) | within 14 weeks |
| Final CD Set | Prior to NTP |

D. The Contractor shall submit an electronic submittal package for each Design Stage including, but not limited to the items outlined in Table 1.

E. The Contractor shall host formal design review meetings with the Owner and their representatives for each design stage submittal. The Contractor shall submit the design stage package no less than five (5) business days prior to the design review meeting. The Owner and their representative(s) will provide formal comments for each phase of design and shall have ten (10) business days for review of each submittal.

F. The Contractor shall address all Owner comments in writing in the Owner's preferred format and provide their comments with the next design submittal. The Owner's review period will not begin until a complete design package and comment responses are received.

G. Owner comments shall be incorporated into each successive stage of the design review. If the Owner has substantial comments on the 90% CD submittal, a formal review of the Final CD set may be performed by the Owner and at the Owner's discretion and at no additional cost to the

Owner. Contractor shall perform subsequent revisions and comment tracking prior to acceptance and issuance of a construction NTP.

## Table 1 – Design Submittal Packages

| Submittal Requirement | 30% Schematic Design (SD) | 60% Design Development (DD) | 90% CD Pre-AHJ & Final CD Set |
|---|---|---|---|
| 1. Cover Sheet (TOC, project details, designers of record, Equip. Summary Table[1], etc.) | X | X | X |
| 2. Energy System Sizes & Production Estimates | X | X | X |
| 3. Site Plan (including array names, interconnection details, conduit routes) | X | X | X |
| 4. Interconnection Equipment Assessment | X | X | X |
| 5. Electrical Site Plan Drawings, incl. Balance of System | X | X | X |
| 6. Electrical Single Line Diagrams w/ Utility Meter #s (& ex. PV) | X | X | X |
| 7. Site Plan (including topographic survey, GPR/UG utilities, easements) | | X | X |
| 8. Demolition Plans (tree/lights first submittal, comprehensive for final submittal) | | X | X |
| 9. Trench/Conduit Routes, Vault Locations, UG/Vault Details | | X | X |
| 10. DC String Wiring Plans (with corresponding inverter locations & IDs) | | X | X |
| 11. Electrical Grounding Details | | X | X |
| 12. Signage Details | | X | X |
| 13. Monitoring System & Metering Details | | X | X |
| 14. Lighting Plan, As-Builts, Details and Photometric Plans | | X | X |
| 15. Equipment Pads, Mounting Details and Elevations | | X | X |
| 16. All specifications related to the Scope of Work | | X | X |
| 17. Construction Schedule | | Prelim | Detailed |
| 18. Interconnection Plan | | | X |
| 19. Interconnection Application Revision & Any Utility Coordination/Correspondence | | | X |
| 20. Array Elevation Plan View | | | X |
| 21. Structural Drawings and Calculations | | | X |
| 22. Equipment Manufacturer's Cut Sheets and Details | | | X |
| 23. Complete list of all Subcontractors, incl. specialty | | | X |
| 24. Site Specific Construction Management Plan | | | X |
| 25. Contractor's Commissioning Protocol | | | X |
| 26. Complete Design Package Sufficient for AHJ Review | | | X |

Notes:

1. Equipment Summary Table shall include the following with details: Array No/Name, Dimensions, Azimuth, Tilt, Module Model/Count, Inverter Model/Count, Nameplate, No. of Strings, Canopy Column Count. BESS System, if included, shall list Power (kW), Energy (kWh), Pad Dimensions, Manufacturer and Control System.

H. The Owner will formally approve, in writing, each phase of the design upon determination that the design is progressing at or beyond the percentage completion expected at stage. The Contractor shall not enter a subsequent design phase without the approval of the Owner. The Contractor is solely responsible for obtaining approvals from the Owner and all other Authorities Having Jurisdiction (AHJs).

I. The Contractor shall submit a System Size Spreadsheet showing all system sizes by site. For PV systems, size shall include modeling with year one production (kWh), and associated yields (kWh/kWp) per item 2 in Table 1. The spreadsheet shall be submitted at each phase of design as noted above and prior to construction. All final PV system designs shall be within 5% of contracted target production and must receive written approval from the Owner before submittal to the AHJ. Along with the System Size Spreadsheet, the Contractor shall provide modeling software output reports, including shade analysis and 8760 production data using approved modeling software and assumptions prior to construction and post construction phase submittals. Where other energy system components are included in the scope, the spreadsheet shall include nameplate and other key operational details for the additional systems.

J. The Contractor shall conduct an interconnection equipment assessment for each interconnection service prior to the 30% Design submittal. Any issues with existing Owner or Utility equipment that may prevent the system from interconnection to the Utility or may require unanticipated upgrades shall be identified at the time of the 30% Schematic Design submittal. The Contractor shall document costs for upgrades and compare with any cost assumptions provided review and approval.

K. The Contractor's 90% CD submittal set shall include specifications and/or details for the following items, either detailed on drawings or provided as specifications. Any deviations from bridging document specifications shall be identified and submitted as redlines with the 90% CD submittal.

1. Cutting and Patching
2. Subsurface Investigation
3. Concrete Forming, Reinforcing, and Finishing
4. Structural Steel Framing
5. Metal Fabrications
6. Roof Patch and Repair
7. Painting and Coating
8. Signage
9. Testing and Commissioning
10. Exterior Lighting and Controls
11. Earthwork
12. Vegetation Clearing and Control
13. Pavement Specialties and Striping
14. Fencing and Gates

L. The Contractor shall submit complete electronic copies of all Final Approved Permit Sets (Issued for Construction) drawings prior to Construction. This document set shall address all comments made by the Owner on the 90% submittal. Construction NTP shall not be provided until the complete document set has been provided.

M. The Contractor shall prepare materials for, and participate in, community outreach meetings with the Owner as required by the scope of work.

2.02 CONSTRUCTION PHASE

A. Contractor shall obtain all required permits and approvals from the AHJ(s) and the Utility(ies) prior to starting Construction, in coordination with the Owner, and shall make copies available to the Owner of all permit applications and approvals.

B. Owner shall provide formal NTP for construction upon receipt of acceptable Final Approved Permit Sets with all necessary AHJ approvals and all required proof of bonding. Contractor shall submit executed NTP documentation to the Owner prior to commencing construction.

C. Prior to beginning construction, Contractor shall:

1. Provide a comprehensive onsite Construction Management and Safety Plan for the construction of the Project in accordance with all applicable laws, policies, and OSHA compliant safety practices. Plan should include, at a minimum, address of local emergency medical facilities, project directory, information on Sub-Contractors, coordination with Owner staff during specific construction tasks, and communication protocols.

2. Provide an updated detailed Construction Schedule and a three-week look-ahead. Contractor shall keep the detailed construction schedule up to date. Accurate and up to date three-week look-ahead schedules shall also be provided throughout construction on a weekly basis the day prior to the weekly meeting.

3. Conduct a kickoff meeting with the Owner to confirm all logistics for mobilization and start of construction.

D. The Contractor shall provide Manufacturers' Installation Manuals for major project components, including, but not limited to: PV modules, inverters, racking or mounting structure, monitoring systems, BESS systems, microgrid systems, EV charging systems, other major electrical equipment, and lighting. When approved by the Owner, recommended installation standards shall become the basis for commissioning, inspecting and accepting or rejecting actual installation procedures used on the work.

E. Prior to ordering equipment and materials, the Contractor shall verify all measurements at each project site and notify the Owner in writing on any discrepancies between the drawings and site measurements.

F. Any proposed changes to design or scope of work shall be submitted in writing to the Owner for approval before any changes are made. Submittal for changes shall contain all necessary details of the proposed changes, detailed costs, and an updated energy system details, including size and production spreadsheet.

G. CONSTRUCTION SUBMITTALS: Shall be provided by the Contractor as detailed in Table 2:

**Table 2 – Construction Submittals**

| Construction Submittal | Submittal Schedule |
|---|---|
| 1. Construction Mgt & Safety Plan | No later than 15 days prior to site mobilization. |
| 2. Construction Schedule | - Three-week look-ahead schedule updated and submitted weekly prior to the weekly meeting.<br>- Detailed schedule regularly maintained and provided every two weeks or as-requested. |
| 3. Manufacturers' Installation Manuals | No later than 5 days after construction kickoff meeting. |
| 4. Weekly Meeting minutes | No later than the day prior to the next scheduled project meeting. |
| 5. Test Reports | As available |
| 6. Factory Tests | As available |
| 7. Field Tests | As available |
| 8. Design Deviations/ Requests for Information | As-needed. All deviations shall be accurately and legibly detailed by the Contractor and approved by Designer of Record, then presented to the Owner/Owner Reps in the form of an RFI. All changes shall be recorded on as-built drawings at the time of the change. |
| 9. Proposed Change Orders | Prior to commencing any changed work. Shall be formally submitted and approved by the Owner/Owner Rep in writing. |

2.03 COMMISSIONING PHASE

A. The Contractor shall provide complete commissioning of all energy systems installed as part of this project.

B. Commissioning protocols shall be provided in the form of a Method of Procedure (MOP) for review and approval by the Owner for all major energy systems. Protocols shall adhere to all bridging document requirements and follow standard industry practices.

C. Prior to commencement of commissioning tasks, the Contractor shall notify the Owner and Owner representatives. The Contractor shall reference the previously approved procedures and provide a schedule of all commissioning, testing, and safety activities.

D. Contractor shall provide electricians and support to Owner and Owner representative for verification of commissioning and workmanship, including providing reasonable notice prior to conducting commissioning activities so Owner representatives may observe.

E. A detailed and comprehensive commissioning report shall be submitted within 15 days after commissioning has been completed on a site-by-site basis.

2.04 CLOSEOUT PHASE / PROJECT ACCEPTANCE

A. Contractor shall deliver document submittals to the Owner per Table 3 in order to achieve each completion milestone and successfully closeout the project. A digital library will be created by

the Owner, and the Contractor shall upload organized and collated digital versions of closeout documentation for each of the items listed below on a site-by-site basis. The Owner will review each submittal and formally approve each item upon review and confirmation of completeness. Incomplete submittals shall be corrected by the Contractor prior submittal acceptance. A formal notice by the Contractor shall be provided for each milestone acknowledging this checklist and successful submission of completed and approved checklist items. The Owner shall review and formally approve the notice for each site.

### Table 3 – Closeout Document Submittals & Milestones

| **Substantial Completion** | | **Complete Yes/No?** | **Date** |
|---|---|---|---|
| 1 | AHJ Substantial Completion Notice (As-needed for Interconnect) | | |
| 2 | Schedule for Project Closeout | | |
| 3 | Commissioning Protocol | | |
| 4 | Utility Interconnection Request Submitted | | |
| 5 | Contractor Notice of Substantial Completion | | |
| **Commercial Operation Date - COD (All Substantial Completion items plus:)** | | | |
| 6 | Utility Permission-to-Operate (PTO) Notice | | |
| 7 | AHJ(s) Acceptance/Completion Documentation | | |
| 8 | Contractor Commissioning Documentation | | |
| 9 | As-Built Plan Sets (See Item C) | | |
| 10 | Major Equipment Cut Sheets/Warranty Documentation | | |
| 11 | As-Built Performance Modeling & 8760 Data | | |
| 12 | DAS Login Access and Credentials & Verification of Function | | |
| 13 | Punchlist – Major/Safety Items Signed Off by Owner/Inspectors (See Item D) | | |
| 14 | O&M Manual Draft (See Item E) | | |
| 15 | Subcontractor Notices of Completion | | |
| 16 | Contractor Formal Commercial Operation Notice | | |
| **Final Completion/Acceptance (All COD items plus:)** | | | |
| 17 | Punchlist – All Lists Signed Off (See Item D) | | |
| 18 | O&M Manual Final | | |
| 19 | Owner Cx Inspection Completed | | |
| 20 | Operation and Safety Training (for Purchaser) | | |
| 21 | All Change Orders/Payments Finalized | | |
| 22 | Final Amended Executed Contracts (See Item F) | | |
| 23 | Inverter/Data Logger Serial Numbers, IDs, Locations Provided and Functional | | |
| 24 | DSA Closeout Documentation Complete and Submitted (See Item G below) | | |
| 25 | Contractor Notice of Final Completion | | |

B. Contractor shall submit complete digital “As-Built” Record Drawings for all sites for review and approval by the Owner. Final as-built plans shall be provided in both AutoCAD (CAD) and

portable document format (PDF). All deviations from the sizes, locations and other features shown in the Final CD/IFC plan sets must be captured in detail in the As-Built Record Drawings, including as-built sketches, details, and clarifications. Details shall include locations of work buried under or outside each building, including, without limitation, all utilities, plumbing and electrical lines and conduits. All directional boring logs, depths and routes and canopy or other foundation locations and depths shall be accurately shown on As-Built Record Drawings.

C. The Contractor shall submit documentation of Punch List Completion for items under control of the Contractor within 30 days of the Owner issuing the Final Punch List. The document must be signed and show proof of completion of each item.

D. The Contractor shall submit to the Owner a comprehensive Operations and Maintenance (O&M) manual. O&M manuals shall be prepared for the Owner for all financing types, including third-party finance of the project. O&M manuals shall be collated into a single, bookmarked portable document format (PDF) file. The document shall be a well-organized, comprehensive and custom document with details for each site. The O&M document should not duplicate closeout submittal items listed in Table 3 and should not be a collection of manufacturers cut-sheets. The intention of the document is to provide an overview of the energy systems installed at each site for the Owner's reference to safely interact with the systems, monitor performance, contact the owner during operation, respond during or after an emergency, and to understand the regular maintenance that will occur. The O&M manual shall include the following minimum items:

1. An overview and description of the energy systems installed, including system nameplates, system functions and key performance details. Summary shall also include the date and reference number for: Permission-to-Operate (PTO), Commercial Operation Date, Final Completion, and AHJ Closeout.
2. A simple site plan for each site identifying the locations of major equipment, array/system naming conventions, monitoring system locations, and disconnects or other safety related equipment.
3. Safety details, including shut-down procedures.
4. Contact information for routine items and for emergencies.
5. Monitoring system details including information for accessing the platform and key performance metrics the Owner should review.
6. Summary of Performance Guarantee on a site-by-site basis, inclusive of COD for each site, reporting dates and true-up dates.
7. Maintenance information, including schedules, responsibilities for ongoing maintenance, and Standard Operating Procedures for both O&M personnel and the Owner. Detail shall include notification and site access protocols for O&M personnel.
8. Troubleshooting and repair, including responses to typical issues and responsible parties.
9. For BESS/Microgrid systems, a control plan detailing the intended system operation and function, with details for monitoring and confirming performance.

10. Any other information that may be required for the Owner to easily and safely interact with, confirm performance, troubleshoot, maintain and/or service the materials and equipment installed under this Contract.

E. For Contracts where the Contractor is providing a Performance Guarantee (PeGu), the Contractor shall submit executed Performance Guarantee (PeGu) Agreement amendment(s) within 30 days of PTO at all sites. All performance tables and commercial operation dates must be updated with the final as-built statistics.

F. Contractor shall provide any other Project documentation required by AHJs to successfully closeout permits or meet other project requirements.

G. Contractor shall ensure DSA closed and certified status for each project site and provide supporting documentation.

END OF SPECIFICATION SECTION 01 33 01

# Attachment B2.4: 05 90 02 Solar PV Canopy

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 05 90 02
# SOLAR PHOTOVOLTAIC CANOPY STRUCTURES

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This section describes requirements for solar photovoltaic canopy mounting systems, including design requirements for a design-build delivery. The Contractor shall include all work reasonable inferred by these specifications and the bridging documents, to comply with applicable codes, and to provide complete PV mounting systems acceptable to the Owner and Authorities Having Jurisdiction (AHJs).

B. “Owner” shall refer to owner of the site where project will be located, regardless of system ownership, and include any representative of the site owner, such as consultants or inspectors. “Contract” refers to the design-build contract and any associated design-build bridging documents, inclusive of requirements outlined in the request for proposals (RFP). “Contractor” refers to the entity performing the work, inclusive of Engineer and Architect of Record for design-build contracts.

### 1.02 RELATED DOCUMENTS

A. The Contract and any design-build Bridging Documents.

B. 01 10 00: Summary of Work

C. 01 13 00: Supplementary Criteria

D. 01 33 01: Design-Build Process & Submittals

E. 05 90 021: Solar Canopy

F. 26 00 00: General Electrical

G. 26 32 13: Diesel Generator

H. 48 14 00: Solar Photovoltaic System

I. 48 17 13 Battery Energy Storage System

J. Other technical bridging specifications

K. Where this specification and the Contract or other Bridging Documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended changes or procedures with the Owner.

### 1.03 DEFINITIONS

A. AC: Alternating Current.

B. ADA: American Disabilities Act

C. AHJ: Authority Having Jurisdiction

D. AWS: American Welding Society

E. DSA: Division of the State Architect

F. BESS: Battery Energy Storage System

G. GPR: Ground Penetrating Radar

H. GRC: Galvanized Rigid Steel

I. HDB: Horizontal Directional Bore.

J. LED: Light Emitting Diode

K. NEM: Net Energy Meter.

L. NEMA: National Electrical Manufacturers Association

M. OTC: Over-the-Counter (DSA)

N. PC: Pre-Check (DSA)

O. PV: Photovoltaic.

P. PVC: Polyvinyl Chloride

Q. RFI: Request for Information

R. RFP: Request for Proposals

S. RMC: Rigid Metal Conduit

T. UL: Underwriters Laboratories

U. USA: Underground Service Alert

V. UV: Ultraviolet Radiation

1.04 CODES & REFERENCES

A. The design and installation shall conform to all requirements as defined by the applicable codes, laws, rules, regulations and standards of applicable code enforcing authorities (Latest Edition unless otherwise noted). The following are key standards that shall be followed. The Architect/Engineer of Record and Contractor shall ensure all applicable codes are followed:

1. Aluminum Association (AA) (www.aluminum.org) - Aluminum Standards and Data
2. ASTM International (ASTM) (www.astm.org), including:
    a. A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
    b. A36, Standard Specification for Carbon Structural Steel
    c. A123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
    d. A653, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
    e. E3010, Standard Practice for Installation, Commissioning, Operation, and Maintenance Process (ICOMP) of Photovoltaic Arrays
3. American Institute of Steel Construction (AISC) Manual of Steel Construction
4. American Iron and Steel Institute (AISI) Specifications for the Design of Cold Formed Steel Members
5. American National Standards Institute (ANSI)
6. American Society of Civil Engineers (ASCE), Minimum Design Loads and Associated Criteria for Buildings and Other Structures (7-16)
7. California Building Code (CBC), with State of California Amendments

8. California Department of Forestry and Fire Protection, Office of the State Fire Marshal – Solar Photovoltaic Installation Guidelines
9. California Energy Commission Title 24 Building Energy Efficiency Requirements
10. California Geological Survey (CGS)Local and State Fire Code
11. Institute of Electrical and Electronics Engineers (IEEE)
12. National Electrical Manufacturers Association (NEMA)
13. National Fire Protection Association (NFPA), National/CA Electrical Code
14. Occupational Safety and Health Administration (CAL_OSHA)
15. Research Council on Structural Connections (RCSC)
16. Underwriters Laboratory (UL), including:
    a. UL 2703 – Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for use with Flat-Plate Photovoltaic Modules.
17. Utility company standards and requirements
18. Owner Specifications and Requirements
19. All other applicable Codes and Ordinances

1.05 GENERAL

A. This is a design-build project and includes the construction of Structural Photovoltaic Shade Canopies (PV Canopies). The design and installation shall conform to all requirements as defined by the applicable codes, laws, rules, and standards as specified in the Contract.

B. If the Contractor is in doubt as to the intent of any portion of these specifications and the Contract, or necessary information is omitted, the Contractor shall notify the Owner in writing for clarifications or corrections to be provided by addendum.

C. General specifications as described in Section 26 00 00: General Electrical, are referred to herein and shall apply to this specification. Section 26 00 00 shall be deemed to supersede this specification in the case of conflicts.

1.06 WORK INCLUDED

A. The work includes the design and construction of the structural systems for solar PV canopies, in conformity with plans, applicable codes and professionally recognized standards. Design work shall include all due diligence as identified in Section 01 10 00, Summary of Work.

B. The structural design shall be fully developed, including descriptions and calculations for all structural components. The site, plans, elevations, schedules, and detail drawings must be sufficiently developed to reflect the overall design per the Contract and as described in Section 48 14 00, Photovoltaic System Specifications.

C. All design documents, cut sheets, and technical specifications shall be produced by the Contractor and submitted, reviewed, and accepted by the Owner per the guidelines specified in the Contract.

D. PERMITS AND INSPECTIONS

1. Contractor shall obtain all required permits and arrange for all required inspections, including DSA and utility company requirements, inspections, and sign-offs.

2. Contractor shall not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

E. Contractor to confirm location of all underground utilities and infrastructure with the use of Ground Penetrating Radar (GPR) or equivalent Owner approved technology and Underground Service Alert (USA) prior to construction.

F. Contractor shall provide all materials, labor, equipment, services, and incidentals necessary to install the structures at each Site as shown on the design drawings and as specified hereinafter.

G. Contractor shall provide temporary power and lighting as required for construction. Additionally, Contractor shall provide sufficient temporary facility lighting in place of removed existing lighting during construction phase until under canopy lighting is fully operational, unless an exception is provided by Owner in writing.

H. Contractor shall include any other structural work as might reasonably be implied as required, even though not specifically mentioned herein or shown on the drawings.

I. Contractor shall be responsible for prompt removal and disposal of spoils from all related construction activities.

1.07 DESIGN PROCEDURE & REQUIREMENTS

A. Engineering calculations, drawings and specifications shall be prepared and signed by a Structural Engineer, registered in the State of California and regularly employed in the design of photovoltaic canopy systems. For projects under the jurisdiction of the California Division of the State Architect (DSA), the Engineer and Architect of Record shall be regularly employed in the design of DSA canopy projects. The Structural Engineer shall be the Engineer of Record as required by code-enforcing authorities. The Engineer of Record shall provide required statements and certifications.

B. All structural system components shall be designed and constructed to withstand the environmental conditions of the site to which they will be exposed. The mounting systems shall be designed and installed to resist dead load, live load, corrosion UV degradation, wind loads, and seismic loads appropriate to the geographic area over the expected life of the PV system. Design life shall be a minimum of 25-years.

C. For California projects under the purview of DSA, Canopies shall be Pre-Check (PC) structures.

D. All canopies shall be designed to meet ADA requirements per DSA and any other relevant AHJ(s). Contractor shall be responsible for the design and construction of all required ADA improvements to complete the project.

E. GEOTECHNICAL STUDY AND ANALYSIS

1. Preliminary geotechnical analyses have been conducted by the Owner and provided as part of the RFP/Q documents for this site. Contractor shall not rely upon the District's geotechnical analysis and shall identify and perform all necessary due diligence to design and implement the Project.

2. If needed, the Criteria Architect will be responsible for California Geological Survey (CGS) submittal and approval in order to expedite the schedule.

3. The Contractor and Engineer of Record shall review the geotechnical studies and shall be responsible for notifying the District of any issues with the reviews and/or subsequent reports. The Engineer of Record shall be responsible to ensuring geotechnical investigations are sufficient for the purposes of design and that all CGS/DSA requirements have been met.

1.08 SUBMITTALS

A. DESIGN SUBMITTALS

1. Prepare design drawings in accordance with Section 01 33 01: Design-Build Process & Submittals
2. Provide review of and any RFI's (where needed) for geotechnical reports.
3. Design Drawings for canopies shall include but not be limited to the following:
    a. Foundation design, plans, elevations and details.
    b. Canopy plans and elevation drawings with clear heights, tilt and azimuth clearly labeled.
    c. Plan drawings clearly identifying column location and parking layout, including ADA stalls.
    d. Complete racking and module layout designs, inclusive of plans showing locations of photovoltaic attachment devices with attachment details and spacing.
    e. Equipment mounting details
    f. Inverter and any other balance of system mounting details and layout, inclusive of conduit/conductor routing.
    g. Lighting design, including photometric plans and temperature rating of fixtures.
    h. Equipment space layouts and clearances.

B. ACTION SUBMITTALS

1. Product Data: For each type of product.
    a. Include construction details, material descriptions, dimensions of individual components and profiles, weights and finishes.
    b. Manufacturers' specifications and other data required to demonstrate compliance with the specified requirements. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
    c. Complete material list of all items proposed to be furnished and installed under this Section, including but not limited to the following items: Foundations, structural steel, purlins, PV module attachment hardware, grounding devices, WEEBS, lighting systems, and all other products required to properly install the canopies.
    d. Manufacturers' recommended installation procedures which, when approved by the Owner, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.
    e. Samples of module attachment hardware.
    f. Sample lighting fixture
    g. Samples of clear-height labels for canopies
2. Shop Drawings: For structures and attachments
    a. Include plans, elevations, sections, and mounting details.
    b. Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    c. Detail fabrication and assembly.

C. INFORMATIONAL SUBMITTALS

1. Field quality-control reports.

2. Sample Warranty: For manufacturer's special materials and workmanship warranty.

D. CLOSEOUT SUBMITTALS.

1. Provide closeout documents per Section 01 33 01, Design-Build Process & Submittals and Attachment C.

2. AS-BUILTS

a. Contractor shall maintain "as-built" records at all times, showing the exact location of racking system, including concealed conduits and feeders installed under this contract.
b. Upon completion of work and before acceptance can be considered, the Contractor must forward to the Owner, a corrected set of as-built plans, highlighting any updates, to show the mounting system work as installed in both PDF and CAD format.
c. Comply with additional “As-built” requirements in other sections of the Specifications.

1.09 INSTALLER QUALIFICATIONS

A. Installer shall have a minimum of 5-years documented experience in the installation of structural steel and solar canopies.

B. Where manufacturer certifies installers, installer shall possess certification from the manufacturer’s products being installed.

1.10 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace components of the canopy & racking system and fasteners that fail in materials or workmanship within specified warranty period.

B. Warranty Period: Minimum twenty-five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

2.01 SOLAR CANOPY STRUCTURES

A. All structures and components shall be from a manufacturer/provider specializing in production of solar canopies with a minimum of 5 years documented experience.

B. The canopies shall consist of interconnected structural steel columns and beams, with purlins attached to cross beams. Solar modules shall be installed on purlins with mechanical fasteners, not clips.

C. Canopies shall have a single row of columns along the long axis of the canopy. In parking areas, columns shall be located between parking stall spaces with beams cantilevered to either one or both sides of the column for both dual entry (aisle) and single entry (perimeter) parking structures.

D. Canopies installed at sites under the control of the California Division of the State Architect (DSA) shall be Pre-Check (PC) Approved Structures and follow the guidelines outlined in DSA PL 07-02: Over-The-Counter Review of Pre-Check Approved Designs. Contractor shall be responsible for all design and coordination to achieve DSA and any other AHJ permits for the design.

E. COATINGS AND CORROSION CONTROL

1. Each canopy 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. The design life shall be a minimum of 25-years.
2. All structural members and racking installed outdoors shall be hot dipped galvanized steel.
    a. All galvanized structural components shall be hot-dipped galvanized in compliance with ASTM 123.
    b. All purlin framing members shall be galvanized according to ASTM A653 to a minimum coating weight of G120 if the site is within 5-miles of a marine environment. All other sites, minimum coating weight shall be G90. Heavier coating shall be utilized if required by the Engineer of Record.
    c. Field cuts of galvanized materials shall be kept to a minimum. All galvanized materials cut during construction shall be field coated with a long-lasting rust inhibiting coating, color matched and intended for coating hot-dipped galvanized metal in outdoor settings.
3. All canopy bolts, nuts and washers, unless otherwise noted, shall be hot dip galvanized or stainless steel.
4. Particular attention shall be given to the prevention of corrosion at the connections between dissimilar metals.

F. All materials shall conform to the requirements and tolerances of the latest editions of the AISC Manual of Steel Construction, AISI Specifications for the Design of Cold Formed Steel Members, ASTM Standard Specifications.

G. All framing material shall be drained or have provisions to prevent water pooling on or within the framing member (weep holes).

H. Purlins shall be structurally connected to beams as detailed on the drawings with hot-dipped galvanized fasteners, unless otherwise specified by the Structural Engineer of Record. Number of purlins and purlin spacing shall be as shown on the drawings. Mounting holes for the racking system and solar module installation shall be pre-located and pre-drilled prior to finishing and coating operations. Should an approved substitution of modules dictate modification of purlin placement, Contractor shall provide stamped drawings for review detailing any modifications and obtain Owner approval prior to proceeding.

I. FOUNDATIONS AND COLUMNS

1. In parking areas, concrete column foundations shall extend a minimum height of 30 inches above grade for protection of structural steel from vehicle strikes.
2. All column anchor bolts shall be torqued per Engineer of Record requirements and marked once torqued. Nuts shall then be double nutted or ‘staked’ (threading irreversibly altered) to protect from structural compromise and vandalism.
3. All structural connections with a flanged base on columns shall be outfitted with metal pole skirts that completely covers the flange, bolts and nuts, coated to match columns. Pole skirts shall have rounded corners. Alternatively, flange bases may be grouted at the approval of the Owner.

J. CANOPY

1. All canopies shall have a minimum clear height above grade of 12-feet at the lowest point of any structure. Contractor is responsible for determining grade elevations under canopies and ensuring clear-heights are achieved. Clear heights shall be identified on drawings, including at all low side corners and at the point of minimum clearance on the low side.
2. All canopies to be co-planer and in alignment horizontally and vertically with adjacent arrays. Canopies shall be level horizontally along the long axis of the canopy. Slopes on the long axis of the canopy or stair-stepping between adjacent arrays shall not be allowed unless approved in writing by Owner and only where substantial grade change exists below the canopy.
3. Top of column heights shall be shown in design drawings.
4. Canopies shall have a minimum tilt of five degrees (5°) and maximum tilt of ten degrees (10°), with tilt and aspect clearly shown drawings. All canopies on a site shall have the same tilt, unless approved otherwise by Owner.
5. LABELS
    a. Canopies placed in parking lots shall be clearly labeled with max clearance for vehicles at the low points.
    b. Labels shall be highly visible from a vehicle with high-contrast colors, rated for long-term UV exposure with lifetime to match warranties specified for PV panels in Section 48 14 00.
    c. Minimum labeling along the long axis of the low-side of the canopy shall be one every 30 feet of canopy or 3 labels, whichever is greater. Labeling shall also include the exterior low-side corner of each canopy within a parking lot. Label should be easily visible from a vehicle.

K. ELECTRICAL CONDUITS

1. Electrical conduits extending from the canopy to grade (including any spares) are to be encased in the foundations, not mounted on the outside of finished concrete piers.
2. All electrical connections between separate structures shall be underground. Overhead “jumpers” between structures shall not be permitted. Structures are considered separate wherever a gap exists between structural crossmembers that is not spanned by purlins.

2.02 SPARE CONDUITS

A. Spare conduits shall be installed per the following requirements and as listed in Section 01 10 00, Summary of Work. If any discrepancy exists, Contractor shall provide an Owner with an RFI to clarify any discrepancy.

B. Spare conduit shall have a minimum of two sufficiently rated pull strings or wires inside conduit for future wire pull. Conduits shall be properly capped with PVC, GRC or RMC as appropriate.

C. Provide spare conduit and vault schedule in tabulated format on design drawings and as-builts.

D. EV CHARGING SPARES

1. For canopies located in parking lots, a minimum of one canopy (or more if listed/shown in the Bridging Documents) shall include 1 x 3-in spare conduit(s) for future EV charger conductors. Conduits shall originate at the main service cabinet (or as shown in the Bridging Documents) to the termination location(s) designated in the Bridging Documents.

2. In the absence of a designated termination point(s) at the canopies, one conduit shall terminate in a pull box at the first column of a canopy in the vicinity of ADA spaces. If the canopy only includes ADA stalls, a second conduit and pull box shall be installed to the nearest canopy with non-ADA stalls. The conduit shall be routed from the first pull box to the second pull boxes.
3. EV conduits should be identified as “SPARE” on the drawings and in on the conduits.
4. At the canopies, the spare conduit shall terminate in a flush grade, traffic rated pull box.

E. BATTERY ENERGY STORAGE SYSTEM (BESS) SPARES

1. Contractor shall install spare conduits for future BESS implementation. Spare conduits shall include 2 x 3-in and 1 x 1.5-in conduits from the main service to a pull box at the future BESS location indicated in the Bridging Documents.
2. Where PV System is >500 kWp or BESS system is greater than 300 kW-AC, spare conduit size for the two larger conduits shall increase from 3-in to 4-in.
3. In the absence of a designated BESS location, Contractor shall work with Owner during design to establish a BESS location and provide spare conduits to that location.
4. At the BESS location, the spare conduit shall terminate in a flush grade, traffic rated pull box, see Guide Specifications for pull box requirements.

F. OTHER SPARES

1. A 1 x 1.5-in (minimum) spare conduit for security camera cable or other data pathway shall be provided to each canopy. Conduit shall provide pathway to the nearest existing site data connection located within 300 feet of the canopy.
2. Conduit at the canopies shall extend from grade inside of foundations and up column to the level of the structural cross-member. Conduit shall terminate in an 8" x 8" x 3" NEMA 4X junction box. Pathways to multiple canopies may be combined into a single 2" conduit.

G. Additional spare conduits may be required as specified in the Bridging Documents.

2.03 LIGHTING SYSTEMS

A. Contractor shall review and confirm as-built lighting plans for sites with existing lighting.

B. Canopy lighting systems shall be designed to meet the Illuminating Engineering Society of North America (IESNA) requirements for parking lot areas, to meet or exceed minimum values and maximum uniformity ratios as listed in the IESNA criteria.

C. Lighting shall meet all Title 24 requirements for installations in California.

D. All lighting sources shall be LED type.

E. Under canopy lighting shall be shrouded to prevent direct line of sight from neighboring houses.

F. Lighting control system shall be connected to the existing lighting controls in each area. Contractor shall field verify that existing lighting circuit conductor, controls, and overcurrent protective device at the circuit point of supply are sufficiently rated for the final lighting load after removal of existing lighting and addition of new lighting. The Contractor shall notify the Owner if existing conductors or infrastructure are found to be deficient, and connection of the new lighting to the new project panelboard shall be implemented by Contractor.

G. Lighting design on canopies shall insure cut-off light control to limit spill light or glare to adjoining areas as-needed. Design and install custom shielding or other mitigation measures to avoid light pollution and glare to neighbors.

H. Lighting temperature or Kelvin Rating shall be consistent with Owner Standards and approved during design phase. Contractor shall provide Owner a submittal for fixtures and obtain written approval from Owner of temperature rating prior to ordering fixtures.

I. Existing pole mounted lighting in areas of new carport canopies shall be removed. Modify other existing lighting to coordinate with the new work and design, including reconnection of any existing downstream circuiting and controls to remain. Foundations of existing pole mount lighting are to be completely removed a minimum of 6-inchs below grade, with grade restored to surrounding condition and demo'd material removed and disposed of by Contractor. Light standards and fixtures shall be carefully removed and returned to the Owner at Owner's option. Contractor to confirm prior to demo.

J. New design shall cover all areas of the parking lots (in the area of the work) to leave no dark spots and meet IESNA and requirements for all areas previously covered by light standards removed under this contract. Contractor shall install new pole mounted luminaires if canopy lighting does not provide sufficient lighting in all areas previously covered by removed or altered light standards. Existing fixtures may remain, if not in direct conflict with canopies or causing shading of new canopies.

## PART 3 - EXECUTION

### 3.01 SITE PREPARATION AND INSPECTION

A. Contractor shall direct, oversee and inspect all site work related to structural installation. Site preparation shall be in accordance with final drawings and specifications provided by manufacturer.

B. Hardscaped areas shall be sawcut prior to drilling of foundations.

C. Contactor shall take care during foundation installation and steel erection to protect existing paving, striping, and landscaping to minimize. Contractor shall be responsible for repairing any damage caused to existing improvements.

### 3.02 INSTALLATION

A. Erect/stand structural steel with proper equipment and qualified installers.

B. Actively cooperate with other trades and provide incidental welding, connections, etc. for securement of work of others to structural steel framing.

C. Erect/stand temporary flooring, planking, and scaffolding necessary in connection with erection of structural steel or support of erection machinery. Use of temporary floors shall be as required by municipal or state laws and governing safety regulations. Hoist metal deck onto structural frame.

D. After erection, clean connections, and abrasions to shop coat and spot paint with same primer used in shop.

E. Installation of the structural system and all components shall be in strict accordance with manufacturer's and Engineer of Record's recommendations.

F. Post installation, Contractor shall provide the materials and labor to grout the base of the column to produce a finished joint.

G. ERECTION TOLERANCES

1. Erection tolerances for structural steel work shall be in accordance with latest AISC “Code of Standard Practice for Steel Buildings and Bridges”.

H. BOLTING

1. High strength steel bolts shall be used where indicated. Fabrication and erection shall be in strict accordance with the latest edition of “Specifications for Assembly of Structural Joints Using High-Strength Steel Bolts”, as approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation. Load indicator washer shall be used. Use beveled washers on sloping surfaces.

I. WELDING

1. Welding and welded joints shall be in accordance with AWS standards. Work shall be performed by operators who have been qualified by test in accordance with AWS D1.1, “Structural Welding Code – Steel”, to perform type of work required for this project.
2. All methods, sequence, qualifications and procedures, including preheating, post heating, etc. shall be detailed in writing and submitted for review by the testing laboratory and results provided to Owner. Provisions shall be made in detailing of lengths of members for dimensional changes as a result of shrinkage stresses so as to provide specified finished dimensions.
3. Remove all runoff tabs, and bottom backing bars. Top backup bars to be removed or have continuous fillet weld to column.

J. ANCHOR BOLTS

1. Provide at site, for others to install, all anchor bolts, bearing plates, and templates to be embedded in concrete.
2. Provide necessary steel or wood templates and diagrams for setting and securing of such anchor bolts in concrete forms.
3. Be jointly responsible with others for proper locating and installing bolts. Make good any deficiencies and errors.
4. Setting of anchor bolts in hardened concrete necessitates drilled holes solidly grouted in place with epoxy grout. Submit materials and methods for review and approval.
5. Nuts shall then be double nutted or 'staked' (threading irreversibly altered) to protect from structural compromise and vandalism. Install flange covers over anchor bolts.

END OF SPECIFICATION SECTION 05 90 02

# Attachment B2.5: 26 00 00 General Electrical

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 26 00 00
# GENERAL ELECTRICAL

## PART 1 - GENERAL

### 1.01 SUMMARY

A. This specification defines the general electrical work required for complete and fully functioning photovoltaic systems at each site, including any ancillary electrical work. The work shall include the design, procurement, construction, commissioning and startup of the electrical systems, materials, equipment, fabrication, installation, and tests in conformity with applicable codes, laws, regulations, and professionally recognized standards.

B. “Owner” shall refer to owner of the site where project will be located, regardless of system ownership, and include any representative of the site owner, such as consultants or inspectors. “Contract” refers to the design-build contract and any associated design-build bridging documents, inclusive of requirements outlined in the request for proposals (RFP). “Contractor” refers to the entity performing the work, inclusive of Engineer and Architect of Record for design-build contracts.

### 1.02 RELATED DOCUMENTS

A. The Contract and any design-build Bridging Documents.

B. 01 10 00: Summary of Work

C. 01 13 00: Supplementary Criteria

D. 01 33 01: Design-Build Process & Submittals

E. 05 90 02: Solar Photovoltaic Canopy Structures

F. 26 32 13: Diesel Generator

G. 48 14 00: Solar Photovoltaic Systems

H. 48 17 13 Battery Energy Storage System

I. Other Owner’s Specification or Bridging Documentation

J. Where this specification and the Contract or other Bridging Documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended changes or procedures with the Owner.

### 1.03 DEFINITIONS

A. AC: Alternating Current.

B. AWG: American Wire Gage

C. IEEE: Institute of Electrical and Electronics Engineers.

D. HDB: Horizontal Directional Bore.

E. NEC: National Electrical Code.

F. NEM: Net Energy Meter.

G. NEMA: National Electrical Manufacturers Association

H. NRTL: Nationally Recognized Testing Laboratory.

I. RFI: Request for Information

J. RFP: Request for Proposals

K. PTO: Permission to Operate (from the electrical utility)

L. PV: Photovoltaic.

M. PVC: Polyvinyl Chloride

N. UBC: Uniform Building Code

O. UL: Underwriters Laboratories.

1.04 CODES & REFERENCES

A. The design and installation shall conform to all requirements as defined by the applicable codes, laws, rules, regulations, and standards of applicable code enforcing authorities (Latest Edition unless otherwise noted). The following are key standards that shall be followed. The Architect/Engineer of Record and Contractor shall ensure all applicable codes are followed:

1. ASTM International (ASTM) (www.astm.org), including:
   a. E3010, Standard Practice for Installation, Commissioning, Operation, and Maintenance Process (ICOMP) of Photovoltaic Arrays
2. American National Standards Institute (ANSI)
3. California Building Code (CBC), with State of California Amendments
4. California Department of Forestry and Fire Protection, Office of the State Fire Marshal – Solar Photovoltaic Installation Guidelines
5. California Energy Commission (CEC) Title 24 Building Energy Efficiency Requirements
6. California Public Utilities Commission (CPUC), Including Title 21
7. Institute of Electrical and Electronics Engineers (IEEE)
8. International Electrical Testing Association (NETA)
9. Local Fire Permit Requirements
10. National Electrical Manufacturers Association (NEMA)
11. National Fire Protection Association (NFPA), National & California Electrical Code (NEC & CEC)
12. Underwriters Laboratory (UL), including:
    a. UL 2703 – Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for use with Flat-Plate Photovoltaic Modules.
13. Utility company standards and requirements
14. Division of the State Architect (DSA)
    a. DSA IR-16-8 (most recent) Guidelines
    b. DSA PL-07-02 (most recent) Guidelines
15. Owner Specifications and Requirements
16. All other applicable Codes and Ordinances

1.05 WORK INCLUDED

A. The Contractor shall include all items and all work reasonably inferred by these specifications and the Contract, including any design-build bridging documents. If the Contractor is in doubt as to the intent of any portion of these specifications or the Contract, or necessary information is omitted, the Contractor shall notify the Owner in writing for clarifications or corrections to be provided by addendum.

B. Work shall include all documentation, including all required design, construction as-built and close-out documents and compliance documentation.

C. The work shall include the design of the electrical systems, materials, equipment, fabrication, installation and tests in conformity with applicable codes and professionally recognized standards. The electrical design shall be fully developed, including but not limited to the following:

1. Description and supportive calculations for all power and grounding systems.
2. Evaluation of existing switchgear and Utility transformers for interconnection compatibility as part of preliminary design.
3. Location and layout of all system equipment.
4. Site plans, elevations, schedules, equipment arrangement and detailed drawings
5. Single line diagrams including local utility system tie-ins.
6. All other drawings, calculations, details, and schedules required for the system design.

D. Design documents, cut sheets, shop drawings, and technical specifications shall be submitted, reviewed and accepted by the Owner per the guidelines specified in the Contract.

E. Incidental work directly related to the construction of the System, including, but not limited to: excavating, directional boring, backfilling, roof flashing, fire stopping, waterproofing, pavement repair, striping, and testing.

F. Design and construction coordination with all other disciplines and trades.

G. Temporary power and lighting as required for construction and security during construction.

H. All other utilities, labor, materials, apparatus, tools, equipment, transportation, and special or occasional services as required to fulfill the contracted scope.

I. Any other electrical work as might reasonably be implied as required to fulfill the contracted scope, even though not specifically mentioned herein or shown on the drawings.

J. All required construction documents, compliance documentation, as-built, and close-out documents.

1.06 CONDITIONS AT SITE

A. Contractor is responsible for familiarizing themselves with all discernible site conditions. No extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not. See Section 01 10 00 Summary of Work for further detail.

B. Lines of other services that are damaged as a result of this work shall promptly be repaired at no expense to the Owner and to the complete satisfaction of the Owner.

1.07 QUALITY ASSURANCE

A. GENERAL

1. Construction Documents shall be designed and signed by a validated, registered professional engineer in the State of California.

2. No modifications shall be made to the approved Construction Documents without the Owner's written consent.

B. CONFORMANCE

1. All equipment and accessories to be the product of a manufacturer regularly engaged in its manufacture.

2. Supply all new equipment and accessories free from defects and listed by Underwriter's Laboratories, Inc., or bearing its label or label of a Nationally Recognized Testing Laboratory (NRTL).

3. All items of a given type shall be the products of the same manufacturer, or equal.

4. If after contract is awarded, minor changes and additions are required by aforementioned authorities, they shall be included at Contractor's expense.

C. COORDINATION

1. Contractor shall become familiar with the conditions at each job site and plan the installation of the electrical work to conform with the existing conditions so as to provide the best assembly of the combined work of all trades.

D. COORDINATION DRAWINGS FOR ELECTRICAL INSTALLATION

1. Prepare Coordination Drawings, to scale. Detail major elements, components and systems of electrical equipment and materials in relation to each other and to other systems, installations, and building components. Indicate locations and space requirements for installation, access and working clearances. Show where sequence and coordination of installations are important to the efficient flow of the Work. Indicate the following:

    a. Provisions for scheduling, sequencing, moving, and positioning large equipment in or on the site or buildings during construction.
    b. Plans, elevations, and details including the following:
        i) Clearances to meet safety requirements and for servicing and maintaining equipment, including space for equipment disassembly required for periodic maintenance.
        ii) Equipment support details.
        iii) Exterior wall, roof and foundation penetrations of cable and raceway; and their relation to other penetrations and installations.
        iv) Fire-rated wall and roof penetrations by electrical installations.
        v) Sizes and locations of required concrete pads and bases.
        vi) Grounding system details.

1.08 DELIVERY, STORAGE AND HANDLING

A. Protection: Use all means necessary to protect the materials of this Section before, during, and after installation and to protect the work and materials of all trades.

B. Delivery and Storage: Deliver all materials to the job site in their original containers with all labels intact and legible at time of use. Store in strict accordance with approved manufacturers' recommendations. All deliveries are to be made to the Contractor's job trailer or approved storage location. Under no circumstances shall Owner be responsible for accepting deliveries.

C. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost to the Owner.

D. Contractor shall personally, or through an authorized representative, check all materials upon receipt at jobsite for conformance with approved shop drawings and/or plans and specifications.

1.09 SCHEDULING/SEQUENCING

A. Contractor shall coordinate all schedules and sequencing of electrical work with Owner.

B. EQUIPMENT ORDERING

1. Contractor shall place orders for all equipment in time to prevent any delay in construction schedule or completion of project. If any materials or equipment are not ordered in time, additional charges made by equipment manufacturers to complete their equipment in time to meet the construction schedule, together with any special handling charges, shall be borne by the Contractor.

2. Contractor shall coordinate production and delivery schedule for all Owner-supplied equipment with the equipment suppliers to ensure that all Owner-supplied equipment is delivered to site in coordination with the construction schedule and in such a manner as to cause no delays in completion of the Contract as scheduled.

1.10 WIND LOADING AND SEISMIC DESIGN

A. Comply with all applicable codes and standards and provide wind load restraints for all equipment installed under this contract that requires restraint. The electrical equipment wind loading restraint shall be designed as required by the Authorities Having Jurisdiction (AHJs).

B. The electrical system shall be designed for the appropriate seismic zone and to meet all seismic design requirements of the AHJs and applicable codes.

C. Where applicable, the electrical equipment shall be designed to accommodate lateral displacement in the event of an earthquake based on a nonlinear response-history seismic analysis for the appropriate seismic zone.

1.11 PERMITS AND INSPECTIONS

A. Contractor shall obtain all required permits and arrange for all required inspections, including DSA and utility company requirements, inspections, and sign-offs. Utility company coordination and permitting shall include the complete interconnect process and securing permission to operate (PTO).

B. Contractor shall not allow or cause any of the work to be covered or enclosed until it has been tested and/or inspected.

**PART 2 - PRODUCTS**

2.01 MATERIALS

A. Materials of the same type or classification, used for the same purpose, shall be the product of the same manufacturer, or equal.

2.02 POSTED OPERATING INSTRUCTIONS

A. Furnish approved operating instructions for systems and equipment where indicated in the technical sections for use by operation and maintenance personnel. The operating instructions shall include wiring diagrams, control diagrams, and control sequence for each principal system and equipment. Print or engrave operating instructions and frame under glass or in approved laminated plastic. Post instructions as directed. Attach or post operating instructions adjacent to each principal system and equipment including startup, proper adjustment, operating, lubrication, shutdown, safety precautions, procedure in the event of equipment failure, and other items of instruction as recommended by the manufacturer of each system or equipment. Provide weather-resistant materials or weatherproof enclosures for operating instruction exposed to the weather. Operating instruction shall not fade when exposed to sunlight and shall be secured to prevent easy removal or peeling.

2.03 CATALOGED PRODUCTS / SERVICE AVAILABILITY

A. Materials and equipment shall be current products by manufacturers regularly engaged in the production of such products. Specified product models shall have been in satisfactory commercial or industrial use for a minimum of 2 years prior to design. The 2-year period shall include applications of equipment and materials under similar circumstances and of similar size. The 2-year period shall be satisfactorily completed by a product for sale on the commercial market through advertisements, manufacturers' catalogs, or brochures. Products having less than a 2-year field service record will be acceptable if a certified record of satisfactory field operation for not less than 6,000 hours, exclusive of the manufacturers' factory or laboratory tests, is furnished. The equipment items shall be supported by service organizations which are reasonable convenient to the equipment installation in order to render satisfactory service to the equipment on a regular and emergency basis during the warranty period of the contract.

2.04 ACCEPTABLE MANUFACTURERS

A. Materials shall be of make mentioned elsewhere in this specification, or equal. All materials shall be new and approved by the Underwriters' Laboratories or an NRTL approved by Owner.

2.05 BASIC ELECTRICAL EQUIPMENT AND MATERIALS

A. INVERTERS AND PV MODULES.

1. Refer to Specification Section 48 14 00 Photovoltaic Systems.

B. AC PANELBOARDS

1. As manufactured by Cutler-Hammer, Square D, General Electric, Siemens, IEM, or to match existing equipment at each Site, wherever possible. Similar products may be submitted for considerations and formal approval. Equipment shall at a minimum be NEMA 3R outdoors or NEMA 1 for surface mount in unfinished interior locations and flush mounted in finished and occupied spaces. Provide housekeeping pads for all floor or slab mounted equipment.

2. Enclosures: code gauge galvanized sheet steel with welded full flange end pieces, stretcher-leveled steel trim, back pan and door or painted steel or powder-coated steel. All surface mounted panels to have enclosures painted in gray enamel. All flush mounted panels to have cover painted to match adjacent surface. Where sites are within 5-miles of a marine environment, enclosures shall be NEMA 4X.
3. Phase and ground bussing of copper with silver-plated or tin-plated or nickel-plated contact surfaces.
4. Trims on surface-mounted cabinets secured with nickel-plated screws with cup washers, bottom of all trims to have lugs for resting on cabinet flange.
5. Panels shall be 20 inches minimum in width, provided with approved gutter space, barriers and adjustable supports. Doors mounted with concealed hinges provided with combination spring latch and lock. Doors and trims and surface mounted cabinets primed and finished with one coat baked on gray enamel.
6. Each panel shall be equipped with a copper ground bus.
7. All panels shall be fully bussed to accept future circuit breakers.

C. Distribution Low Voltage Dry-Type Transformers (120/208V and 277/480V):

1. Ventilated type, NEMA 3R where used outdoors.
2. Transformer shall be 3-phase, 60 Hertz. Primary winding shall be Delta connected and secondary winding shall be Wye connected. The temperature rise at rated voltage and full load shall not exceed 150 degrees C with a 220 degrees C U.L. Component Recognized Insulation System. The windings shall be Aluminum or Copper.
3. The higher voltage winding shall have quantity (6) 2.5% taps - (2) FCAN and (4) FCBN. Set secondary voltage for 120/208V.
4. Transformer terminals shall be front connected for ease of installation and maintenance.
5. Where the transformers are installed outdoors provide weatherproof drip cover, rodent screen and a NEMA 3R rating of the enclosure. Where sites are within 5-miles of a marine environment, enclosures shall be NEMA 4X rated.
6. Transformers shall be suitable to carry the PV load characteristics and in the direction of power flow required for the PV system power production.

D. CIRCUIT BREAKERS

1. Circuit breakers shall be molded case rated 250 or 480 volt, multiple or single pole with amperage ratings as required for each circuit. All breakers to be bolt on, manually operated with "de-ion" arc chutes. Plug-in breakers are not acceptable.
2. Circuit breakers shall be suitable for reverse feed and rated to interrupt the available short circuit current at the point of application.
3. Circuit breaker at point of PV system interconnection shall be electronic trip with trip unit LTPU as shown in the drawings.

E. Raceways and Conduit Bodies: Only the raceways specified below shall be utilized on these projects. Substitutions shall be pre-approved in writing:

1. Rigid Type - hot dip galvanized, to be used at all exterior locations, below grade, or in concrete slab, and to 18" on either side of structural expansion joints in floor slabs, with completely watertight, threaded fittings throughout.
    a. All rigid steel conduit couplings and elbows in soil or concrete or under membrane to be ½ lap wrapped with Scotch #50 tape and threaded ends coated with T&B #S.C.40 rust inhibitor prior to installation of couplings.
    b. ½ lap wrap all rigid steel conduit stub-ups from slab or grade to 6" above finished grade level with Scotch #50 tape.
    c. In lieu of rigid steel conduit for power and control raceways and branch circuit conduits in soil or concrete slabs, "Schedule 40" PVC with Schedule 80 PVC conduit elbows and stub-ups may be used with code size (minimum No. 12) ground wire. A “stub-up” is considered to terminate 6" above the finished surface.
        i) Schedule 80 PVC conduit shall be used in all concrete footings or foundations and to 18" of either side of footings or foundation walls.
        ii) Schedule 80 PVC conduit shall be used in all concrete masonry unit (CMU) walls or columns.
2. Provide a minimum cover of 36 inches for all conduits in ground outside of buildings, unless otherwise noted.
3. Horizontal Directional Boring where feasible. Owner will allow horizontal directional boring if the following conditions are met:
    a. Conduit installed using horizontal directional boring (HDB) shall include tracer tape or traceable conduit. Minimum depth of the conduit shall be per CEC 2016 Article 300.5 or per Owner Requirements, whichever is more stringent. The Contractor 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. Contractor shall provide documentation of final depth and routes of all conduit installed in horizontal bores.
    b. Prior to construction, final boring and trenching plans shall be approved by signature by the engineer of record to confirm that depths and routing are compliant with all code requirements related to area of repose for adjacent buildings and other structures. Boring and trenching should stay out of this zone of structural influence wherever possible. In areas where the bore or trench must fall in this area, all measures necessary (such as addition of slurry encasement) will be taken to comply with code requirements and the requirements of the structural and geotechnical engineers.
    c. Complete and accurate as-builts and reporting of bore path, diameter, depth, and conduit configuration shall be provided in hard copy and electronic format at completion of construction. As-built record set to be updated within 30 days of completion of this work. The boring data shall be recorded in minimum 10ft intervals during installation, and the full data set shall be provided.
    d. Threshold on voltage: Allowable for electrical/wiring systems not exceeding 600V only. (Open trench installation with concrete encasement is required where voltage is greater than 600V.) Encasement will not be required in bore trenches in drive aisles where bentonite will be used to sufficiently fill the interstitial space / annulus.
    e. Bore trench will avoid the 2-5 ft depth range where possible, as this area is commonly congested with existing underground utilities at Owner school sites.

f. Since conduits are pulled in bundles when installing in bore trenches, Contractor shall take measures necessary to allow for heat dissipation between conduits, by addition of empty conduit or other means as required by code or Owner standards (the more stringent shall apply). All conduit to be PVC Sch 40 or as-approved by Owner.
g. Minimum separation between electrical conduit and conduit for communications cabling shall be maintained per code or Owner standards (the more stringent shall apply) and for proper functioning of data conductors. Owner will consider deviations from requirements, such as use of a single bore path for both electrical and low voltage wiring with an RFI from Contractor that propose alternate solution.
h. Detectable locator tape is to be used along entire length of each bore route to indicate alignment of conduits and presence of shallow utilities.

4. 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 an appropriate copper grounding conductor sized per CEC requirements and continuity shall be maintained throughout conduit runs and pull boxes. Minimum conduit size shall be ¾”. A metallic tracing/caution tape shall be installed in the trench over all buried conduit.
5. All underground conduits placed in trenches, buried under roadways, or swales shall be encased with red dyed concrete slurry cap.
6. All conduit runs in concrete floor slabs (where allowed) shall be installed to comply with all applicable UBC and structural codes to maintain the structural integrity of the floor slab. Where conflicts occur, alternate routing shall be provided at no additional cost to the Owner.
7. Electrical Metallic Tubing (EMT) shall only be used and exposed in electrical and mechanical rooms and in unfinished spaces and in concealed and furred spaces, made up with steel watertight or steel set screw type fittings and couplings. Set screws shall have hardened points. Cast fittings are unacceptable. EMT may be used in exterior installations where allowed by MEC, AHJ requirements or other applicable code. All exterior fittings shall be watertight. EMT may not be installed in areas subject to severe physical damage, including in any carport location with potential for vehicle strike. EMT may not be installed within 8’ of grade in exterior locations.
8. All exposed conduits on sides of buildings, or in other visible areas, shall be painted to match adjacent finishes, after complete installation.
9. Fasten conduits securely to boxes with locknuts and bushings to provide good electrical continuity.
10. To facilitate pulling of conductors, install junction boxes as required.
11. If empty conduits are provided as part of the project, conduits shall be provided with a minimum of two sufficiently rated pull strings or wires inside conduit and properly capped for future wire pull.
12. If conduits are to pass through structural expansion joints in floor slab, rigid galvanized conduit shall be used 18" on either side of joint, complete with Appleton expansion couplings and bonding jumpers, or equal. All above grade expansion joint crossings shall

also utilize expansion joint couplings or flex conduit transitions as required for each particular installation. No solid conduits shall be allowed to cross expansion joints without proper provisions for building and seismic movement. Expansion joints only refer to contiguous structures, not the overhead space between adjacent, separate canopies. Conduits/conductors shall not pass overhead between separate canopies unless approved in writing by Owner.

13. Provide thermal expansion fittings or provisions, per CEC 300.7(b), for all raceways subject to high temperatures in direct exposure to sunlight. Provide expansion provisions where more than 0.25" of expansion is calculated.
14. Minimum cover of conduits in ground outside of building - 30 inches, unless otherwise noted.
15. Provide and install exterior wall conduit seals and cable seals in the locations listed below. Coordinate installation and scheduling with other trades:
    a. Conduit seals through exterior wall or slab (below grade): O.Z. Gedney series “FSK" in new cast in concrete locations, series "CSM" in cored locations.
    b. Conduit seals through exterior wall or slab (above grade): O.Z. Gedney series "CSMI."
    c. Cable seals at first interior conduit termination after entry through exterior wall or slab: O.Z. Gedney series "CSBI." Coordinate quantity of conductors at each location.

F. JUNCTION BOXES / PULL BOXES

1. One-piece steel knockout type drawn j-boxes, unless otherwise noted, sized as required for conditions at each location.
2. J-boxes for wet locations, cast aluminum FS or FD type with cast aluminum gasketed spring lid cover. Weatherproof “Bell” type boxes are not acceptable.
3. Pull boxes to be NEMA 1 (indoor) or NEMA 3R (outdoor), sized per code, with grey enamel finish, steel construction, and screw-on covers. Where sites are within 5-miles of a marine environment, enclosures shall be NEMA 4X. The list of owner sites within 5-miles of a marine environment has been provided in Attachment A2, Supplemental Criteria.
4. All connectors from conduit to junction or outlet boxes shall have insulated throats. Connectors shall be manufactured with insulated throats as integral part. Insertable insulated throats are unacceptable.
5. Conduit Bodies: Malleable iron type, with lubricated spring steel clips over edge of conduit body, O-Z/Gedney type EW, or equal.

G. Site Pull boxes: All site pull boxes shall be flush in-ground concrete, with engraved covers identifying service use (i.e., electrical, communications, etc.).

1. Boxes shall be NEMA 250, Type 6, outside flanged, with recessed cover for flush mounting, by Christy or equal, with required depth to provide box and conduit depths shown or required.
2. Provide concrete covers for all boxes in planted or paved areas (up to available concrete cover size).

3. Provide galvanized steel covers for all larger boxes (when concrete is not available), or in traffic areas. No cast iron covers.
4. Provide bolted covers and slab bottoms (with grouted perimeter) or vault type boxes for all electrical distribution and signal system pull boxes used for site distribution, to prevent rodent entry. No collar type boxes with dirt or gravel bottoms.
5. Provide drain hole at bottom of all vault type boxes, with loose aggregate base below, for proper drainage.
6. All covers to be completely flush with finished adjacent surfaces.
7. Provide galvanized steel H20 rated covers and installation of box rated for H20 in all traffic areas.

H. Wire and Cable:

1. 600 or 1,000-volt or 1,500-volt class, as required for system design, with color coded insulation, minimum No. 12 AWG for DC string circuits or AC circuits.
2. All conductors shall be copper. Any substitution shall require written approval from Owner.
3. INSULATION TYPE
    a. Standard locations: PV string wiring conductors shall be XLPE insulation 2000V, UV rated Type PV for wet and dry locations. All AC wire sizes used shall be based on a 75-degree insulation rating, unless specifically used with 90-degree rated devices. For wires/cables with 90 deg C insulation, the 90 deg C ampacity ratings shall be used for cable sizing before conditions of use de-rates are applied per CEC. All DC wire sizes shall be based on 90-degree insulation rating, when used with 90-degree rated PV equipment and components.
    b. All conductors, excluding bare copper ground conductors, shall be stranded.
    c. Install all wiring (low voltage and line voltage) in conduit, except PV string wiring at modules, which may be run outside of raceway.
    d. Do not pull conductors into conduit until raceways and boxes have been thoroughly cleaned and swabbed as necessary to remove water and debris.
    e. Approximately balance all AC circuits about the neutral conductors in AC collector panels.
    f. All wire and cable shall bear the Underwriters' Label or equivalent NRTL label, brought to the job in unbroken packages.
    g. The equipment grounding conductor shall be insulated. Insulation color shall be green.
    h. Install all circuits in one continuous section unless splices are approved by Owner. Contractor shall exercise care in pulling to avoid damage or disarrangement of conductors, using approved grips. No cable shall be bent to a smaller radius than the spool on which it was delivered from the manufacturer or as required by CEC code, whichever is greater. Color code feeder cables at terminals. Provide identifying linen tags in each pull box.

I. Fire stopping: as manufactured by 3M Fire Protection Products or equal.

1. Fire-rated and smoke barrier construction: Maintain barrier and structural ceiling fire and smoke resistance ratings including resistance to cold smoke at all penetrations, connections

with other surfaces or types of construction, at separations required to permit building movement and sound vibration absorption, and at other construction gaps.

2. Systems or devices listed in the UL Fire Resistance Directory under categories XHCR and XHEZ may be used, providing that it conforms to the construction type, penetration type, annular space requirements and fire rating involved in each separate instance, and that the system be symmetrical for wall penetrations. Systems or devices must be asbestos free.

J. Equipment support frames

1. Unistrut or approved equal, hot-dip galvanized G90.
2. Install components true and level. Deburr cuts, install end caps, tighten all bolts to their recommended torques.

K. Utility Disconnect Switch

1. Manufacturer and part number shall be previously approved by the electric utility for use as a utility-lockable disconnect switch.
2. Amperage rating, voltage rating, enclosure NEMA rating, and phase configuration shall match the design drawings.
3. Switch may only be non-fusible if sufficiently protected against short circuit current by an upstream series-rated overcurrent protective device.
4. Termination lug wire range and quantity must be sufficient for the wire size and quantity shown in the design drawings. Contractor shall verify that the disconnect switch is listed for use with the wire size and quantity shown in the design drawings. Lugs shall be specifically listed for use with the wire metal type shown in the drawings, or be listed for both copper and aluminum.
5. As supplied by the factory, disconnect switch shall be pad-lockable in the open position by the electric utility.

## PART 3 - EXECUTION

3.01 INSPECTION

A. Examine the areas and conditions under which the work of this Section will be installed. Correct conditions detrimental to the proper and timely completion of the Work. Do not proceed until unsatisfactory conditions have been corrected.

3.02 FIELD QUALITY CONTROL

A. All workmanship shall be first class and carried out in a manner satisfactory to and approved by the Owner.

B. This Contractor shall personally, or through an authorized and competent representative, constantly supervise the work and, as much as possible, keep the same foreman and workmen on the job throughout.

3.03 INSTALLATION/APPLICATION/ERECTION

A. All cutting, repairing and structural reinforcing for the installation of this work shall be done by the General Contractor in conformance with the Owner's requirements.

B. Excavate and trench or directional bore as necessary for the electrical installation, and when the work has been installed, inspected, and approved, backfill all excavations with clean earth from excavation, or imported sandy soil in maximum 8" (eight-inch) layers, moisten and machine tamp to 95% compaction, and restore the ground and/or paving or floor surfaces to their original condition.

C. Floor Mounted Equipment Installation: Provide mounting channels for grouting into floor or slab. Channels shall be properly drilled to receive the equipment placed flush in floor, leveled and secured in place prior to pouring of floor, of length as required for switchboard. Bolt or weld switchboard to channels.

D. Furnish and install all disconnect switches as required by code (AC and DC).

3.04 EARTHQUAKE RESISTANT INSTALLATION & FASTENING:

A. All electrical equipment and raceways shall be designed to withstand forces generated by earthquake motions. As a minimum, equipment and equipment frames shall be designed to withstand a force of 50% of the weight of the equipment and frame acting at its center of gravity. Anchorage of the equipment and/or frame to the structure shall be for a force of 100% gravity also acting at the center of gravity.

B. For floor mounted inverters and switchboards / distribution panels, the above values shall be doubled. Design stresses in either case may be increased 1/3 over normal allowable stresses but never beyond yield.

3.05 ADJUSTING AND CLEANING

A. All electrical equipment, including existing equipment not "finish painted" under other sections, shall be touched up where finished surface is marred or damaged.

B. All equipment shall be left in clean condition, with all shipping and otherwise unnecessary labels removed there from.

C. All metal shavings shall be removed, and rust inhibitor applied to minimize oxidation of new steel equipment and boxes.

3.06 IDENTIFICATION

A. Inverters, combiner boxes, pull boxes, switchboards, panel boards, distribution circuit breakers, disconnect switches, and related electrical enclosures shall be properly identified by means of engraved laminated plastic descriptive nameplates mounted on apparatus using stainless steel screws or permanent epoxy adhesive where set screws are not feasible. Standard adhesives alone are not acceptable. Nameplates shall have white letters with black background. Cardholders in any form are not acceptable.

B. Provide all required safety and identification placards as required by code.

3.07 PAINTING OF EQUIPMENT

A. Factory Applied: Electrical equipment shall have factory-applied painting systems which shall, as a minimum, meet the requirements of NEMA ICS 6 corrosion-resistance test, except equipment specified to meet requirements of ANSI C37.20 shall have a finish as specified in ANSI C37.20.

B. Field Applied: Paint electrical equipment as required to match finish or meet safety criteria.

3.08 TESTING

A. General:

1. All inspections and tests shall be in accordance with the International Electrical Testing Association - Acceptance Testing Specifications ATS-2009 (referred to herein as NETA ATS-2009).

2. Final test and inspection may be conducted in presence of Owner: Tests shall be conducted at the expense of and by the Contractor at a mutually agreed time. Submit written test reports.

3. The electrical installation shall be inspected and tested to ensure safety to building occupants, operating personnel, conformity to code authorities, and final Construction Shop Drawings.

4. Refer to Specification Section 48 14 00 Photovoltaic Systems for commissioning and performance testing requirements.

5. Final Inspection Certificates: Prior to final payment approval, deliver to the Owner, with a copy to the Owner, signed certificates of final inspection by the appropriate inspection authority.

a. Grounding System:

i) All ground connections shall be checked and the entire system shall be checked for continuity. The resistance of the ground system at each site shall be measured using a 3-point fall-of-potential method. The maximum ground resistance shall be three ohms.
ii) Ground tests shall meet the requirements of the California Electric Code, Article 250.
iii) All PV system grounding shall meet the requirements of CEC Article 690.

END OF SPECIFICATION SECTION 26 00 00

# Attachment B2.6: 26 32 14 Diesel Generator

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 26 32 13
# GENERATOR

## PART 1 - GENERAL

1.01 SUMMARY

A. Project location is 1351 Pioneer Square, Brentwood, CA 94513

B. Section includes packaged engine-generator sets for emergency and standby power supply with the following features:

1. Fuel system day tank.
2. Parallel generator sets.
3. Load banks.
4. Outdoor enclosure.
5. Acceptance Testing.

C. Engine driven electrical generating systems shall be as manufactured by

1. Caterpillar
2. Cummins
3. Kohler
4. Or equivalent if approved in writing by Owner

D. Obtain packaged generator sets and all associated auxiliary components through one source from a single manufacturer. Walk-in enclosures may deviate from this requirement.

1.02 RELATED DOCUMENTS

A. The Contract and any design-build Bridging Documents

B. Section 01 10 00: Scope of Work

C. Section 01 13 00: Supplementary Criteria

D. Section 01 33 01: Design-Build Process and Submittals

E. Section 05 90 02: Solar Photovoltaic Canopy Structures

F. Section 26 00 00: General Electrical

G. Section 48 14 00: Photovoltaic System

H. Section 48 17 13: Battery Energy Storage

I. Where this specification and the Contract or other Bridging Documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended changes or procedures with the Owner.

1.03 DEFINITIONS

A. EPS: Emergency power supply.

B. EPSS: Emergency power supply system

1.04 ACTION SUBMITTALS

A. Product Data: For each required component provide manufacturer’s standard cut sheet

containing technical details, listings and general information illustrating compliance with these specification requirements.

B. Provide the following detailed documentation for review and evaluation:

1. The manufacturer shall provide copies of following documents for review and evaluation in accordance with general requirements of Division 01 and Division 26:

   a. Factory published specification sheet indicating standard and optional accessories, ratings, etc. Weights of all equipment shall be highlighted.
   b. Manufacturer's catalog cut sheets of all auxiliary components such as battery charger, silencer, exhaust flex, main circuit breaker, etc.
   c. Dimensional elevation and layout drawings of the generator set, enclosure and transfer switchgear and related accessories. Concrete pad recommendation, layout and stub-up locations of electrical and fuel systems shall be included.
   d. Engine mechanical data, including heat rejection, exhaust gas flows, combustion air and ventilation air flows, noise data, etc. Air flow requirements shall be for cooling and combustion air in CFM at 0.8 power factor, with air supply temperature of 95, 80, 70, and 50 °F.
   e. Fuel consumption in gallons per hour at 0.8 power factor at 0.5, 0.75 and 1.0 times generator capacity.
   f. Generator electrical data including resistances, reactances, time constants, temperature and insulation data, thermal damage curve, cooling requirements, excitation ratings, voltage regulation, voltage regulator, efficiencies, waveform distortion and telephone influence factor.
   g. Certified trip curves for each circuit breaker.
   h. Certified copies of all Type (Design) and Verification Test Reports for prototype units.
   i. Interconnect wiring diagram of complete emergency system, including generator, switchgear, day tank, remote pumps, battery charger, and remote alarm indications.
   j. Control panel schematics.
   k. Calculations indicating acceptable performance of the submitted unit starting and running the specified load.

2. Report of exhaust emissions showing compliance with applicable regulations.
3. Third party certified noise test data on an equal or similar enclosure design.
4. Manufacturers and dealers written warranty.
5. Seismic Qualification Certificates for engine-generator set, accessories, and components.

1.05 CLOSEOUT SUBMITTALS

A. Submit test report confirming acceptance of all Installation inspections and tests as outlined in Part 3 of this specification.

B. Submit operation and maintenance data based on factory and field-testing, operation and maintenance of specified product.

C. Submit maintenance manuals and recommended spare parts list required to conform to industry standard maintenance guidelines. Instructions shall include but not be limited to:

1. Instructions for replacing any renewable components of the system.
2. Instructions for periodic cleaning and adjustment of equipment with a schedule of these functions.

3. A complete list of all equipment and components with information as to the address and telephone number of both the manufacturer and local supplier of each item.

1.06 QUALITY ASSURANCE

A. The system design and installation shall conform to the following standards

1. All equipment shall be UL listed for its intended purpose, including UL 2200.
2. All applicable NFPA standards, including but not limited to: 70 and 110.
3. State Building Code.
4. All requirements of the Authority Having Jurisdiction (AHJ)

B. The equipment supplier and the Contractor shall demonstrate a minimum five (5) years' experience in the successful design and installation of standby generation systems similar in size and scope to that required for this project.

1.07 WARRANTY

A. The installer and manufacturer's warranty shall be for a minimum period of five (5) years from the date of the final acceptance test approval.

B. The supplier shall provide a trailer mounted portable engine generator with accessories (including interconnection to the electrical distribution system) to provide backup power for any warrantee related system outages that exceed five (5) calendar days.

1.08 COORDINATION

A. Coordinate sizes and locations of actual equipment provided. Provide sketches to illustrate submitted equipment will fit within the allocated space where the dimensions of the submitted equipment exceed those illustrated on the drawings for the basis of design.

**PART 2 - PRODUCTS**

2.01 GENERAL

A. Provide factory assembled water cooled diesel engine-driven electric generating system rated for emergency standby service. The automatic transfer switch(es) specified in other sections of this specification shall be supplied by the generator set manufacturer in order to establish and maintain a single source of system responsibility and coordination. Refer to the drawings for service ratings at 60 Hz.

B. The system shall automatically start and accept full rated load within ten (10) seconds of being signaled to start.

C. Engine generator and accessories including control panel, engine starting batteries and output circuit breaker(s) shall be mounted within a sound attenuated weatherproof enclosure. Refer to the enclosure specification section for additional details.

D. SPECIFIER TO MODIFY IF NOT INSTALLED IN FREE STANDING ENCLOSURE.

E. Specified kW is for continuous service during utility source interruption, as established in ISO 8528-3 at 86°F. Rating shall be substantiated by manufacturer's standard published curves. Special and maximum ratings will not be accepted.

F. Supplier shall have been engaged regularly in generator or engine manufacture, or both, for at least twenty-five (25) years. The generator manufacturer and dealer shall be ISO 9001 certified.

G. The supplier shall maintain a full time in-house parts and service organization so that parts and service are readily available, twenty-four (24) hours/day seven (7) days/week. Qualified, factory trained service personnel shall be available within four (4) hours of notification.

H. Prototype testing shall certify the acceptable performance of the generating set series. The test shall prove acceptance, as a system, of the design and integration of all components. Proposed system shall be a current factory production model. Prototype testing shall confirm:

1. Fuel consumption at ¼, ½, ¾ and full load.
2. Exhaust emissions.
3. Mechanical and exhaust noise levels.
4. Governor speed regulation at ¼, ½, ¾ and full load.
5. Generator temperature rise in accordance with NEMA MG1-22.40
6. Harmonic analysis, voltage waveform deviation and telephone influence factor.
7. Generator short circuit capacity.
8. Cooling system capacity.

I. Provide manufacturer's load analysis calculation confirming that the generating set submitted is compatible with loads to be applied.

1. Generator-Set Performance: Steady-State Voltage Operational Bandwidth: 3% of rated output voltage from no load to full load.
2. Transient Voltage Performance: Not more than 20% variation for 50% step-load increase or decrease. Voltage shall recover and remain within the steady-state operating band within three (3) seconds.
3. Steady-State Frequency Operational Bandwidth: 0.5% of rated frequency from no load to full load.
4. Steady-State Frequency Stability: When system is operating at any constant load within the rated load, there shall be no random speed variations outside the steady-state operational band and no hunting or surging of speed.
5. Transient Frequency Performance: Less than 5% variation for 50% step-load increase or decrease. Frequency shall recover and remain within the steady-state operating band within five (5) seconds.
6. Output Waveform: At no load, harmonic content measured line to line or line to neutral shall not exceed 5% total and 3% for single harmonics. Telephone influence factor, determined according to NEMA MG1, shall not exceed 50%.
7. Sustained Short-Circuit Current: For a three-phase, bolted short circuit at system output terminals, system shall supply a minimum of 250% of rated full-load current for not less than ten (10) seconds and then clear the fault automatically, without damage to generator system components.
8. Below requires ten (10) second maximum start time under specific conditions and includes startup only, not load assumption.
9. Start Time: Comply with NFPA 110, Type 10, system requirements.

J. The proposed generator set shall be EPA Tier Certified and in compliance with all AHJ regulations at the time of installation/commissioning. Actual engine emissions values must be in compliance with EPA Tier emissions standards per ISO 8178 – D2 Emissions Cycle at specified EKW/BHP rating.

K. The manufacturer’s warrantee shall be for a minimum period of five (5) years from the date of

initial system start-up and acceptance or 1,500 operating hours, whichever occurs first. The warrantee shall include repair parts, expendables (lubricating oil, filters, antifreeze, etc.), labor and travel expenses necessary for repairs at the job site. The supplier shall provide a trailer mounted portable engine generator with accessories (including interconnection to the electrical distribution system) to provide backup power for any warrantee related system outages that exceed five (5) calendar days.

2.02 ENGINE

A. Frequency regulation shall be Isochronous, regulated to within +/- 0.25% from no load to full load.

B. All fuel piping shall be black iron or flexible fuel hose rated for this service. Flexible fuel lines rated 300°F and 100 PSI.

C. The engine shall be equipped with a rail-mounted, engine-driven radiator with blower fan and all accessories. The cooling system shall be sized to operate at full load conditions, 110°F ambient air entering the room or enclosure (where an enclosure is specified), and permanent anti-freeze solution of 5 ethylene-glycol-based antifreeze and water with anticorrosion additives as recommended by engine manufacturer to protect equipment to –15°F without derating the unit. Antifreeze shall have a service life of 3000 hours without maintenance. The generator set supplier is responsible for providing a properly sized cooling system based on the installed static pressure restriction.

D. Provide thermostatically-controlled electric-immersion type engine jacket water heater, be sized by the manufacturer to maintain jacket water temperature at 90°F, 208 V, single-phase, 60 HZ mounted, piped and prewired to terminal strip.

E. Lube oil pump shall be mechanically driven positive displacement. Lube oil system shall be piped through an oil cooler and a full flow filter with replaceable cartridge. Filter and Strainer shall be rated to remove 90% of particles 5 micrometers and smaller while passing full flow.

F. Fuel oil pump shall be mechanically driven positive displacement with dual full flow filters and replaceable cartridge. One filter shall be isolated while the other is on-line. Fuel system shall have a manual-priming pump. Fuel piping shall be arranged to prohibit loss of prime with an anti-siphon check valve at the fuel pump suction piping. Filter and Strainer shall be rated to remove 90% of particles 5 micrometers and smaller while passing full flow.

G. Air intake shall be via a heavy duty replaceable dry element filter and "blocked filter" indicator.

H. Provide lubricating oil pressure gauge, water temperature gauge, battery charge rate ammeter and running time meter mounted in common panel with engine controls, alternator controls and alternator instruments.

I. A critical type silencer (25-34 DBA at 500Hz exhaust noise reduction), companion flanges, and flexible stainless steel exhaust fitting properly sized shall be furnished and installed according to the manufacturer's recommendation. Exhaust pipe size shall be sufficient to ensure that exhaust backpressure does not exceed the maximum limitations specified by the engine manufacturer. The silencer shall be mounted so that its weight is not supported by the engine nor will exhaust system growth due to thermal expansion be imposed on the engine. The muffler and all indoor exhaust piping shall be "lagged" by the Contractor to maintain a surface temperature not to exceed 150°F. The insulation shall be installed so that it does not interfere with the functioning

of the flexible exhaust fitting.

J. Packaged generator set shall be certified and in compliance with the latest Non-Road, Off-Highway EPA and CARB Emission regulations.

2.03 ALTERNATOR

A. The synchronous generator designed in accordance with NEMA MG 1 and directly connected to the engine flywheel housing with a flex coupling to ensure permanent alignment. The insulation material shall meet NEMA standards for Class H insulation and be fungus resistant. Temperature rise of the rotor and stator shall not exceed NEMA class F (130 ºC rise by resistance over 40°C ambient). Subtransient resistance shall not exceed 12%.

B. The excitation system shall be of brushless construction. The permanent magnet brushless exciter shall be independent of main stator windings, shall consist of a three-phase armature and a three-phase full wave bridge rectifier mounted on the rotor shaft. Surge suppressors shall be included to protect the diodes from voltage spikes. Generator shall have the ability to sustain short circuit current for ten (10) seconds of 300% of rated current to allow protective devices to operate.

C. The automatic voltage regulator (AVR) shall maintain generator output voltage within +/- 0.5% for any constant load between no load and full load. The regulator shall be three phase sensing, totally solid state design, which includes electronic voltage buildup, volts per Hertz regulation, overexcitation protection, loss of sensing protection, temperature compensation, shall limit voltage overshoot on startup, and shall be environmentally sealed. System shall reduce voltage automatically if load demand exceeds engine capacity and remove excitation when generator is overloaded for more than ten (10) seconds. Voltage regulator shall be, volts-per-hertz and include over voltage and under voltage protection.

1. Maintain voltage within 20% on one step, full load
2. Maintain frequency within 10% and stabilize at rated frequency within two (2) seconds.

D. Generator Protector: Microprocessor-based unit shall continuously monitor current level in each phase of generator output, integrate generator heating effect over time, and predict when thermal damage of alternator will occur. When signaled by generator protector or other generator-set protective devices, a shunt-trip device in the generator disconnect switch shall open the switch to disconnect the generator from load circuits. Protector performs the following functions:

1. Initiates a generator overload alarm when generator has operated at an overload equivalent to 110% of full-rated load for sixty (60) seconds. Indication for this alarm is integrated with other generator-set malfunction alarms. Contacts shall be available for load shed functions.
2. Under single or three-phase fault conditions, regulates generator to 300% of rated full-load current for up to ten (10) seconds.
3. As overcurrent heating effect on the generator approaches the thermal damage point of the unit, protector switches the excitation system off, opens the generator disconnect device, and shuts down the generator set.
4. Senses clearing of a fault by other overcurrent devices and controls recovery of rated voltage to avoid overshoot.

E. The alternator output shall be wired with a circuit breaker. Breaker shall utilize an electronic LSI solid state trip. Unit breaker shall each be housed in a steel NEMA 1 enclosure mounted on a

separate support stand vibration isolated from the engine / generator arrangement.

2.04 VIBRATION ISOLATION

A. Provide spring vibration mounts between engine generator set and structural sub-base as recommended by equipment manufacturer. Unit shall be suitable for installation on any level surface.

2.05 FUEL STORAGE TANK

A. The storage tank system shall be supplied by the engine generator set supplier and shall include the following:

1. Tank sized for a usable capacity of an uninterrupted period of twenty-four (24) hours of operation at 100% of rated power output of engine-generator system without being refilled; pressure tested, double walled, U/L Listed.
2. Transfer pump sized greater than the maximum fuel draw of the engine rated fuel consumption at 110% rated capacity output capacity.
3. Rupture basin alarm contact.
4. Low level alarm contact at 25% capacity.
5. High-Level Alarm Sensor: Liquid-level device operates alarm and redundant fuel shutoff contacts at midpoint between overflow level and 100% of normal fuel level.
6. Redundant High-Level Fuel Shutoff: Actuated by high-level alarm sensor in day tank to operate a separate motor control device that disconnects day-tank pump motor. Sensor shall signal solenoid valve, located in fuel suction line between fuel storage tank and day tank, to close. Both actions shall remain in shutoff state until manually reset. Shutoff action shall initiate an alarm signal to control panel but shall not shut down engine-generator set.
7. Float controls.
8. Fuel gauge, dial type.
9. Piping connections for:

    a. Engine supply.
    b. Engine return.
    c. Vent with vent whistle.
    d. Bottom drain.
    e. Fuel gauge.
    f. Manual fill cap, lockable.

2.06 STARTING

A. A DC electric starting system with positive engagement shall be furnished. The motor voltage shall be as recommended by the engine manufacturer.

B. Provide batteries as recommended by equipment manufacturer, sized to provide no less than three cranking cycles without recharging. Provide unit mounted battery rack fabricated of metal with acid-resistant finish and thermal insulation, hold down and battery cables.

C. A current limiting automatic-equalizing and float battery charger shall be furnished to recharge batteries. Unit shall comply with UL 1236 and include the following features:

1. Equalizing-charging rate shall be initiated automatically after battery has lost charge until an adjustable equalizing voltage is achieved at battery terminals. Unit shall then be automatically switched to a lower float-charging mode and shall continue to operate in that

mode until battery is discharged again.

2. Adjust float and equalize voltages for variations in ambient temperature from minus 40 °F to 140 °F to prevent overcharging at high temperatures and undercharging at low temperatures.
3. Maintain constant output voltage regardless of input voltage variations up to plus or minus 10%.
4. Ammeter and Voltmeter shall be flush mounted in door. Meters shall indicate charging rates.
5. Sense abnormally low battery voltage and close contacts providing low battery voltage indication on control and monitoring panel. Sense high battery voltage and loss of ac input or dc output of battery charger. Either condition shall close contacts that provide a battery-charger malfunction indication at system control and monitoring panel.
6. Enclosure and Mounting: NEMA 3R, wall-mounted cabinet.

D. Provide battery blanket heater to maintain battery temperature between 50°F and 90°F.

2.07 CONTROL PANEL

A. Provide a generator set mounted control panel for complete control and monitoring of the engine and generator set functions. Panel shall include automatic start/stop operation, cycle cranking, AC metering (0.5% true RMS accuracy) with phase selector switch, shutdown sensors and alarms with horn and reset, adjustable cool-down timer and emergency stop push-button and engine run time meter (non-resettable).

B. Critical components shall be environmentally sealed to protect against failure from moisture and dirt. Components shall be housed in a NEMA 3R enclosure with hinged door.

C. The panel itself shall be mounted on a separate support stand isolated from the engine / generator arrangement. Panel / breaker arrangements mounted on the generator set in such a way that access to the AC Generator terminal box is restricted in any way whatsoever are not acceptable.

D. Provide the following readouts:

1. Engine oil pressure
2. Coolant temperature
3. Engine RPM
4. System DC Volts
5. Engine running hours
6. Generator AC volts
7. Generator frequency
8. Generator AC amps

E. Provide the following indications for protection and diagnostics according to NFPA 110 Level 1:

1. Low oil pressure
2. High water temperature
3. Low coolant level
4. Overspeed
5. Overcrank
6. Emergency stop depressed
7. Approaching high coolant temperature

8. Approaching low oil pressure
9. Low coolant temperature
10. Low voltage in battery
11. Control switch not in auto position
12. Low fuel main tank
13. Battery charger AC failure
14. High battery voltage
15. Fuel tank rupture
16. Engine running

F. Diagnostics capabilities shall identifying both system and component level issues. The diagnostic codes shall be maintained in a history log specifying the number of occurrences, and second/minute/hr at which they occur.

G. Provide the following control functions:

1. Terminals located inside the control panel for REMOTE EMERGENCY STOP
2. ON / OFF / AUTO control switch

2.08 REMOTE INTERFACE

A. Where the generator is paired with a microgrid system the generator control system shall be capable of remote control and communicating with an external microgrid controller. The generator remote control capabilities shall include start/stop operation from an external microgrid controller. The generator remote interface shall be capable of providing all the information displayed on the control panel to an external microgrid controller via standard communication protocols.

2.09 ANNUNCIATOR

A. Provide an annunciator to meet the requirements of NFPA 110, Level 1, installed in enclosure suitable for flush or surface mounting. The annunciator shall provide remote annunciation of all points stated above and shall incorporate ring-back capability so that after silencing the initial alarm, any subsequent alarms will sound the horn.

2.10 I/O MODULE

A. Provide remote I/O modules for redundant monitoring of NFPA110, Level 1 alarms by the Owner's system(s). The remote I/O modules shall interconnect with the ECP on the remote annunciator network wiring.

2.11 SOUND ATTENUATED WEATHERPROOF ENCLOSURE.

A. Engine generator set, generator control panel, engine starting batteries, accessories and internally mounted exhaust silencer shall be enclosed in factory-assembled, rainproof-weather-protective skid-base enclosure with full floor panel. The enclosure shall have a resulting sound level of less than 71 DBA at fifty (50) feet. The enclosure and generator shall be UL2200 labeled.

B. Enclosure will consist of a roof, fuel tank and rupture basin base, two (2) side walls, and two (2) end walls, of highly corrosion resistant construction made from galvanized steel. Stainless steel flush fitting latches and hinges tested and proven to withstand extreme conditions of corrosion. The sheet steel components shall be pre-tested with zinc phosphate prior to polyester powder coating at 392 °F. Roof bows shall be cambered to aid in rain runoff.

C. An integral fuel tank underframe and rupture basin shall be supplied, consisting of the following:

1. A rupture basin utilizing minimum 7 gauge steel channel perimeter walls and bottom.
2. A U.L. listed (per U.L. 142) above-ground # gallon capacity rectangular tank of minimum 12 gauge steel construction.
3. The tank shall have venting and emergency venting (to roof) per U.L. 142, lockable fill, low level and high level alarm contacts, and an electric analog level gauge.
4. The fill valve shall have an overfill prevention type, equal to the “Stopper” OPW 61f stop.
5. The rupture basin shall have a float contact to indicate tank rupture.
6. The entire system shall be leak tested prior to installation.

D. Intake openings shall be screened to prevent the entrance of rodents. The system shall include a cooling and combustion air inlet silencer system, an equipment enclosure section, and a cooling air discharge silencer section.

E. Number of doors on enclosure shall be as required so that all normal maintenance operations, such as lube oil change, filter change, belt adjustment and replacements, hose replacements, access to the control panels, etc., may be accomplished without disassembly of any enclosure components. Access doors shall be fabricated of the same material as the enclosure walls. They shall be reinforced for rigidity and set is a welded frame to ensure proper operation. Handles shall be key lockable, all doors keyed alike, and hinges shall be zinc die cast or stainless steel. Fasteners shall be zinc plated or stainless steel. Doors shall be of a lift off design allowing one person to remove door if necessary and/or top hung and supported by gas struts.

F. Battery racks and batteries shall be factory-installed and wired. Exhaust silencer, flexible exhaust connector and condensate drain valve shall be factory-installed.

G. Lube oil and coolant drains shall be extended to the exterior of the enclosure and terminated with drain valves and capped with pipe nipples on flanged connectors. Radiator access shall be through a hinged, lockable cover on enclosure. Cooling fan and charging alternator shall be fully guarded to prevent injury.

H. Owner shall select finish color of enclosure.

I. The exhaust stack shall be a minimum of 10 feet- 0 inches above the enclosure roof. All required supports shall be attached to the enclosure. No obstructions shall be allowed to the exhaust outlet.

J. Provide a manual stop break-glass station to allow emergency shutdown of the unit. The station shall be integrated into the enclosure and accessible from the exterior, no greater than 6 feet-0 inches AFG.

K. Four-point lifting provisions shall be provided at or near the enclosure base, with capacity suitable for rigging the entire assembly. Quality assurance procedures of the manufacturer shall include regular testing of the lift devices.

L. Air handling shall be as follows:

1. Air will enter the enclosure through removable hood(s) or an integral, baffled plenum.
2. Motor operated damper(s) will be provided, wired to open upon engine startup or loss of power (dampers shall fail open).
3. Radiator discharge will be through a gravity operated damper and into a hood or vertical

plenum, as dictated by airflow.

M. The manufacturer shall perform the system integration of all mechanical and electrical components in the enclosure. All devices in the enclosure, including specified generator set accessories, shall be prewired in EMT or galvanized rigid steel conduit with flexible liquidtight metal conduit connections where vibration isolation is necessary.

N. The enclosure shall include:

1. Interior A.C. and D.C. lighting. Switch control for both AC and DC lighting shall be provided at each entry door. D.C. light switches shall be timer types.
2. Exterior lighting at each entry door shall be HPS wall packs with integral photocells.
3. GFCI protected duplex receptacles for maintenance to limit extension cord lengths to a maximum of fifteen (15) feet.
4. Electric space heater(s) with a single thermostat controlling all heaters.
5. Ventilation fan with thermostat and interlocked to prohibit operation while the generator is running.
6. Three phase, four wire 208Y/120V AC distribution panelboard via a 480-dry type transformer. The transformer primary shall be protected by a heavy duty fused disconnect.
7. All ancillary equipment shall comply with the applicable sections of the electrical specification.
8. SPECIFIER TO VERIFY VOLTAGE TO AUXILIARIES AND MODIFY EXTERIOR LIGHTING LAMP TYPE IF HPS DOES NOT MATCH SITE LIGHTING
9. Provide a manual stop break-glass station to allow emergency shutdown of the unit. The station shall be integrated into the enclosure and accessible from the exterior, no greater than 6’0” AFG.

2.12 LOAD BANK, WHERE REQUIRED BY AHJ

A. Permanent, outdoor, weatherproof, remote-controlled, forced-air-cooled, resistive unit capable of providing a balanced three-phase, delta-connected load to generator set at 100% rated-system capacity. Unit shall be capable of selective control of load in 25% steps and with minimum step changes of approximately 5 and 10% available.

B. Permanent, radiator-mounted resistive unit capable of providing a balanced three-phase, delta-connected load to generator set at 50% rated-system capacity. Unit shall be capable of selective control of load in 25% steps of load bank rating and with minimum step changes of approximately 5 and 10% available.

C. Resistive Load Elements: Corrosion-resistant chromium alloy with ceramic and stainless-steel supports. Elements shall be double insulated and designed for repetitive on-off cycling. Elements shall be mounted in removable aluminized-steel heater cases. Galvanized steel is prohibited. Element's maximum resistance shall be between 100 and 105% of rated resistance.

D. Load-Bank Heat Dissipation: Integral fan with totally enclosed motor shall provide uniform cooling airflow through load elements. Airflow and coil operating current shall be such that, at maximum load, with ambient temperature at the upper end of specified range, load-bank elements operate at not more than 50% of maximum continuous temperature rating of resistance elements.

E. Load-Element Switching: Remote-controlled contactors switch groups of load elements. Contactor coils are rated 120V. Contactors shall be located in a separate NEMA 250, Type 3R

enclosure within load-bank enclosure, accessible from exterior through hinged doors with tumbler locks.

F. Contactor Enclosures: Heated by thermostatically controlled strip heaters to prevent condensation.

G. Load-Bank Enclosures: NEMA 250, Type 3R, aluminized steel complying with NEMA ICS 6. Louvers at cooling-air intake and discharge openings shall prevent entry of rain and snow. Openings for airflow shall be screened with 1/2-inch- (13-mm-) square, galvanized-steel mesh. Reactive load bank shall include automatic shutters at air intake and discharge. Components other than resistive elements shall receive exterior epoxy coating with compatible primer.

H. Protective Devices: Power input circuits to load banks shall be fused, and fuses shall be selected to coordinate with generator circuit breaker. Fuse blocks shall be located in contactor enclosure. Cooling airflow and over-temperature sensors shall automatically shut down and lock out load bank until manually reset. Safety interlocks on access panels and doors shall disconnect load power, control, and heater circuits. Fan motor shall be separately protected by overload and short-circuit devices. Short-circuit devices shall be non-interchangeable fuses with 200,000 amps interrupting capacity.

I. Remote-Control Panel: Separate from load bank in NEMA 3R enclosure with a control power switch and pilot light, and switches controlling groups of load elements.

J. Control Sequence: Control panel may be preset for adjustable single-step loading of generator during automatic exercising.

## PART 3 - EXECUTION

3.01 INSTALLATION

A. Placement of the generator shall be the responsibility of the electrical Contractor. Coordinate placement with the Owner’s Representative and obtain all associated permits and permissions necessary for blockage of public way, interference with parking, etc.

B. Fill all fluid levels (including fuel where applicable) to maximum recommended levels by the manufacturer prior to testing and after testing completed.

3.02 START-UP AND TESTING

A. After installation is complete and normal power is available, the manufacturer's local dealer shall perform the following four (4) hour load test:

1. Verify that the equipment has been properly installed.
2. Check all auxiliary devices for proper operation, including battery charger, jacket water heater(s), generator space heater, all remote annunciator points, etc.
3. Test all alarms and safety shutdown devices for proper operation and annunciation.
4. Check all fluid levels.
5. Start engine and check for exhaust, oil, fuel leaks, vibrations, etc.
6. Verify proper voltage and phase rotation at the transfer switch before connecting to the load.
7. Connect the generator to building load and verify that the generator will start and run all designated loads. Testing shall be performed in accordance with NFPA 110 from a “cold start” condition. Each of the following shall be observed and recorded upon opening of the

Normal supply circuit breaker to the ATS:

a. Time delay on start
b. Cranking time until the prime mover starts and runs
c. Time required to reach operating speed
d. Voltage and frequency overshoot
e. Time required to reach steady state conditions with all switches transferred to the emergency position
f. Voltage, frequency and current

8. The system shall be tested under load for a period of two (2) hours. The following readings shall be taken at fifteen (15) minute intervals:
   a. Oil pressure
   b. Coolant temperature
   c. Battery charge rate
   d. AC volts
   e. AC Amperes- all phases
   f. Frequency
   g. Kilowatts
   h. Kilovolt-amperes
   i. Ambient Temperature
9. Allow system to cool for five (5) minutes.
10. The system shall be tested for a period of two (2) hours with the use of a portable resistive/reactive loadbank, or permanent loadbank if installed, at 100% rated load. Load shall be applied upon reaching rated RPM in one step. All data specified above shall be recorded for this segment until completion of the two-hour test.
11. The Generator Distributor shall provide a written test report upon completion of testing. Report shall specifically indicate the successful completion of each item referenced above and submit all recordings in a format similar to NFPA 110 tables.

B. All costs associated with the referenced testing, including fuel consumption, load bank rental, temporary cables from the generator to the load bank, etc. shall be included in the bid price.

3.03 TRAINING

A. Provide one (1) day of on-site training to instruct the Owner's personnel in the proper operation and maintenance of the equipment. Review operation and maintenance manuals, parts manuals, and emergency service procedures.

END OF SECTION 26 32 13

# Attachment B2.7: 48 14 00 Solar PV Systems

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 48 14 00
# PHOTOVOLTAIC SYSTEM

## PART 1 - GENERAL

1.01 SUMMARY

A. This is a design-build project and includes the design, construction, and commissioning of complete Photovoltaic Systems (PV), including all AC, DC, monitoring, metering and balance of system components. The design and installation shall conform to all requirements as defined by the applicable codes, laws, rules, regulations, and standards as specified in the Contract.

B. This section describes requirements for the solar photovoltaic (PV) system, including:

1. PV modules
2. Optimizers/Rapid Shutdown
3. Solar Inverters
4. Metering & Data Acquisition System
5. Balance of System for a complete PV system.

C. "Owner" shall refer to owner of the site where project will be located, regardless of system ownership, and include any representative of the site owner, such as consultants or inspectors. "Contract" refers to the design-build or construction contract and any associated design-build bridging documents, inclusive of requirements outlined in the request for proposals (RFP). "Contractor" refers to the entity performing the work, inclusive of Engineer and Architect of Record for design-build contracts.

1.02 RELATED DOCUMENTS

A. The Contract and any design-build bridging documents.

B. 01 10 00: Summary of Work

C. 01 13 00: Supplementary Criteria

D. 01 33 01: Design-Build Process & Submittals

E. 05 90 02: Solar Photovoltaic Canopy Structures

F. 26 00 00: General Electrical

G. 26 31 13: Diesel Generator

H. 48 17 13: Battery Energy Storage System

I. Other Owner's Specification or Bridging Documentation

J. Where this specification and other specifications or bridging-documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended equipment or procedures with the Owner.

1.03 DEFINITIONS

A. AC: Alternating Current.

B. AHJ: Authority Having Jurisdiction.

C. BOS: Balance of System

D. CEC: California Electrical Code -OR- California Energy Commission

E. COD: Commercial Operation Date

F. CPUC: California Public Utilities Commission.

G. DAS: Data Acquisition System.

H. DC: Direct Current.

I. MPPT: Maximum power point tracking.

J. MW: Megawatt

K. NEC: National Electrical Code.

L. NEM: Net Energy Meter.

M. NEM-A: Net Energy Metering Aggregation

N. NEMA: National Electrical Manufacturers Association

O. PTC: PVUSA Test Condition, commonly regarded as “real-world” measure of PV output.

P. PTO: Permission to Operate with the electrical utility.

Q. PV: Photovoltaic.

R. STC: Standard Test Conditions defined in IEC 61215.

S. UL: Underwriters Laboratories.

1.04 CODES & REFERENCES

A. The design and installation shall conform to all requirements as defined by the applicable codes, laws, rules, regulations and standards of applicable code enforcing authorities (Latest Edition unless otherwise noted). The following are key standards that shall be followed. The Architect/Engineer of Record and Contractor shall ensure all applicable codes are followed:

1. ASTM International (ASTM) (www.astm.org), including:
   a. E3010, Standard Practice for Installation, Commissioning, Operation, and Maintenance Process (ICOMP) of Photovoltaic Arrays
2. American National Standards Institute (ANSI)
3. California Building Code (CBC), with State of California Amendments
4. California Energy Commission Title 24 Building Energy Efficiency Requirements
5. California Department of Forestry and Fire Protection, Office of the State Fire Marshal – Solar Photovoltaic Installation Guidelines
6. California Public Utilities Commission (CPUC), Including Title 21
7. Institute of Electrical and Electronics Engineers (IEEE)
8. International Electrotechnical Commission (IEC), including:

   a. 62446-1 Photovoltaic (PV) systems – Requirements for testing, documentation and maintenance. Part 1: Grid connected systems – Documentation, commissioning tests and inspection
9. International Electrical Testing Association (NETA)
10. Local Fire Permit Requirements
11. National Electrical Manufacturers Association (NEMA)
12. National Fire Protection Association (NFPA), National & California Electrical Code
13. Underwriters Laboratory (UL), including:
   a. UL 1741 - Inverters, Converters, Controllers and Interconnection System Equipment for Use With Distributed Energy Resources.
   b. UL 1703 – Standard for Flat-Plate Photovoltaic Modules and Panels.
   c. UL 2703 – Standard for Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for use with Flat-Plate Photovoltaic Modules.
14. Utility company standards and requirements
15. Division of the State Architect (DSA), including:
   a. DSA IR-16-8 (most recent) Guidelines
   b. DSA PL-07-02 (most recent) Guidelines
16. Owner Specifications and Requirements
17. All other applicable Codes and Ordinances

1.05 WORK INCLUDED

A. The work shall include the design, engineering, materials, labor, equipment, installation, testing, services, and incidentals necessary to install complete Photovoltaic (PV) Systems in conformity with the Contract, applicable codes, and professionally recognized standards.

B. The Contractor shall include all items and all work reasonable required to complete the System in accordance with the Agreement. If the Contractor is in doubt as to the intent of any portion of these specifications, or necessary information is omitted, the Contractor shall notify the Owner in writing for clarifications or corrections to be provided by addendum.

C. All design documents, cut sheets, shop drawings, and technical specifications shall be submitted, reviewed and accepted by the Owner per the guidelines specified in the Contract and any bridging documents.

D. PV systems shall consist of arrays of framed photovoltaic modules, mounting hardware, terminal boxes, combiner boxes, quick-connect electrical connectors, DC wiring, DC disconnects, utility interactive inverters, AC disconnects, AC feeders, transformers, AC circuit breakers, AC panel boards / switchgear, complete data acquisition (DAS) and monitoring systems, rapid shutdown devices where required, and any other equipment described or inferable from the Contract and Bridging Documents.

E. Metering, monitoring system, DAS, weather stations, and cellular modem equipment, including subscriptions for first five years.

F. Utility grid interconnection, including all interconnection application and coordination during design, construction, commissioning, and startup. Work shall include, review of any previous interconnect applications, utility company coordination, revisions to interconnect applications as-needed, inspections, permits, and final approval for the complete interconnection and PTO of the PV systems with the utility company grid. See Section 3.06 for further detail.

G. The Contractor shall provide for the disconnection, disposition, and proper disposal of all existing equipment to be demolished and/or replaced.

1.06 CONDITIONS AT SITE

A. Contractor is responsible for familiarizing themselves with all discernible site conditions. No extra payment will be allowed for work required because of these conditions, whether specifically mentioned or not. See Section 01 10 00 Summary of Work for further detail.

B. Lines of other services and other site improvements that are damaged as a result of this work shall promptly be repaired at no expense to the Owner and to the complete satisfaction of the Owner.

1.07 SUBMITTALS

A. DESIGN SUBMITTALS

1. Prepare design drawings in accordance with Section 01 33 01, Design-Build Process & Submittals

2. Design drawings shall include but not be limited to the following:

a. PV system modeling and production estimates, including cover sheet summary table
b. Electrical site plans including all balance of system components
c. Electrical design, including site electrical, single lines, DC wire plans/schedules, stringing diagrams, wire schedules, grounding details, etc.
d. Complete module layout designs, coordinated with racking designs.
e. Inverter and any other balance of system details and layout, inclusive of conduit/conductor routing.
f. All other balance of system mounting details
g. Monitoring system design and installation details
h. Equipment space layouts and clearances

B. ACTION SUBMITTALS

1. PRODUCT DATA: For each type of product.

a. Include construction details, material descriptions, dimensions of individual components and profiles, weights, and finishes.
b. Manufacturers' datasheets, specifications, and other data required to demonstrate compliance with the specified requirements. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
c. Complete material list of all items proposed to be furnished and installed under this Section, including but not limited to the following items: PV modules, Inverters, conductors, PV connectors, ground lugs (where not provided by PV mounting rack manufacturer), cable clips, cable ties, wire management products, PV wire strain relief, PV wire gland fittings, PV wire abrasion protection, conduit and fittings, conduit supports, cable tray and fittings, pull boxes, structural fasteners and anchors, monitoring systems, DC string fuses, and all other BOS to provide a complete PV system.
d. Manufacturers' recommended installation procedures which, when approved by the Owner, shall become the basis for inspecting and accepting or rejecting actual installation procedures used on the work.

2. SHOP DRAWINGS shall include:
   a. Cable tray plan and details, if proposed for array wiring.
   b. Proposed method to enclose PV wire at transitions.
   c. All Shop Drawings shall include:
      i) Plans, elevations, sections, and mounting details.
      ii) Details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
      iii) Detail fabrication and assembly.
3. Commissioning and Performance Testing Protocol

C. INFORMATIONAL SUBMITTALS

1. Field quality-control reports.
2. Warranty: Manufacturer's special materials and workmanship warranty and minimum power output warranty.
3. Hazardous Materials Documentation: Environmental impact of system equipment containing hazardous materials shall be provided from the Manufacturer. Documentation shall include disposal instructions for equipment at the end of its useful life.

D. CLOSEOUT SUBMITTALS

1. See Section 01 33 01 and Section 3 for closeout submittal requirements.
2. At a minimum, closeout submittals shall include the following documentation, provided in electronic format:
   a. As-built drawings in CAD and PDF format
   b. Commissioning documentation
   c. Performance testing documentation
   d. Closeout documentation library
3. AS-BUILTS
   a. Contractor shall maintain "as-built" records at all times, showing the exact location of the PV system, including concealed conduits and feeders installed under this contract. As-builts shall also document module stringing.
   b. Upon completion of work and before acceptance can be considered, the Contractor must forward to the Owner, a corrected set of as-built plans, highlighting any updates, to show the mounting system work as installed in both PDF and CAD format.
   c. Comply with additional “As-built” requirements in other sections of the Specifications.

1.08 INSTALLER QUALIFICATIONS

A. Contractor shall have and maintain a current California Class A or Class B and C-10 license for the duration of the Contract.

B. Contractor shall be familiar with the equipment to be installed and have the necessary training to install in the equipment. For equipment where a manufacturer certifies installers, installer shall possess certification from the manufacturer’s products being installed.

1.09 MATERIALS, DELIVERY, STORAGE, AND HANDLING

A. All equipment shall be listed to Underwriters' Laboratories (UL) standards as applicable.

B. All materials shall be delivered new, undamaged and without defects.

C. All equipment and panels shall be handled with care so as not to damage the delivered products. All equipment shall be installed in new and neat condition.

D. Appropriate protective clothing shall be worn when handling the equipment. Such clothing shall include hard hats and steel-toe boots when lifting materials to overhead, and insulated gloves when working on an active system.

E. Where PV systems will be installed on a roof or overhead, all materials stored on the roof shall be distributed so as not to overload the roof at any point. All materials stored on roof shall follow the guidelines of the roofing system manufacturer including protection boards, pallets and/or mats to prevent damage to the roof system and insulation assemblies.

1.10 WARRANTY

A. MANUFACTURER'S WARRANTY

1. Manufacturer agrees to repair or replace components that fail in materials or workmanship within specified warranty period.

2. Manufacturer Minimum Warranty Periods shall be:

a. Modules: 25-years module power output guaranteed at minimum 80% at 25-years.
b. Inverters: 10-years.
c. Monitoring & DAS System: 5-years
d. Weather Station: 5-years

3. Contractor shall ensure that all components are installed per the Manufacturer's requirements such that warranties are maintained. Contractor shall notify Owner of any issues with the design or installation that could impact equipment warranties and seek Owner approval prior to installation.

4. Contractor shall provide a warranty, inclusive of troubleshooting and repair of all work, per Section 01 11 00, Summary of Work requirements and utility interconnect rules.

**PART 2 - PRODUCTS**

2.01 GENERAL

A. Acceptable system manufacturers/vendors shall meet the minimum criteria and warranties described in this specification and as required in other sections of the Contract and Bridging Documents.

B. Manufacturers shall provide their latest line of equipment, meeting all current industry standards, utility requirements and criteria set forth in the Contract.

C. The Owner seeks equipment from proven, industry leading manufacturers in solid financial standing, producing "tier-one" financeable equipment.

D. Contractor proprietary products shall have an ICC report or a testing report stamped and signed by a licensed California engineer.

E. All equipment shall be listed to Underwriters' Laboratories (UL) standards as applicable.

F. All equipment costs shall include all known and future duties, tariffs, export tariffs, customs, demurrage, and shipping costs.

G. All major components of the systems and the installation procedures shall meet CEC requirements, including Articles 690 and 705.

H. No substitution for contracted equipment shall be made without the written consent of Owner.

2.02 PV SYSTEM EQUIPMENT

A. PV MODULES shall meet the following:

1. Module manufacturer that has produced no less than 250-MW of modules in the prior year.
2. Modules are from a field-tested product line that has been commercially available for no-less than three years.
3. Module manufacturer shall provide a 25-year warranty on the solar modules with at least 80 percent power output guaranteed at 25 years. The solar module manufacturer shall confirm that the warranty applies on an "as installed basis," i.e., the warranty will confirm the panels were installed according to its requirements and specifications for installation.
4. Have a minimum 25-year design life, designed for normal, unattended operation.
5. UL 1703 listed.
6. UL listed for the specified/intended voltage.
7. Meet IEC 61215 (crystalline silicon PV modules) or IEC 61646 (thin film PV modules) standards.
8. Meet California SB1 Guidelines for Eligibility.

B. RAPID SHUTDOWN DEVICES

1. Rapid shutdown devices shall be included wherever required for compliance with CEC 690.12 requirements (Rapid Shutdown of PV Systems on Buildings) or to meet other code requirements.
2. Devices shall at a minimum meet the following requirements:
    a. Meet CEC 690.12 requirements (Rapid Shutdown of PV Systems on Buildings).
    b. SunSpec Rapid Shutdown Certified.
    c. Be certified for use with the specified module and inverter.
    d. Wherever commercially available, device should be pre-installed by the module manufacturer.

C. INVERTERS shall meet the following:

1. String-type inverters.
2. Manufacturer produced no less than 250-MW of inverters in the prior fiscal year.

3. Field-tested product line that has been commercially available for no less than 2 fiscal years.
4. Comply with the following:
    a. UL 1741 listed, inclusive of UL 1741-SA requirements.
    b. IEEE 1547, including testing to IEEE 1547.1 and IEEE C62.45.
    c. IEEE C62.41.2 and CSA107.1-01.1.
    d. California Rule 21, CEC approved and utility line interactive type.
5. SunSpec Rapid Shutdown Certified for installations requiring rapid shutdown.
6. For rooftop applications and any other application where Rapid Shutdown is required, the inverter and optimizer or rapid shutdown device shall be certified by the manufacturer to meet the current CEC Section 690 requirements.
7. Incorporate disconnect switch for main DC power disconnect in compliance with applicable codes and utility requirements.
8. Sized as required to support the PV module production load within the rating of the equipment, together with all other components. Sizing shall not exceed 1.35 DC:AC ratio without approval by Owner.
9. Meet the following requirements:
    a. Nominal AC Voltage (Three-phase, + 10%): 208, 240, or 480 V-AC (as required per site)
    b. Nominal AC Frequency (+ 0.5 Hz): 60 Hz
    c. Line Power Factor (Above 20% rated power): >0.99
    d. AC Current Distortion (At rated power): <5% THD
    e. Maximum Open Circuit Voltage DC: 1,000 V-DC.
    f. Maximum Ripple Current (% of rated current): <5%
    g. Minimum Inverter Efficiency: >96%
    h. Temperature Range Ambient: -4º F to 122º F (-20º C to 50º C)
    i. Enclosure Environmental Rating (minimum): NEMA 3R (NEMA 4X within 5 miles of a marine environment or high dust area)
    j. Relative Humidity (non-condensing): 0-95%
    k. Sound level: <85 dBa
    l. Capable of producing reactive power to operate between a power factor of 0.9 lagging to 0.9 leading (as adjusted on the inverter equipment).
    m. Protective Functions: Standard wakeup voltage, wakeup time delay, shutdown power, shutdown time delay, AC over / under voltage and time delays, AC over / under frequency and time delays, ground over current, over-temperature, AC and DC over current, DC over voltage
    n. User Display: Standard-LCD with on/off capability and physical screen cover or other means of protection from UV exposure.
    o. DC Disconnect: 1,000 V-DC load break rated (or higher where DC voltage is higher).
    p. Seismic Rating appropriate for the site and installation method.
    q. Internal combiner panel option to allow connections of sub-arrays at the Inverter without the use of additional equipment.

D. MONITORING & DATA ACQUISTION SYSTEM (DAS)

1. Contractor shall provide the following monitoring instrumentation:

a. PRODUCTION METER – A PV system production meter measuring the output of the solar array on a minimum 15-minute interval.
b. CONSUMPTION METER - A separate consumption meter shall be provided for each utility account on a minimum 15-minute reporting interval. Consumption meters shall be synced with PV meter production intervals. Consumption metering shall provide for clear disaggregation of PV production and site consumption.
c. WEATHER STATION - A weather station shall be provided at all sites. The station shall provide at a minimum: solar irradiation (coplanar and horizontal), ambient temperature and any other data relevant to weather correction of solar PV system performance.

2. A Data Acquisition and Monitoring System (DAS) shall be provided for all points of interconnect. The DAS shall include, but not be limited to, the measurement, calculation, display, and reporting of the following items:

   a. PV production in 15-min reporting intervals.
   b. Energy consumption in 15-min reporting intervals.
   c. Weather data in 15-min reporting intervals
   d. Varying levels of summary data, including daily, weekly, monthly, and yearly intervals.
   e. A minimum of 1-year of 15-min interval data shall be downloadable in a single instance.
   f. System electrical functions (instantaneous and accumulated power output (kW and kWh), AC and DC system voltage and amperage, and peak value tracking with associated time stamps).
   g. $CO_2$ emissions avoided from the generation of PV energy at the site (compared to local utility fuel mix electric carbon content). $CO_2$ avoidance factor shall be readily customizable for the local utility.
   h. Capable of outputting data in the Western Renewable Energy Generation Information System (WREGIS) format sufficient for registering Renewable Energy Credits (RECs) from each system.
   i. Lifetime logging and access to data reported by DAS, including database-level, "unprocessed" data for lifetime of system operation.
   j. Provide access by unlimited individuals to data via the internet for each Site. Data shall be available on a real-time and daily basis to Owner/Owner's representative and must be sufficient to establish an operational baseline.
   k. DAS shall provide access to all data through an open data exchange protocol (FTP Push or Application Program Interface (API)) to Owner and Owner's Third-Party Designee at no additional cost. This data shall, at a minimum, include PV production data, energy consumption data, inverter production data, inverter AC power data, inverter current data, inverter voltage data, weather station and/or satellite data, weather-adjusted expected production data, and alarm status readings. All data shall be available over multiple timescales, ranging from 15-min intervals to annual intervals and shall include both real-time and historic data.

3. Cellular data shall be used for communications with the DAS and metering systems. In the absence of cellular service availability, the Owner may, at its own discretion, provide internet connections on a site-by-site basis.

4. Contractor shall ensure all systems are properly installed, and cloud-based systems are setup and functional. Commissioning shall include checks of the monitoring/DAS systems

and confirmation of proper setup/function. Contractor shall provide logins and orientation to the Owner for all monitoring and DAS systems.

2.03 BALANCE OF SYSTEM

A. CONDUITS & RACEWAYS

1. All roof and exterior mounted raceways shall be designed and installed to accommodate expansion and contraction due to heating affects, including adequate cable length and listed expansion couplings. All expansion couplings or installations shall include grounding bonding jumpers as required by code.
2. Outdoor conduit shall be rigid galvanized steel with threaded fittings except where DSA and other applicable codes or specifications specifically allow for the use of EMT conduit. Outdoor connections to boxes shall use raintight fittings. All conduit shall meet CEC Code, DSA Guidelines and any applicable standards. All conduit shall be rated for exposed installation and a minimum design life equivalent to the solar panels. Colors to be selected and approved by the Owner.
3. Paint all visible exposed raceways and boxes to match adjacent surface finish after installation.
4. For canopy installations, all conduits and stub-ups under canopies shall be encased within concrete caissons or piers. Where conduits or stub-ups are not at canopy base, they shall be protected from vehicle strikes with appropriately sized bollards if protection is required by code or the electrical engineer.
5. All interior conduit to be EMT with steel set-screw fittings (no cast fittings).
6. Raceway system shall be designed/installed in a manner that prevents water from draining into electrical equipment.

B. DC CIRCUITS AND FEEDERS shall be:

1. 2-wire + ground and stranded.
2. Minimum No. 10 AWG for DC string circuits.
3. Type PV or USE-2/RHW-2 marked minimum 1000V or 1500V per design and sunlight resistant.
4. Installed in raceways or cable tray, except where supported and protected by PV modules.
5. Sized to CEC table 310.15(B)(16) (90-degree column). Minimum ampacity shall be 156% of the rated short circuit current available to be carried on the specific conductor. Conduit fill to 40% max. Include temperature derating as required for the ambient temperatures and roof conditions per CEC, and conduit fill derating as required. Provide equipment grounding conductor in each conduit.

C. AC CONDUCTORS shall be:

1. Sized per applicable sections of CEC Articles 310, 690 and 705. Conduit fill to 40% max. Include temperature derating as required for the ambient temperatures and roof conditions per CEC. Provide equipment grounding conductor in each conduit.

2. 3-wire or 4-wire + ground, as required by inverter manufacturer's installation manual. All grounding per CEC 690, Part V.
3. Installed in raceways.
4. Type THWN-2 or XHHW-2 for wet and dry locations.

D. DC string fuses shall be 1000 or 1500V-DC rated per design and UL listed for PV application. The amp rating shall be equal to the series fuse rating of the PV module. If not provided with inverter, Contractor shall provide DC string fuses. Minimum of one spare fuse shall be supplied for each inverter.

2.04 MISCELLANEOUS REQUIREMENTS

A. All exterior equipment to be sunlight and UV resistant as well as rated for elevated temperatures at which they are expected to operate (on roofs in hot sunlight).

B. No dissimilar metals are allowed to contact each other (use deox, joint compound, plastic or rubber washers) with the exception of anodized aluminum module frames in contact with galvanized steel rack framing. Best practices shall be used to avoid corrosion.

C. No aluminum in contact with concrete or masonry materials.

D. Bolted connections shall be non-corrosive and include locking devices designed to prevent twisting over the design life of the PV system.

E. Combiner boxes (where used) shall be NEMA 3R rated (minimum, NEMA 4X shall be used within 5 miles of a marine environment) and shall include fuses for string inputs and a bus bar to combine the strings into sub-arrays, for input into the Inverter system. Minimum combiner box output bus ampacity shall be 156% of the rated short circuit current available to be carried on the bus (the sum from all strings to the bus).

F. The PV system shall be designed to automatically drop offline when normal utility power is lost to avoid unintentional islanding effects as required by the local utility. Exceptions may be made by Owner where PV system is part of an emergency power/battery backup allowed by Utility and AHJ.

G. All electrical system equipment shall be properly rated to withstand and interrupt (in the case of over current protection devices) the available fault current at the point of use.

H. All required overcurrent protection and electrical bussing sizes per CEC 690.

I. Means of system grounding to be approved by professional Electrical Engineer of record and GFCI protection shall be in accordance with latest CEC requirements.

J. Arc-fault protection where applicable per CEC 690.11.

K. For PV system supply side interconnection, the Contractor shall inspect the existing main service switchgear to confirm suitability of the switchgear supply side bus for interconnection of the PV system. Where required by the AHJ, any modification of the existing switchgear necessary to construct the supply side connection shall be approved by the switchgear manufacturer or a Nationally Recognized Testing Laboratory. Where a NRTL approves modification of the switchgear, a field labeling report shall be provided to the Owner. The Contractor is responsible for obtaining switchgear manufacturer approval of any modification required to accommodate the supply side connection, or NRTL approval and report.

L. Outdoor grounding connections between dissimilar metals (such as aluminum lugs and copper wire) will be protected against galvanic corrosion by the application of outdoor-rated deox or conductive joint compound between the interfacing metal surfaces.

**PART 3 - EXECUTION**

3.01 EXAMINATION

A. Examine substrate areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Do not begin installation until mounting surfaces have been properly prepared.

C. If preparation of mounting surfaces is the responsibility of another installer, notify Owner of unsatisfactory preparation before proceeding.

D. Examine modules, inverters, DAS and all other BOS equipment before installation. Reject components that are damaged or have been stored or handled improperly.

E. Examine roofs, supports, and supporting structures for suitable conditions where PV system will be installed.

F. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 INSTALLATION

A. INSTALLATION STANDARDS

1. System Installation shall conform to the equipment manufacturers Installation Manual(s) and requirements or guidelines.

2. All Local, State, and CEC codes shall be observed, including all industry standards related to the installation, operation, and maintenance of photovoltaic power systems.

3. Comply with NECA 1, Standard for Good Workmanship in Electrical Construction.

B. Coordinate layout and installation of PV modules with mounting assembly and other construction. Install PV modules, inverters, rapid shutdown devices, DAS and other PV system components in locations indicated on plans.

C. Support PV panel assemblies independent of supports for other elements such as roof and support assemblies, enclosures, vents, pipes, and conduits. Support assembly to prevent twisting from eccentric loading.

D. Install weather seal fittings and flanges where PV panel assemblies penetrate exterior elements such as walls or roofs. Seal around openings to make weathertight. See related specifications and drawing notes for waterproofing requirements.

E. Seismic Restraints: Seismic-restraint devices shall be employed per the design documents and code requirements.

F. Wiring Method: Install all AC cables in raceways. PV wire may be routed in free air beneath solar PV modules and where not exposed to physical damage.

G. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Install lacing bars and distribution spools.

H. System installation shall conform to the equipment manufacturers' installation manuals and all related requirements and guidelines.

3.03 CONNECTIONS

A. Coordinate PV panel cabling to equipment enclosures to ensure proper connections.

B. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A-486B.

C. Make splices, terminations, and taps that are compatible with conductor material and that possess equal or better mechanical strength and insulation ratings than un-spliced conductors.

D. PV wire splices shall be made with listed PV connectors of the same make and model only.

3.04 WIRE MANAGEMENT

A. All wiring methods must meet or exceed current industry standards for wire management, strain relief and fastening.

B. All DC string wire management shall use stainless steel or galvanized steel cable clips, Heyco or similar. UV rated cable ties shall be used minimally and only in locations where the use of cable clips is impossible.

C. Wiring shall not be routed over sharp edges of structural members, equipment or modules.

D. Wiring shall be routed under the modules of the array wherever possible to avoid direct exposure to the sun or elements.

E. Wiring shall be secured under the array so as to prevent excessive slack resulting in wire motion, and to minimize visibility of inter-module and home run wiring to the public.

F. Excess slack in the wire shall be secured such that it is in the module channel or secured to the junction box of the module. Factory-installed wire leads for modules can be wrapped around the junction box of the module.

G. Where exposed, wires, cables and conductors shall be managed in a neat and orderly manner. Where exposed to environmental conditions (e.g., sunlight, rain, wind, etc.) and visible from below, wires shall be fastened in a uniform and discrete fashion.

H. All conductors and conduits between separate arrays shall be routed underground. Wiring shall be routed down columns, encased in piers/caissons, routed underground between arrays or carports, and up the nearest column on the adjacent array. Under no circumstance shall circuits, conduits, or chaseways be mounted overhead between separate structures, including seismic gaps.

I. Strain relief and drip loops shall be utilized at all entrances to and from conduit bodies, junction boxes, weather heads, switchgear, inverters, and panelboards etc. Conductors shall be strapped with strain relief as not to stress panel leads, home runs or mechanically crimped connections

within the array. Sufficient slack shall be provided at both ends of cables to allow service and re-termination, and to prevent thermal expansion and contraction from stressing connections.

J. Wire in switchboards, panelboards, meter cabinets, pull boxes, and other cabinets shall be neatly grouped and tied in bundles with nylon ties rated for the temperature rating of the electrical equipment at 10-inch intervals. In switchboards, panels and terminal blocks, wires shall be fanned out to terminals and trained for straight entry into the terminals. At no point shall nylon ties be used on bussing or bussing used in any manner to support other materials including but not limited to circuit conductors.

K. Maintain the conductor required bending radius per NEC and manufacturer specifications.

L. Wires shall not be installed until debris and moisture is removed from conduits, boxes, and cabinets. Wires stored at site shall be protected from physical damage until they are installed and walls are completed.

M. Wire-pulling compounds furnished as lubricants for installation of conductors in raceways shall be compounds approved and listed by UL, NRTL, or equal. Oil, grease, graphite, or similar substances are not permitted. When pulling conductors, do not exceed manufacturer's recommended values.

N. CONDUCTOR COLOR CODES

1. AC Circuits (<600V): Conductors must be color-coded by phase and voltage as required by NEC, the AHJ, and the utility.

2. DC Circuits, grounded

| Conductor | Color |
|---|---|
| Positive | Red |
| Negative | White |

3. DC Circuits, ungrounded

| Conductor | Color |
|---|---|
| Positive | Red |
| Negative | Black |

4. For phase and neutral conductors 6 gauge or larger, permanent thermoplastic-colored tape may be furnished to mark conductor end instead of coded insulation. Tape shall cover not less than 2 inches of conductor insulation within enclosure.

O. TAPE AND SPLICE KITS

1. Wire splice kits shall be UL listed for their manner of use, such as direct burial or wet operation. Splices, joints, and connectors joining conductors in dry and wet locations shall be covered with listed insulation approved by the manufacturer for use with the splice, or as contained in the listed splice kit. Free ends of conductors connected to energized sources shall be taped.

2. Thermoplastic insulating material approved by UL, NRTL, or equal for installation as sole insulation of splices shall be furnished and shall be installed according to manufacturer's printed specifications. Standard electrical tape shall not be the sole insulation material for splices unless explicitly listed for use in the application and meeting the temperature rating of the insulation requirements for the splicing connection.

P. TERMINATIONS

1. Terminations of conductors shall be performed to the requirements and recommendations listed within the manufacturer manuals of the termination hardware and equipment where the termination shall occur.
2. Conductors shall be terminated with minimal exposure of the bare conductor.
3. Conductors cannot exceed the size and quantity restrictions of the lug. Contractor to verify equipment lugs supplied will accept the size and quantity of conductors shown in the project drawings.
4. Full engagement of the conductor within the lug must be maintained.
5. Provide necessary coating of anti-oxidation coating on all exposed conductor ends entering the lug.
6. Where mechanical connectors are used, torque all set-screws to manufacturer specifications with a calibrated torque wrench and indicate with torque marks. Torquing electrical connectors "hand tight" is not allowed.
7. Where compression connectors are used, they must be installed with compression tools and dies approved by the manufacturer for use with the connector.
8. Ensure the final portion of the conductor before entering the termination is not part of a conductor bend (straight on entry).
9. Terminations of aluminum conductors cannot be made within 18 inches of earth/grade.
10. Termination fittings, connectors, and lugs must be rated and listed for the conductor metal type connected.

Q. GROUNDING

1. Washer-type PV module grounding devices shall be listed for grounding PV modules to galvanized steel substrate and shall be installed according the manufacturer’s installation manual with appropriate bolt size and clearance hole size.
2. All PV modules shall be bonded to each other and to the racking structure with listed PV module grounding devices and equipment grounding conductors. Where the PV modules are listed for use with a UL 2703 listed PV mounting rack, the rack shall meet this requirement.
3. Where PV modules and steel purlins are grounded and bonded, contact between dissimilar metals such as copper and galvanized steel shall be avoided. Where contact cannot be avoided, outdoor-rated deox or conductive joint compound shall be applied between the interfacing metal surfaces.
4. Outdoor grounding connections between dissimilar metals (such as aluminum lugs and copper wire) will be protected against galvanic corrosion by the application of outdoor-rated deox or conductive joint compound between the interfacing metal surfaces.
5. GROUNDING ON CANOPIES

a. Contractor shall submit proposed method for mounting and grounding PV modules to the canopy structure. The proposed method shall meet AHJ requirements and utilize either of the following:
    i) UL 2703 listed module mounting and grounding clamps and devices.
    ii) Direct bolting of the module to the canopy steel structural purlins and UL listed PV module grounding devices.
b. If PV modules are mounted to the canopy structure with module mounting clamps, the clamps must be approved for this purpose by their manufacturer as part of a UL 2703 listed assembly. Clamps shall be listed for PV module grounding to galvanized steel substrate, and their installation shall comply with the clamp installation manual and the PV module installation manual.
c. If PV modules are direct bolted to the canopy steel structural purlins, mounting bolt size and specification must be written and detailed in the canopy structural drawings. Mounting bolt size must comply with the PV module installation manual, and be compatible with the module mounting hole diameter.
d. Washer-type PV module grounding devices shall be listed for grounding PV modules to galvanized steel substrate, and shall be installed according the manufacturer's installation manual with appropriate bolt size and clearance hole size.
e. All PV modules shall be bonded to each other and to the canopy galvanized steel structural purlins with listed PV module grounding devices and equipment grounding conductors. The canopy galvanized steel structural purlins shall be bonded to the structural beams, unless a welded structural connection exists between the purlins and beams. An equipment grounding conductor shall ground the PV array to the PV inverter ground bar, and a grounding electrode conductor shall ground the PV inverter to the canopy grounding electrode.
f. Where PV modules and steel purlins are grounded and bonded, contact between dissimilar metals such as copper and galvanized steel shall be avoided. Where contact cannot be avoided, outdoor-rated deox or conductive joint compound shall be applied between the interfacing metal surfaces.

## 3.05 IDENTIFICATION

A. Identify equipment, boxes, raceways with placards and labels as indicated on plans. All placards and labels shall comply with CEC articles 690 and 705.

B. Placards: Unless noted otherwise on plans or required by code, all placards shall be machine generated phenolic type with red background and white lettering, affixed to equipment with stainless steel screws or with permanent adhesive where set screws are not feasible. Minimum lettering size shall be 1/4" high unless indicated otherwise.

C. Labels: Unless noted otherwise on plans, all labels shall be machine generated peel and stick UV-resistant vinyl labels rated for outdoor conditions with red background and white lettering, affixed to raceways and other components as indicated on plans. Minimum lettering size shall be 1/4" high unless indicated otherwise.

D. Contractor shall provide all placards as required by code, the utility and the design. The following specific placards shall be provided, in addition to any others required by code, utility or the design:

1. All placards shall be machine generated phenolic type with red background and white lettering, affixed to equipment with stainless steel screws or with permanent adhesive where set screws are not feasible. Minimum lettering size to be 1/4" unless otherwise noted or required for legibility.
2. Provide a placard clearly visible at each main service panel to identify both sources of power, with the following wording in 1/4" high lettering per CEC 690.64(B)(4): “Warning - This Service Is Fed by Two Sources Of Power – The Utility Service Main Disconnect And The PV System Main Disconnect – Both Services Must Be Disconnected To Remove Power From The Switchboard”.
3. Provide a placard on each PV system input circuit breaker (where used) at the main panel with the following wording in 1/4" high lettering per CEC 690.64(B)(7): “Warning – Inverter Output Connection – Do Not Relocate This Overcurrent Device”.
4. Provide a placard on all disconnects with the following wording in 1/4" high lettering per CEC 690.17: "Warning - Electric Shock Hazard - Do Not Touch Terminals - Terminals On Both The Line and Load Sides May Be Energized In The Open Position".
5. Provide a placard on the Main PV System Disconnect (adjacent to each main service panel) with the following information in 1/4" high lettering per CEC 690.53: "Photovoltaic Power Source Disconnect - Operating Current: X Amps; Operating voltage: XX VAC; Maximum System Voltage: XX VAC; Short-Circuit Current: XXX Amps", where X is the operating current, XX is the system voltage, and XXX is the maximum short circuit current contribution of the generating facility at the point of interconnection with the utility system.
6. Provide a placard on the respective Main Switchboard to identify the two sources of power feeding the equipment. Include the following information in 1/4" High lettering per CEC 690.54: "Caution - Possible Backfeed From Photovoltaic Power System – X VAC, XX Amps", where X is the system voltage and XX is the maximum AC amperes of the installed system.
7. Provide a placard on each PV System Inverter with the following information in 1/4" high lettering: "Photovoltaic Power Source Inverter Rating - Operating Current: XX Amps; Operating voltage: XXX VDC; Maximum System Voltage: 1,000 VDC; Short-Circuit Current: XXXX Amps", where XX is the maximum DC amperes of the installed system, XXX is the operating voltage DC, and XXXX is the short circuit current that the Inverter can provide (from all strings in parallel).
8. Provide utility-required System Directory placard and utility safety switch Identification placard as required by local utility company, to identify all system components.
9. Provide a placard for all Combiner Boxes to read: “DC Combiner Box [XXX]– [*System Voltage*] VDC Maximum”.

E. CONDUCTOR IDENTIFICATION

1. All conductors, including DC homerun circuits, shall be labeled at each point the conduit run is broken by a cabinet, box, gutter, etc. Where terminal ends are available, identification shall be by means of heat shrink wire markers.
2. Labels shall indicate circuit or string and phase in accordance with the project drawings.

## 3.06 UTILITY INTERCONNECTION

A. In the event that the Owner has already submitted initial interconnection applications prior to the Contract being executed, the Contractor shall promptly review any past applications and take over coordination with the Utility, including making any proposed modifications to the system design.

B. The Contractor shall take all responsibility for the interconnect process upon contract execution until interconnect is complete, PTO has been achieved and no further work or coordination is required by the Utility.

C. The Contractor should note that tariff grandfathering is key to District's project strategy and the financial performance of the project. The Contractor shall ensure that any tariff grandfathering or other milestone achieved by the initial interconnect application is maintained.

D. Should an issue arise that may jeopardize the initial interconnection scheme, tariff grandfathering, some other utility milestone, substantially increase interconnection costs or the ability to interconnect the project, the Contractor shall promptly notify the Owner and seek approval from Owner before making any changes to the interconnect application.

E. The Contractor shall inspect the existing main service switchgear to confirm suitability of the switchgear for the proposed interconnect scheme. Any substantial modification of the existing switchgear required to intertie the project shall be approved by the switchgear manufacturer or a Nationally Recognized Testing Laboratory. Where a NRTL approves modification of the switchgear, a field labeling report shall be provided to the Owner. The Contractor is responsible for obtaining switchgear manufacturer approval of any modification required to accommodate the connection, or NRTL approval and report.

F. The solar PV system shall not be interconnected at the main service switchboard until written authorization from the Utility Company has been obtained. Unauthorized interconnections may result in injury to personnel and damage to equipment or property for which the Contractor may be liable.

## 3.07 INSTALLATION STANDARDS

A. System Installation shall conform to the equipment manufacturers Installation Manual(s) and requirements or guidelines.

B. All Local, State, and CEC codes shall be observed, including all industry standards related to the installation, operation, and maintenance of photovoltaic power systems.

## 3.08 TESTING

A. Solar PV modules and inverters shall be factory tested for performance and the results shall be included with the equipment submittals.

B. Contractor shall megger test each array feeder before energizing to establish that no shorts to ground exist at any point in the solar PV arrays.

C. Contractor shall perform ratio, polarity, and saturation tests performed on all voltage potential transformers (PTs) and current transformers (CTs). The polarity check shall be performed using high current injection test equipment. Contractor shall calibrate all current transducers to within 5 percent of nameplate accuracy using primary current injection method.

D. System start-up procedure shall be as outlined by the Manufacturer's Installation Manual(s).

3.09 COMMISSIONING

A. Commissioning of PV Systems shall adhere to IEC 62446-1 requirements and shall include the following at a minimum:

1. CONDUCTORS
    a. AC & DC conductor inspection / megger. Insulation resistance and DC hi-pot testing of each AC and DC conductor, phase-to-phase and phase-to-ground.
    b. Wire management check
    c. DC string polarity, Voc & Isc testing and recording
    d. Confirm all conduits & junction boxes are installed properly/watertight
2. Inspection of DC fusing and disconnects
3. Inspection of AC components: AC Disconnect, Main Switch Board, AC Combiner Panel Boards, Breakers, Fuses, Terminations, Phasing, OCPD operation, etc.
4. Grounding & bonding system inspection and continuity testing
5. INVERTERS
    a. Inverter inspections and tests per manufacturer instructions
    b. Inverter start-up and confirm proper inverter settings
    c. Inverter output tests - Confirm PV system AC output as expected based on design, insolation and inverter readings
6. IV Curve Trace, Performance testing and recording
7. As-built sun access measurement at the corners of all arrays, minimum.
8. THERMAL IMAGING
    a. Check all electrical components while systems are energized
    b. Spot check, Modules, Inverters, Disconnects, AC system, etc.
9. Torque spot check on mechanical and electrical terminations
10. Inspection of corrosion control measures
11. Confirm signage and placards meet plans
12. Workmanship evaluation
13. Inspection of DAS / CT metering and monitoring equipment
14. Weather station component inspection and performance audit
15. Confirm web-based monitoring interface operations
16. LIGHTING CONTROLS
    a. Confirm canopy lighting levels match photometric design
    b. Verify component installations
    c. Confirm lighting controls function as specified

17. Commissioning of any other major electrical infrastructure installed on the project per manufacturer requirements
18. Medium voltage equipment tested to NETA requirements

B. PERFORMANCE TESTING

1. Solar PV system testing shall comply with CPUC Electric Rule 21 testing procedures and requirements. Perform testing on “no-cloud” days to avoid performance fluctuations due to passing clouds.
2. Contractor shall complete performance testing to ASTM E2848-13 standard. Contractor shall define methodology within the protocol and obtain Owner's acceptance and notify owner before performing testing.
3. Contractor shall perform power output test to confirm that completed solar PV system meets or exceeds intended output. Power output tests shall be conducted on at least five (5) separate days.
4. Monitoring system shall be fully functional during performance testing. Contractor shall provide Owner access to the monitoring system prior to performance testing.

3.10 INDEPENDENT COMMISSIONING

A. An Independent, third-party commissioning agent may be employed by the Owner to perform an independent commissioning on the PV system.

B. Contractor shall provide documentation, access to the system and any control/monitoring systems, and support the independent commissioning entity with their work.

C. Contractor shall promptly correct punchlist items identified by the Owner and third-party commissioning agent.

3.11 DOCUMENTATION

A. All commissioning, certification and testing reports shall be provided to the Owner within 15 days of completion of testing.

B. The Contractor shall submit comprehensive closeout documentation as specified in Section 01 33 01: Design-Build Process & Submittals and Attachment C.

END OF SPECIFICATION SECTION 48 14 00

# Attachment B2.8: 48 17 13 Battery Energy Storage

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## Request for Qualifications/Proposals

## for

## 4CD Brentwood PV and Resiliency Project

# SPECIFICATION SECTION 48 17 13
# BATTERY ENERGY STORAGE SYSTEMS (BESS)

## PART 1 - GENERAL

1.01 SUMMARY

A. This is a design-build project and includes the design, construction, and commissioning of a complete electrochemical Battery Energy Storage System (BESS). The design, installation and commissioning shall conform to all requirements as defined by the applicable codes, laws, rules, regulations, eligible incentive programs and standards as specified in the Contract.

B. “Owner” shall refer to owner of the site where project will be located, regardless of system ownership, and include any representative of the site owner, such as consultants or inspectors. “Contract” refers to the design-build or construction contract and any associated design-build bridging documents, inclusive of requirements outlined in the request for proposals (RFP). “Contractor” refers to the entity performing the work, inclusive of Engineer and Architect of Record for design-build contracts.

C. The BESS system shall be grid connected and “behind-the-meter”.

D. The BESS system may be AC-coupled or DC-coupled, provided that such arrangement meets all applicable codes, utility interconnection requirements and the specified requirements.

E. The BESS shall function to provide time of use self-consumption, export control, off-grid preparation, resiliency and/or grid services as defined by the Owner’s Project Requirements in Section 1.06 of this document. In the absence of other requirements in the bridging documents, the Contractor shall work with the Owner during submittal process to develop a clear statement of the intended function and operation of the BESS, as well as a commissioning protocol to ensure functional/operational requirements are satisfied.

F. During the operational period of the BESS, the BESS software/Contractor shall continually optimize the BESS to meet the functional/operational requirements of the system. The Contractor shall not substantially alter the BESS operations, including value streams to the Owner, without written permission from the Owner. Any such alteration shall not reduce non-financial functions of the BESS (e.g. export control, resiliency), shall not reduce Owner savings, and any additional savings shall be shared with the Owner.

G. The BESS shall include BMS, PCS, and Microgrid control software which operates to safely and optimally manage the BESS, critical loads during an outage, and ensure code and eligible incentive program compliance. All software provided with BESS shall be capable of remote update and updates shall be provided at a minimum for the warrantied period.

H. The Contractor shall include all items and all work reasonable required to complete the BESS and microgrid in accordance with the Agreement. If the Contractor is in doubt as to the intent of any portion of these specifications or bridging documents, or necessary information is omitted, the Contractor shall notify the Owner in writing for clarifications or corrections to be provided by addendum.

I. All shop drawings, and technical specifications shall be submitted, reviewed and accepted by the Owner per the guidelines specified in the Contract and any bridging documents.

1.02 RELATED SECTIONS

A. The Contract and any design-build bridging documents.
B. 01 10 00: Summary of Work
C. 01 13 00: Supplementary Criteria
D. 01 33 01: Design-Build Process & Submittals
E. 05 90 02: Solar Photovoltaic Canopy Structures
F. 26 00 00: General Electrical
G. 26 32 13: Generator
H. 48 17 13: Solar Photovoltaic System
I. Other relevant Owner Specifications and Bridging Documents.
J. Where this specification and other specifications or bridging-documents are in conflict, the more stringent shall apply. Contractor shall identify conflicts and confirm recommended equipment or procedures with the Owner.

1.03 CODES & REFERENCES

A. The design and installation shall conform to all requirements as defined by the applicable codes, laws, rules, regulations and standards of applicable code enforcing authorities (latest edition unless otherwise noted). The following are key standards that shall be followed. The Engineer or Architect of Record and Contractor shall ensure all applicable codes are followed:

1. ASTM International (ASTM) (www.astm.org)
2. American National Standards Institute (ANSI), including:
   ANSI C37, Surge withstand capabilities
   ANSI C57, Transformer standards
3. California Building Code (CBC), with State of California Amendments
4. California Building Standards Code, Title 24, including:
   Part 6, California Energy Code
   Part 9, California Fire Code, CFC (including Section 608)
   Part 11, California Green Building Standards Code
5. California Dept. of Industrial Relations, General Industry Safety Orders Section 5185
6. California Office of the State Fire Marshall
7. California Public Utilities Commission, including:
   Tariff Rule 21
   Self-Generation Incentive Program Requirements
8. Institute of Electrical and Electronics Engineers (IEEE), including:
   IEEE 693, Recommended Practice for Seismic Design of Substations
   IEEE 1375, Guide for Protection of Stationary Battery Systems
   IEEE 1491, Guide for Selection and Use of BMS
   IEEE 1547, Standard for Interconnecting Distributed Resources with Electrical Power Systems
   IEEE 2030.7-9, Microgrid controller standards
9. International Electrotechnical Commission (IEC), including:
   IEC 62897, Stationary Energy Storage Systems with Lithium Batteries
10. International Electrical Testing Association (NETA)
11. International Fire Code
12. Local Fire Jurisdiction Requirements
13. National Electrical Manufacturers Association (NEMA)
14. National Electrical Code (NEC)

15. National Fire Protection Association (NFPA), including:
    NFPA 70, National Electrical Code
    NFPA 704, Standard System for the Identification of the Hazards of Materials for Emergency Response
    NFPA 791, Recommended Practice and Procedures for Unlabeled Electrical Equipment Evaluation
    NFPA 855, Standard for the Installation of Stationary Energy Storage Systems
16. California Electrical Code (CEC)
17. Owner Specifications and Requirements
18. Underwriters Laboratory (UL), including:
    UL 1642, Standard for Lithium Batteries
    UL 1741/1741-SA, Standard for Inverters, Converters, Controllers and Interconnection System Equipment for Use with Distributed Energy Systems
    UL 1973, Standard for Batteries for Use in….Stationary Applications
    UL 9540, Standard for Energy Storage Systems and Equipment
    UL 9540a, Standard for Thermal Runaway Fire Propagation in Battery Energy Storage Systems
19. UL 2900, Standard for Software Cybersecurity for Network- Connectable Products
20. Utility company standards and requirements
21. For projects under the Purview of the Division of the State Architect (DSA), all applicable DSA requirements.
22. All other applicable Codes and Ordinances

B. Systems must be able to protect themselves from internal failures and utility grid disturbances. As such, systems must be self-protecting for AC or DC component system failures. In addition, systems must be able to protect themselves from various types of external faults and other abnormal operating conditions on the grid.

C. Systems must be designed to be in compliance with applicable safety standards with regard to construction and potential exposure to chemicals and with regard to module or enclosure resistance to hazards such as ruptures and exposure to fire.

1.04 DEFINITIONS

A. AHJ – Authorities Having Jurisdiction
B. BESS – Battery Energy Storage System
C. BMS – Battery Management System
D. CT – Current Transformer
E. DAS – Data Acquisition System
F. EMS – Energy Management System
G. HMI – Human Machine Interface
H. MSDS – Material Safety Data Sheet
I. OPR – Owner’s Project Requirements
J. OSHA – Occupational Safety and Health Administration (refers to both OSHA and Cal- OSHA)
K. PCC – Point of Common Coupling
L. PCS – Power Conversion System
M. PT – Potential Transformer
N. SGIP – Self Generation Incentive Program

O. SOC – State of Charge or Energy: Nominal Energy Remaining / Nominal Full Pack Energy Available

P. UPS – Uninterruptible Power Supply

1.05 WORK INCLUDED

A. The work shall include the scheduling, materials, labor, equipment, installation, testing, commissioning, software, and incidentals necessary to install complete, turnkey, utility-interconnected Battery Energy Storage Systems (BESS) in conformity with applicable codes, eligible incentive programs, and professionally recognized standards.

B. Operations and Maintenance ("O&M") services for 1 year from the date of substantial completion with an option and defined pricing, with any applicable escalator, for up to 10 years of O&M services. O&M services shall comply with all warranty requirements.

C. Submit for review and comment of all O&M manuals, and miscellaneous documentation required to provide a complete installation. Provide all as-built documentation including calculations, software, design drawings, equipment drawings required for the BESS.

D. Provide and maintain a Schedule for all fabrication, procurement, installation and testing activities for the project.

E. BESS equipment shall include battery systems, power conversion systems, all associated control and communication interface systems, all switchgear, any auxiliary loads, metering/monitoring equipment, and any equipment necessary to support the intended operation of the BESS and to allow for interconnection with the utility. BESS systems shall consist of all enclosures/skids, pads, fencing, underground conduits, conductors, inverters, switchgear, controls, transformers, protection relays, utility metering, IT/communication equipment, breakers, disconnects, cabling and associated relaying.

F. The BESS shall be designed to provide automatic, unattended operation of the BESS, including regular/remote updates for the life of the system. The BMS shall update to track changes in utility tariffs to continually optimize the retail tariff functions of the BESS.

G. The BESS shall be utility grid connected on the Owner-side of the utility meter (behind-the-meter). The Contractor shall be responsible for all required utility company coordination, applications, inspections, and final approval for the complete interconnection of the BESS with the utility company grid, including bi-directional utility meters at each location.

H. The BESS and associated equipment shall qualify for the Self Generation Incentive Program ("SGIP"). The Contractor shall be responsible for all required utility company SGIP coordination, applications, inspections, and final approval for the maximum eligible incentive for the BESS with the SGIP Large Scale Storage incentive program using the applicable SGIP Handbook. The BESS control system shall operate the battery to satisfy the SGIP performance based incentive requirements for a minimum of 5 years.

I. Contractor shall ensure the design, installation and operation of the Project meets all requirements to maximize all available incentives and shall guarantee Owner receipt of incentives for any scope/operations under the control of the Contractor. Contractor shall provide all documentation, coordination, reporting, etc. with entities providing incentives to secure incentives.

J. The Contractor shall ensure adequate clearance and equipment space within the allotted areas and existing building and site conditions. All equipment and sizes / clearances shall be coordinated with the Owner prior to rough-in.

K. The Contractor shall provide for the disconnection, disposition, and proper disposal of all existing equipment to be replaced.

1.06 Owner's Project Requirements

A. The BESS shall support the following Non-Island functions:

1. Tariff Management -Tariff Management is controlling the BESS according to variable electricity tariff rates. Typically, by charging the BESS during off-peak and lower cost energy and discharging during expensive on-peak periods. When combined with PV, the lower costs energy is generated from the PV system and used to charge the BESS. The time-of-use structures with charges based on time of consumption broken into costs for energy ($/kWh) and demand ($/kW) and varying by season provide an opportunity for BESS's to create electric cost savings every day of the year.

2. Demand Charge Reduction - Demand Charge Reduction reduces the demand charges ($/kW) on the monthly electric bill for the maximum demand (non-coincidental) and other relevant demand charge periods. The BESS/microgrid controller should use "learning algorithms" to gauge when a facility is approaching peak demand to shift some of the energy consumption to battery power to mitigate demand charges. The BESS/microgrid controller should incorporate the solar production to determine when the BESS should discharge to reduce the demand charges.

3. Off Grid Preparation - Off Grid Preparation prepares the system to transition to Island mode due to an impending grid outage. Off Grid Preparation is triggered with either advanced notice of an announced rolling blackout, announced Public Safety Power Shutoff (PSPS), weather forecasts looking at high wind speeds, and encroaching major storms such as a hurricane or typhoon. When the event is detected, the BESS/Microgrid controller evaluates the energy required for the critical loads and prepares the energy assets (including the BESS) for the loss of the grid power and maximizes the available capacity of the BESS for Island mode.

B. The BESS shall support the following Island functions:

1. Grid-Forming – Grid-forming is the ability to operate when electricity from the grid is not available. Upon loss of the grid, the BESS needs to transition from grid-following (current-source) to grid-forming (voltage-source). When in grid-forming operation, the BESS provides a voltage and frequency reference for the other generating devices (e.g., PV solar system) and electrical loads.

2. Island Mode – When electricity from the grid is not available, the BESS/Microgrid controller communicates to the relays to open the main breaker to the facility or PV & BESS point of common coupling, isolate the site electric loads, and transition the BESS to grid-forming mode. Once the internal grid is established and stable, the primary functions are related to maintaining stability of the islanded electrical network, managing the balance between generation supply (both solar PV and diesel generator), BESS, and load demand to maintain electrical safety and protection of the loads. When the solar PV system and/or the diesel generator is generating energy, it should serve the loads and charge the BESS with any

energy not required by the load. If there is solar PV energy not required by the load and the BESS is approaching 100% State of Charge (SOC), the BESS/Microgrid controller should begin to curtail or shut down the PV system. The BESS/Microgrid controller should restore the PV system to full operational mode if the BESS can be charged and the solar PV system can operate. In Island Mode the microgrid control system shall dispatch the diesel generator to operate when the battery does not have enough available energy to support the load. When the diesel generator is operating the battery will charge from any available energy from the generator not consumed by the load. When the battery approaching 100% SOC the microgrid control system shall disengage the diesel generator and use the BESS energy to satisfy the load. Once the grid is back in service, the controls synchronize the inverters to the grid, communicate to the relays to close the main breaker to the facility or PV & BESS point of common coupling, connect the non-critical electric loads, and transition the BESS back to grid-following mode.

C. The BESS shall prioritize the order of the below listed functions with the first functions as higher priority.
   1. Off Grid Preparation
   2. Resiliency
   3. Demand Charge Reduction
   4. Tariff Management

D. The Non-Island to Island transition shall occur in less than 60 seconds.

E. The Island to Non-Island transition shall occur in less than 10 minutes.

F. The Microgrid shall support the District specified loads connected to the electric service during a utility outage.

1.07 SUBMITTALS

A. Submittals shall be provided per specification 01 33 01: Submittals and the following guidelines specific to BESS.

B. Study Reports and Calculations. The Contractor shall submit all simulation and field test reports. These reports shall contain assumptions, study methods, results, significant findings and conclusions.

C. Record Drawings – Provide as-built record drawings per Attachment A3 requirements.

D. Testing Plans and Reports
   1. The Contractor shall ensure factory testing is performed on the BESS. Where appropriate, tests should conform to those contained in ANSI, NEMA, ASME, NEC, ASTM and IEEE standards and guides. Where standards are not suitable or applicable, other common industry procedures and mutually acceptable methods shall be used.
   2. The batteries, inverters, controls and assembled containers and other major components shall be factory tested. The Contractor shall be responsible for compliance with all standard factory test procedures that check the quality and performance of the BESS equipment/system.

3. Factory Testing of the PCS and Control System - The Contractor shall ensure factory testing of the PCS and Control system. At a minimum, sufficient tests shall be conducted to demonstrate that all controls, protective functions and instrumentation perform as designed and is in compliance with this specification. Successful tests performed on scale models or analog simulators will be deemed to meet the intent of this paragraph.
4. Where PV system Self-Consumption is required in the Project scope, the tests shall demonstrate that the BESS is capable of automatically charging from the PV generation that exceeds the site load and would otherwise be exported to the grid.
5. Where a microgrid is included in the Project scope, the tests shall demonstrate that the BESS is capable of automatically islanding from the utility connection when the utility grid goes down, and automatically synchronizing and reconnecting with and operating in parallel with the utility connection when the utility grid comes back up.
6. Certified reports of all tests shall be furnished to the Owner for review and shall indicate that there are no exceptions noted and that the tests meet the bridging document and design requirements.

E. Commissioning and Commissioning Reports

1. The Contractor shall submit a Commissioning Plan and conduct commissioning per the manufacturer's recommendations and the standards identified in this specification. The Contractor shall work cooperatively with Owner/Owner's representative to develop a formal commissioning plan to demonstrate the BESS performs to the project requirements.
2. Overall System Tests - The Contractor shall demonstrate that all aspects of the BESS integrate and coordinate as intended at the factory and on site. At a minimum, the contractor shall demonstrate that all control and management systems, including but not limited to, all levels of battery management system, PCS controls, BMS, and overall site controls, interact as intended.
3. Where PV system Self Consumption is required, BESS charges using any energy/power from the PV system that is in excess of the site load, shall be tested and confirmed to meet performance requirements.
4. Where a microgrid system is present, BESS functions in islanded mode shall be tested and confirmed to meet performance requirements.

F. Instruction Books

1. No later than fifteen (15) calendar days from the date of commissioning, the Contractor shall furnish digital (PDF format) detailed instruction books for each energy storage system furnished for the Project. These books shall contain all illustrations, assembly drawings, outline drawings, wiring diagrams, replacement parts list that includes part number identification, a list of recommended spare parts, and instructions necessary for storing, installing, operating and maintaining the equipment. The illustrated parts shall be numbered for identification. All information contained therein shall apply specifically to the equipment furnished and shall not include instructions that are not applicable.

1.08 QUALITY ASSURANCE

A. All equipment shall be listed to Underwriters' Laboratories (UL) standards 1973, 1741, 9540, 9540a, and that is applicable to authorities having jurisdiction (AHJ).

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the International Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

D. Installer Qualifications – The installing contractor shall be familiar with the equipment to be installed and have the necessary training to install the equipment. If specific state contracting qualifications are required for installation of BESS systems, the installing contractor shall comply with those requirements.

1.09 MATERIALS, DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered new, undamaged and without defects.

B. All equipment shall be handled with care so as not to damage the delivered products. All equipment shall be installed in new and neat condition.

C. Appropriate protective clothing shall be worn when handling the equipment.

1.10 WARRANTY

A. All equipment furnished under this Section shall be warranted by the Contractor and the equipment manufacturer(s) for a minimum period of 10 years. The battery shall be sized to meet a cycle life of at least 10 years after substantial completion. Batteries shall maintain at a minimum 75% capacity for a minimum of 10 years. Contractor shall include the full cost of replacement of the battery or such components to reach a life of 10 years at 75% capacity.

B. Warranty shall include all parts and expenses to perform necessary work, inclusive of regular software updates over the warranty period sufficient to meet the operational and functional intent of the system.

**PART 2 - PRODUCTS**

2.01 ACCEPTABLE MANUFACTURERS FOR PROPOSALS

A. Manufacturers shall provide equipment that meets all current industry, utility company, and incentive required standards and all performance criteria set forth in the bridging documents and Contract.

B. The Owner seeks equipment from proven, industry leading manufacturers in solid financial standing, producing tier-one (financeable) equipment.

2.02 EQUIPMENT AND MATERIALS FOR PROPOSALS

A. <u>BESS Systems Shall Meet the Following Minimum Requirements</u>:

1. The contractor will be responsible for any design efforts. Proposed products shall meet the following:

a. The battery shall be electrochemical.

b. At least three of the same systems proposed for this Project (including cells/modules, overall design and software systems), have been installed in a behind-the-meter arrangement with a utility in the United States.
c. The battery shall be from a proven technology designed for the type of service described by this specification and the bridging documents. For the purposes of this specification, proven technology shall be defined as having been in successful commercial service in similar applications for a period of time sufficient to establish a service life and maintenance history.
d. Only batteries that are commercially available or for which suitable (not necessarily identical) replacement components can be supplied on short notice throughout the Project life shall be allowed.
e. Efficiency shall be:
f. Minimum 80% AC round trip EXCEPT for redox flow batteries
g. Minimum 60% AC round trip for flow battery technology
h. The usable capacity shall be a minimum of 75% of its nominal rating at the end of 10 years. A scheduled replacement of BESS components is permissible to achieve this requirement provided that the Contractor clearly includes the cost of the replacement as part of the warranty/operational costs in their proposal.

B. CYCLE LIFE

1. BESS manufacturer must state depth-of-cycle limitations and the product should be sized such that the depth of discharge corresponds to a cycle life meeting the warranty requirements.

2. For purposes of estimating and demonstrating cycle life, cycles are defined in terms of energy charged and discharged from the BESS. Additional details are to be included in the Contractor's warranty terms and conditions.

3. The Contractor shall provide a graph or set of graphs that displays the relationship between depth of discharge, SOC% and the corresponding number of cycles available within the system's life.

C. BESS shall be designed to withstand seismic events for the designated Project seismic zone. For areas of high seismic risk, BESS shall be seismically qualified in accordance with IEEE 693 High Seismic Qualification Level and shall include means to restrain cell movement during seismic events.

D. The Contractor shall have overall responsibility for the safety of the electrical design and installation of the battery.

E. The BESS design and installation shall be modularized and connected in a manner that enables adequate access for easy field removal and replacement of failed modules or equipment. Access areas shall conform to all applicable codes and facilitate access by maintenance personnel. As applicable, the racks shall provide sufficient clearance between tiers to facilitate required maintenance, including testing and inspection, and replacement.

F. All racks and metallic conductive members shall be solidly grounded.

G. Incorporate disconnect switches for AC and DC power disconnect in compliance with applicable codes and utility requirements.

H. Ambient temperature range have been determined by the Contractor and appropriate for the Project location. The BESS has been designed to operate and maintain sustainable operating temperatures within the Project's ambient temperature range.

2.03 BESS MANAGEMENT SYSTEMS

A. The battery management service provider must be approved for use by the BESS manufacturer and any applicable utility and incentive programs.

B. The battery management system and battery management service shall be listed for UL 1741 Power Control Systems (PCS) Certification Requirement Decision (CRD).

C. The battery management service shall update the BESS functions with the applicable tariff information, including but not limited to energy charges, demand charges, time of use intervals, and demand response programs within 24 hours of when the new Tariff, TOU period, or demand response program is implemented.

D. The Contractor shall provide a minimum of a 5yr subscription of battery management services from the selected battery management service provider. The battery management service subscription must be transferable to the Owner.

E. The BESS management systems have been designed to provide for automatic, unattended operation of the BESS. The control system design can provide for local manual operation or remote operation.

F. BATTERY MANAGEMENT SYSTEM (BMS)

1. As a subcomponent of the Project, a Battery Management System (BMS) provides data to operators in real time via a system dashboard/control interface and shall be included to manage the operational health of the BESS and assure safe and optimal performance of the BESS as an interconnected asset to the Owner's electrical system.

2. BMS shall provide the following monitoring information:

   a. State of Charge (usable kWh and % of total capacity available for discharge)
   b. Cell Charge Level
   c. Stack Charge Level
   d. Module Charge Level
   e. State of Module Health
   f. DC Voltage/Current – DC voltages and current at battery terminals
   g. Temperature – BESS Enclosure temperature and ambient air temperature
   h. BESS Status (Charging/Idle/Discharging, Non-Island/Island, Normal/Fault)
   i. BESS Warning and alarms
   j. BESS Logs of operations and alarms
   k. Over-the Air management and upgrade of any software versions
   l. Cyber Security management of the device itself
   m. Notifications and Alerts
      i) Transition from Non-Island to Island mode or from Island to Non-Island mode.
      ii) Fault Conditions

G. BESS Data Acquisition System (DAS) and monitoring system shall meet the following requirements:

1. Where BESS is paired with a PV system, BESS should provide reporting on the same cloud-based platform as the PV system wherever commercially feasible. BESS may have a separate monitoring and cloud-based platform to fulfill all monitoring requirements listed in this section, however key BESS operating parameters including BESS charge and discharge data should be provided on the same platform and time-interval as the PV system.

H. Cellular data shall be used for communications with the battery and microgrid control systems and cloud-based platforms. The Contractor shall provide a minimum of a 5yr subscription of cellular service compatible with the microgrid and battery control systems. In the absence of cellular service availability, the Owner may, at its own discretion, provide internet connections on a site-by-site basis.

1. The BESS vendor shall have the capability to remotely monitor the BESS and independently and be automatically alerted to BESS alarm conditions without relying on personnel to communicate that such alarm conditions exist.

2. Monthly timescale on the monitoring platform to be aligned with utility billing cycle where possible.

3. Monitoring at a minimum shall provide the following real-time and logged parameters on a maximum 15-min interval or less.

    a. BESS Status (Charging/Idle/Discharging, Non-Island/Island, Normal/Fault)
    b. Instantaneous and accumulated power output (kW and kWh) for both BESS and Site Load
    c. State of Charge (usable kWh and % of total capacity available for discharge)
    d. BESS Warning and alarms
    e. BESS Logs of operations and alarms

4. DAS shall provide Owner and/or Owner's representative cloud-based access to all data through an open data exchange protocol (FTP Push or API) at no additional cost to Owner or Owner's representative. Data shall, at a minimum, include energy consumption and discharge data, inverter production data, inverter AC power data, inverter current data, inverter voltage data, state of charge, and alarm status readings. All data shall be available over multiple timescales, ranging from 15-minute (or less) intervals to annual intervals and shall include both real-time and historic data.

5. DAS shall provide all reporting required to obtain incentives.

6. DAS Monitoring / Alarms systems must meet the following requirements.

    a. Determine if the BESS is in imminent danger of failing to meet specified performance levels or potential safety hazards exist.
    b. Determine if the BESS can no longer meet the specified performance criteria or safety hazards exist.
    c. Contractor and O&M provider shall have the capability to respond to alarm conditions and provide required service to correct such alarm conditions within four hours from the inception of the alarm condition.
    d. Owner and/or Owner's representative shall be able to choose whether to receive the same alerts as the Contractor.

e. The vendor shall include, in the Operation and Maintenance Manual, the recommended corrective action and maintenance procedures for each alarm level or observed condition provided.

7. This Project may participate in grid service markets as identified in the bridging documents, Contract or during design. The BESS shall be capable of integration with grid control and telemetry systems. If grid service(s) are identified as a requirement for this project, all such systems shall be included as part of the Project.

2.04 POWER CONVERSION SYSTEM (PCS) FOR DESIGN

A. PCS (Inverters) shall meet the following requirements:

1. Include a warranty for same period as BESS, minimum 10-years.
2. Comply with the following:
   a. UL 1741 listed, inclusive of UL 1741-SA requirements.
   b. IEEE 1547, including testing to IEEE 1547.1 and IEEE C62.45.
   c. IEEE C62.41.2 and CSA107.1-01.1.
   d. California Rule 21, CEC approved and utility line interactive type.
3. Meet the following requirements:
   a. Nominal AC Voltage (Three-phase, ± 10%): 208, 240, or 480 VAC (as required per site)
   b. Nominal AC Frequency (± 0.5 Hz): 60 Hz
   c. Line Power Factor (Above 20% rated power): >0.99
   d. AC Current Distortion (At rated power): <5% THD
   e. Maximum Open Circuit Voltage DC: 1,000 VDC
   f. Maximum Ripple Current (% of rated current): <5%
   g. Minimum Inverter Efficiency: >96%
   h. Temperature Range Ambient: -4º F to 122º F (-20º C to 50º C)
   i. Enclosure Environmental Rating (minimum): NEMA 3R
   j. Relative Humidity (non-condensing): 0-95%
   k. Sound level: <85 dBa
   l. Capable of producing reactive power to operate between a power factor of 0.9 lagging to 0.9 leading (as adjusted on the inverter equipment).
   m. Protective Functions: Standard wakeup voltage, wakeup time delay, shutdown power, shutdown time delay, AC over / under voltage and time delays, AC over / under frequency and time delays, ground over current, over-temperature, AC and DC over current, DC over voltage
   n. Isolation Transformer (if applicable): High-efficiency type, supplied by the manufacturer of the Inverter Systems, mounted within same enclosure or directly adjacent, with factory-designated wiring provisions.
   o. Seismic rating to Project site seismic zone and mounting type
4. The PCS, in conjunction with any microgrid controls (if present), shall be capable of completely automatic unattended operation, including self-protection, and synchronizing and paralleling with the utility. Where a microgrid is part of the project, PCS shall have islanding support functions.

5. The control of the PCS shall be integrated with the overall Project control system. However, the PCS also shall include all necessary self-protective features and self-diagnostic features to protect itself from damage in the event of component failure or from parameters beyond safe range due to internal or external causes. The self-protective features shall not allow the PCS to be operated in a manner that may be unsafe or damaging.

2.05 MICROGRID CONTROL SYSTEM

A. The Project shall include all necessary software applications and supporting hardware required to meet the specified operational/functional requirements. Software algorithms, external data input capabilities, and user interfaces shall provide for user specified variable input or set point values, as well as external data value streams defined in the Owner's Project Requirements, Section 1.06 of this document.

B. The Project shall include the necessary communication and telemetry hardware, and support communications protocols, to effectively provide the required services.

C. No single mode of failure shall result in loss of power to the control and data acquisition module.

D. Operational States - A command table, with permissible operational states and high level logic, must be submitted by the Contractor. The command table shall be reviewed and approved by the Owner prior to the acceptance of the BESS and factory acceptance test.

E. REMOTE OPERATIONS

1. The microgrid control system shall be able to respond to manual commands that are issued remotely by an external supervisory controller using a secure internet-based protocol.

2. The Project shall remain functional in the absence or loss of communication from the remote controller. The Project shall continue its current mode of operation.

2.06 INFORMATION SECURITY FOR DESIGN

A. BESS/microgrid shall include cybersecurity precautions, designed to be hardened against willful attack or human negligence per applicable codes and standards identified in this specification and in common industry practice for BESS/microgrid.

B. Contractor shall develop and implement a cybersecurity plan that addresses and mitigates the critical vulnerabilities inherent in both the hardware and software that comprise the control and data acquisition systems.

2.07 MISC. SYSTEM REQUIREMENTS FOR DESIGN

A. Systems shall be rated in terms of net delivered power and energy in kilowatts (kW) to the Point(s) of Common Coupling and in kilowatt-hours (kWh) of electrical energy storage capacity. All system loads and losses, including wiring losses, losses through the contactor/static switch, power conversion losses, auxiliary loads, and chemical/ionic losses are considered internal to the system and ratings are net of these loads and losses as measured (or calculated if not measured) to the Point(s) of Common Coupling.

B. The system shall be capable of charging from 0% to 100% useable State of Charge (SOC) and discharging from 100% to 0% useable SOC (its rated energy) for a minimum of duration as stated

in the drawings and cycling in conformance with incentive and warranty requirements, if applicable.

C. All exterior equipment shall be designed for outdoor environment with minimum NEMA 3R rating and to be sunlight and UV resistant.

D. Fire Mitigation/Safety

1. The Contractor shall design its system to minimize any potential risks of fires, ensure safety of any nearby occupied areas, and meet all local, state and national fire codes.

2. O&M documentation shall clearly indicate safety precautions and emergency procedures for Owner interaction with the BESS, including fire procedures.

E. Cooling Systems

1. The site temperatures and the effect of temperature on component life shall be considered in developing the thermal design for all components, including batteries and PCS. System shall provide all heat removal systems to accommodate the particular needs of Project components and subsystems (e.g., PCS, transformers, etc.).

2. Air handling systems shall include filters to prevent dust intrusion into the system. Design for energy efficiency using high efficiency motors and variable frequency drives, and variable speed compressors.

F. No dissimilar metals are allowed to contact each other (use plastic or rubber washers). Best practices shall be used to avoid corrosion. No aluminum in contact with concrete or masonry materials.

G. Bolted connections shall be non-corrosive and include locking devices designed to prevent twisting over the design life of the BESS.

H. Environmental impact of system equipment containing hazardous materials shall be disclosed, as well as maintenance and disposal/recycling instructions for equipment at the end of its useful life. BESS owned by third-parties shall provide for disposal/recycling at end of life at no-cost to Owner.

## PART 3 - EXECUTION

### 3.01 REQUIRED PLACARDS & LABELING

A. All placards and labels shall meet all code requirements, these minimum requirements, and industry best practices.

B. All placards shall be machine generated phenolic type with red background and white lettering, affixed to equipment with stainless steel screws or with permanent adhesive where set screws are not feasible. Minimum lettering size to be 1/4" unless otherwise noted or required for legibility.

C. Provide a placard at each Main Switchboard, as noted on drawings and at minimum with the following information in 1/4" High lettering per NEC 690.54: "Caution - Possible Backfeed From BESS – X VAC, XX Amps", where X is the system voltage and XX is the maximum AC amperes of the installed system.

D. Provide a placard on each BESS component, as noted on drawings and at minimum with the following information in 1/4" high lettering: "BESS Inverter Rating - Operating Current: XX Amps; Operating voltage: XXX VDC; Maximum System Voltage: 1,000 VDC; Short-Circuit Current: XXXX Amps", where XX is the maximum DC amperes of the installed system, XXX is the operating voltage DC, and XXXX is the short circuit current that the Inverter can provide (from all strings in parallel).

E. For DC Coupled BESS

1. Provide a placard clearly visible at each main service panel to identify both sources of power, with the following wording in 1/4" high lettering per NEC 690.64(B)(4): “Warning - This Service Is Fed by Two Sources Of Power – The Utility Service Main Disconnect And The PV System Main Disconnect – Both Services Must Be Disconnected To Remove Power From The Switchboard”.

2. Provide a placard on all disconnects with the following wording in 1/4" high lettering per NEC 690.17: "Warning - Electric Shock Hazard - Do Not Touch Terminals - Terminals On Both The Line and Load Sides May Be Energized In The Open Position".

3.02 UTILITY INTERCONNECTION & PERMITTING

A. Contractor shall coordinate with the utility company to provide all grid intertie requirements and process all required paperwork per utility company requirements.

B. Protection relays for the interconnection shall meet or exceed utility requirements.

C. Contractor shall manage the utility interconnection process and ensure that the systems achieve Permission to Operate (PTO)

D. Contractor shall ensure that all permitting is closed out with the AHJ(s).

3.03 INSTALLATION STANDARDS

A. System Installation shall conform to the equipment manufacturers Installation Manual(s) and requirements or guidelines.

B. All Local, State, and NEC codes shall be observed, including all industry standards related to the installation, operation, and maintenance of photovoltaic power systems.

C. Installation and components must meet utility equipment and safety requirements.

D. Installation must meet incentive requirements, where applicable.

E. CIVIL/STRUCTURAL

1. The Project pads, foundations, fencing and other structures have been designed by or under the supervision, reviewed, approved and signed by a qualified registered professional engineer in the Project state.

2. All design shall be in accordance with seismic design requirements as specified elsewhere in these specifications and drawings.

3. The Contractor shall gain access to the Site as outlined in the Contract. The Contractor shall be responsible for damage to site and roadways resulting from the work performed.

4. Existing structures and utilities that are adjacent to or within the limits of the Project area shall be protected against damage. The Contractor shall be fully responsible for all repairs in

the event of removal or damage of any existing structure, equipment or systems that are intended to remain in place.

F. Excavation. When necessary, the Contractor shall perform all common and deep excavation necessary for installation of all foundations and utilities. All excavation shall be in accordance with Cal-OSHA regulations. Excavation spoils shall be the Contractor's responsibility and may be used for backfill or embankment if suitable for this application. Unsuitable or excess excavated material shall be properly and promptly disposed of. The Contractor shall verify that earth material exposed in excavations is consistent with those assumed for the Contractor's foundation designs. If earth materials are different than assumed for particular foundation design the Contractor shall modify the design and/or treat the earth material (over excavate, replace, etc.) as necessary to provide foundation meeting design requirements.

G. Construction Surveying. When necessary, the Contractor shall furnish all labor, equipment, material and services to perform all surveying and staking essential for the completion of the Project in conformance with the plans and specifications.

H. Fills. When necessary, earth fill material adjacent to and below structures shall conform to the Contractor's design requirements for the structure. Contractor prepared specifications and drawings shall indicate the types of soil to use for particular fills and compaction requirements. Fill shall be placed as uniformly as possible on all sides of structural units. Fill placed against green concrete or retaining walls shall be placed in a manner which will prevent damage to the structures and will allow the structures to assume the loads from the fill gradually and uniformly.

3.04 SAFETY FOR DESIGN

A. The BESS and Site shall be designed with personnel safety as the top priority and include all code required and industry standard safety components.

B. Contractor shall design and install a fire protection system that conforms to national and local codes. The fire protection system design and associated alarms shall take into account that the BESS will be unattended at most times. If codes do not exist for the proposed BESS, current industry-accepted best practices shall be employed.

C. The BESS design shall mitigate against chemical spills that are credible for the types of chemistry used. When BESS employs liquid electrolyte, the design shall include features that contain electrolyte spills (to be emptied by contracted chemical disposal company in the event of a spill) and prevent discharge to surrounding site soils.

3.05 COMMISSIONING

A. Contractor shall develop a commissioning plan and commission the BESS/microgrid to the requirements of the listed/applicable standards, to industry best practices and to demonstrate the BESS meets the Project functional, operational, and performance requirements as defined in the Owner's Project Requirements in Section 1.06 of this document. All modes of operation should be tested and validated. The commissioning process should address the following at a minimum:

1. Verification of sensors, metering and alarms
2. Verification of BESS system performance

a. Maximum charge rate
b. Maximum discharge rate
c. Total usable capacity (kWh)
d. Validate reserve charge capacity
e. AC-AC roundtrip efficiency
f. Parasitic loads
g. Four Quadrant operation (P/Q)
h. Calibration of State of Charge (SOC) values
i. Validate internal safeties
    i) Maximum SOC
    ii) Minimum SOC
j. Validate Defined Modes of Operation
    i) Grid Connected
    ii) Island Mode PV and BESS Operations
    iii) Island Mode PV, BESS, and Diesel Generator Operations

3. Verification of Control Functions for the Entire System
    a. BESS
    b. PV
    c. Diesel Generator
    d. Monitoring and Controls
    e. Electric Infrastructure.

B. Factory testing shall be performed and documentation provided as noted in Section 1.07 of this specification.

C. Complete testing of the installed system shall be performed by a manufacturer certified representative prior to system start up. All required modifications shall be made, and system signed off prior to making the system operational.

D. Clear and complete documentation shall be provided demonstrating that the commissioning plan was executed and that the system achieved commissioning requirements.

3.06 BESS TESTING PROTOCOLS

A. The Test shall be conducted in accordance with Good Utility Practices and the provisions in this document

B. Required Performance Criteria

1. Tests conducted shall include the following elements (unless Contractor otherwise agrees in writing in its sole discretion):

- "Availability" is defined as the ability of the BESS to receive and respond to signals from the control system. This value is calculated as the ratio of time the system can function as described to total time within the annual measured period, calculated as a percentage. Availability is not negatively impacted by outages beyond the control of the Contractor, including:
    i. any BESS Outage where Contractor failed to comply with a dispatch notice by Owner that was not in accordance with the BESS Operating Procedures;
    ii. a Contractor Excused Event;

iii. a breach of this Contract by Owner that impedes the ability of the system to receive and respond to signals from the control system; or
iv. insufficient solar irradiance or insufficient stored energy not caused by any act or omission of Contractor.

- "Cloud based Enterprise Wide Information System" or "CEWIS" means the Owner supplied servers and software used by the BESS to record historical operations parameters or compatible replacement.
- "Battery Management System" or "BMS" is defined as the electronic control and communication system that manages and protects the BESS.
- "BESS Energy Capacity" is defined as the rated amount of energy that the BESS can hold, measured in MWh at Maximum Discharge Rate and measured at the Delivery Point.
- "Self-Discharge Rate" is defined as the loss of charge of the BESS while idle.
- "Minimum Charging Time" is defined as the amount of time between a measurement of 0% State of Charge (SOC) to reaching 100% SOC (expressed in units of time).
- "Minimum Discharging Time" is defined as the amount of time discharging from full 100% SOC to reaching a measurement of 0% SOC (expressed in units of time).
- "Maximum Charging Rate" is defined as the maximum rate of charging (expressed in MW).
- "Maximum Discharging Rate" is defined as the maximum rate of discharging (expressed in MW).
- "Performance Test" a test that verifies the BESS Maximum Charging Rate, Maximum Discharging Rate, Minimum Discharging Time, Minimum Charging Time, and BESS Capacity.
- "Response Time" is defined as the amount of time for the BESS to respond to dispatch instructions from Owner's SCADA.

C. Test Parameters. During any Performance Test, at a minimum, the following parameters shall be measured and recorded simultaneously for the BESS at the level of granularity necessary to assess the measured criteria and at least every four (4) seconds:

i. Time
ii. Net electrical energy output as measured by the BESS Meter (kWh dc)
iii. Net electrical energy input as measured by the BESS Meter (kWh dc)
iv. Reactive power (VARS)
v. State of Charge (%)

D. Performance Criteria. Contractor must demonstrate to Owner's reasonable satisfaction, that the BESS:

i. is capable of storing and delivering the MW and MWh amount identified by Contractor as the maximum rated power and energy;

ii. can deliver full rated power (MW) to the Point of Delivery for four (4) consecutive hours, totaling to the BESS Energy Capacity

iii. All identified SGIP performance-based incentive levels are met.

E. TESTS

- Test to measure Maximum Charging Rate, Maximum Discharging Rate, Minimum Discharging Time, Minimum Charging Time, BESS Capacity, and BESS Energy Capacity:

  i. A capacity test shall be performed to determine the BESS Maximum Charging Rate, Maximum Discharging Rate, Minimum Discharging Time, Minimum Charging Time, and BESS Capacity.

  ii. The capacity test will be performed per the most up to date methodology defined by the battery OEM. This will typically involve the following steps:

1) The system will be discharged to 0% SOC potentially with a rest state at a higher SOC in between

2) The system will be left at rest in an active standby state for a period of time as defined by the OEM

3) The system will be charged to 100% SOC at the Maximum Charging rate. The charging rate may be limited by the BMS at higher SOCs. The time required to reach the SOC where charging rate is limited will be noted. It may also be limited by available resources. The DC energy input for charging, WhI will be measured and recorded.

4) The system will be left at rest in an active standby state for a period of time as defined by the OEM

5) The system will be discharged to 0% at the Maximum Discharging Rate. The discharging rate may be limited by the BMS at lower SOCs. The lesser of 4 hours multiplied by Guaranteed BESS Energy Capacity % or the total discharging time required to reach the SOC at which the discharging rate is limited will be recorded (the “Maximum Discharging Rate Time”). The AC energy output until the Maximum Discharging Rate Time is reached, WhDi, will be measured and recorded. The AC energy output until 0% SOC is reached, WhD, will also be measured and recorded.

iii. The reference capacity test value (BESS Energy Capacity) shall be WhDi as measured in item (ii)5) and recorded in units of kWh. The reference capacity test value (“BESS Capacity”) shall be WhDi divided by the Maximum Discharging Rate Time and recorded in units of kW..

F. The power and times (hours/minutes/seconds) recorded in steps (ii) 3 and (ii) 5 shall be the value used to verify conformance to the Guaranteed Maximum Charging Rate, Guaranteed Maximum Discharging Rate, Guaranteed Minimum Charging Time, and Guaranteed Minimum Discharging Time.

3.07 DOCUMENTATION

A. All commissioning and testing reports shall be provided to the Owner within 15 days of completion of testing.

B. The Contractor shall submit to the Owner a comprehensive Operations and Maintenance (O&M) Manual with details for BESS. O&M Manuals shall be compiled as a single, bookmarked portable document format (PDF) file. The document shall be a well-organized, comprehensive and custom document created with details for each site. The document shall be provided according to the requirements in Section 01 33 00.

C. All closeout documentation shall be provided per Sections 01 10 00 and 01 33 00 to achieve the listed project milestones.

3.08 TRAINING

A. Owner training shall be provided by the Contractor. The training course shall cover a breakdown of the BESS, procedures related to emergency response (ruptured modules, fire, etc.), and operation and control of the energy storage system and diesel generator.

B. Training shall be scheduled before commencing Project performance verification tests. An outline for the training and the O&M manual shall be submitted to the Owner 30 days ahead of the actual date of training. Approval of this outline shall be obtained from the Owner.

3.09 OPERATION

A. Contractor shall provide operational services for the life of the BESS per the Contract. Services shall include, at a minimum:

1. Preventative maintenance as specified by the manufacturer(s) and industry standards.
2. Software updates. Updates shall be provided remotely and in prompt response to any utility tariff changes or grid service requirements.
3. Ongoing optimization of energy cost savings function of the BESS.
4. Performance reporting, including energy cost savings provided by the BESS.
5. End-of-life disposal of BESS and/or cell replacement. Where system is owned by a third-party, the cost of disposal/replacement shall be the responsibility of the third-party owner.

END OF SPECIFICATION SECTION 48 17 13