OneEnergy
RENEWABLES

FIRE SAFETY DESIGN

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WEBB LAKE SOLAR PROJECT

OneEnergy Renewables (OER) is a full-service solar development, engineering, construction, and operations company. We are involved with our projects from start to finish: from early stage site diligence, to lease signing, to the ribbon cutting when the site starts operations. OneEnergy designs its facilities to exacting standards in full compliance with applicable electrical standards is of utmost importance to us. The following memorandum explains the approach that OER takes to create a safe, reliable, and responsible solar-powered generation facility.

OER designs solar projects in accordance with the National Electrical Code (NEC). The NEC provides conservative guidelines for the detailed design of most low voltage electrical systems, including a dedicated section for Utility Scale Solar Projects. The Electrical Safety Foundation (ESFI.ORG) provides this short description of The NEC:

The National Electrical Code (NEC), or NFPA 70, is a United States standard for the safe installation of electrical wiring and equipment. It is part of the National Fire Codes series published by the National Fire Protection Association (NFPA). While the NEC is not itself a U.S. law, NEC use is commonly mandated by state or local law, as well as in many jurisdictions outside of the United States. The NEC codifies the requirements for safe electrical installations into a single, standardized source. The "authority having jurisdiction" inspects for compliance with these minimum standards.

OER solar projects are carefully designed and include redundant protection measures against equipment failures and all types of electrical faults. All of OER's designs and calculations are reviewed throughout the design process, both internally and by an independent, experienced, registered Professional Engineer (P.E.). Prior to construction, the P.E. will stamp the plans, and in doing so, they are assuming liability for design-related project failures and vouching that the project is built to exceed the applicable requirements set forth by the NEC.

The equipment on OER solar sites is Underwriters Laboratories (UL) Listed or Recognized, which means that the component or product has been tested and meets nationally recognized safety and sustainability standards. At the PV module level, OER sources high tier modules with a proven track record of safety, performance, and reliability. At the inverter level, OER's Distributed Generation projects typically utilize string inverters, such as the 250kW product by Chint Power Systems (CPS), the market leading supplier of 3-phase string inverters in the US for multiple years. The 250kW inverters employ Smart Inverter (Grid Support) functions in compliance with UL 1741-SA8-SA18 and UL1741-SB standards. On the DC side, these CPS inverters feature *surge protective devices* (SPD) which redirect larger transient loads, such as power surges caused by lightning, to the grounding system. This provides an alternative "return" path for the electricity and protects wires/equipment from overvoltage and thermal runaway. The inverters also include anti-islanding detection and residual current detection as part of the DC ground fault detection method. The inverter continuously checks for islanding conditions. If detected, the inverter will cease operation automatically and disconnect from the grid. If there is a ground fault in the PV array, the inverter will detect leakage current, trigger an alarm, and the inverter will cease operation. There is also a manually operable disconnect switch on the DC side of the CPS inverters that can isolate the equipment during operating loads.

On the AC side of the inverters there is an additional built-in SPD that protects against surges downstream of the inverters. OER also places an external AC disconnect switch on the same rack as each inverter. The NEC requires that any large and permanently-wired equipment must have a disconnecting means within sight distance. Inverters and the outgoing AC circuits are protected against fault current originating from the utility grid by multiple means of overcurrent protection: a utility provided recloser, fusing in the step-up transformers, and circuit breakers in the medium voltage switchboard that is located in between the step-up transformers and the inverter local disconnect switches. Fuses and circuit breakers, the most commonly utilized *overcurrent protection devices* (OCPDs), function by opening the circuit at certain levels of current, thereby halting the flow of electricity and mitigating the risk.

OER's engineering team sizes conductors so that all 4 of the below requirements are met for every single electrical wire on the project:

1. The conductor must be able to safely carry the current load with any applicable safety factors. This judgment is made on the basis of temperature-rise. Wires with a given insulation are rated for a particular operating temperature. Conductor temperature increases with amperage (current load).

2. The conductor must be sized such that it is properly protected by adjacent OCPDs. This is determined by review of (*Time Current Curves*). On a high level, if the current rating of the OCPD is far greater than the current capacity of the conductor, then the OCPD will not open the circuit when it is supposed to and thereby expose the conductor to a greater load than it was designed for. OER's engineering team sizes conductors in tandem with OCPDs to create a safe power system that will perform as intended, even during worst-case scenarios.

    a. On a more detailed level, Time Current Curves are graphs that show the duration of time a conductor or OCPD can withstand different levels of current. Comparing the TCCs for conductors and OCPDs confirms whether the selected OCPD can provide sufficient protection by opening the circuit quickly enough to prevent the conductor from reaching a temperature outside of its designed range.

3. The temperature of the conductor cannot exceed the rated temperature of the equipment terminals that it connects to.

4. If the conductor is in conduit, the conduit must be large enough to house all of the conductors, as determined by code. If the conduit is too small, the heat will not be able to dissipate properly.

OER takes a similar approach to equipment design and selection, following applicable code as well as the requirements of the specific manufacturer for any equipment that is utilized.

OER designs sites such that the entire project is accessible by motor vehicle. All step-up transformers and utility-owned equipment are accessible by a 16' wide gravel road that is suitable for fire-trucks. All major equipment, such as inverters, switchboards, and transformers, are surrounded by aggregate at the base that is at least 4" deep. The aggregate extends a minimum of 5 ft around inverters and AC disconnects and 20 ft around transformers and switchboards. The aggregate serves to isolate the equipment from the surrounding vegetation.

OER solar projects include an elaborate communications system that monitors performance and health of the facility. Using an online portal, the site operator will be immediately notified of critical issues such as overheating equipment or ground faults. After construction and prior to energizing, the solar site goes through commissioning, which is the process of configuring and verifying that all the components are properly designed, installed, and optimized.

OneEnergy Renewables stands by the high level of safety of its projects to on-site personnel, neighbors to the project, and the surrounding environment. We are open to any inquiries regarding the project's safety and design and commit to urgently respond to such inquiries throughout the development, design, and construction process.