

### COMMERCIAL GRID-DIRECT PHOTOVOLTAIC SYSTEM: **Truckee Sanitary District**



Courtesy premierpower.com (4)

#### Overview

**DESIGNER:** Ken Baker, engineering director, Premier Power, premierpower.com

**LEAD INSTALLER:** Reed Hammond, construction manager, Premier Power

**DATE COMMISSIONED:** September 2009

**INSTALLATION TIME FRAME:** 150 days

**LOCATION:** Truckee, CA, 39.3°N

**SOLAR RESOURCE:** 5.6 kWh/m<sup>2</sup>/day

**RECORD LOW/AVERAGE HIGH TEMPERATURE:** -23°F/87°F

**ARRAY CAPACITY:** 125.4 kW

**AVERAGE ANNUAL AC PRODUCTION:** 197 MWh

When the Truckee Sanitary District (TSD) decided to achieve energy independence, it solicited bids from California's top photovoltaic integrators for a ground-mount solar array to completely offset TSD's annual electrical energy usage. Premier Power was selected due to its project and design expertise, and its unique solution to installing a 125 kW PV system at the site.

The harsh weather conditions encountered in Truckee, California, presented significant challenges for this project. The first obstacle to overcome was the significant frost depth and resulting propensity for ground upheaval. This issue was further exacerbated by the presence of large boulders buried beneath the ground, which required removal, relocation or demolition before the installation phase of the project could begin. Premier Power's modified ballast design mitigated these issues and allowed for excavation just below the 24-inch frost line and an

engineered ballast capable of withstanding the major wind speeds found at this location. Another hurdle was finding a module that would withstand the 5,400 pascal front-load rating required by TSD for snow accumulation. Premier Power took a technology-agnostic approach. Not being locked into any particular module manufacturer proved beneficial because this allowed the company to source SOLON modules that met the high front-loading requirement. A blend of 230 Wp and 235 Wp SOLON Blue 220/01 polycrystalline modules makes up the arrays.

The design team also had to find an inverter that works well given Truckee's extreme temperature swings. Premier Power chose Enphase microinverters due to their NEMA 6 environmental rating and broad operating temperature range of -40°F to 149°F. The independent nature of microtechnology was a huge selling point as well. For example, module-level MPP tracking is more immune than a



centralized inverter design to the performance effects of winter snow accumulation and melt, which varies across the array. Also, micros provide the design flexibility to accommodate both 230 W and 235 W modules in a single array.

Since snow levels can get extremely high at the TSD site, the arrays' leading edge is 6 feet above the ground. The custom-mounting solution required significant design and engineering expertise. Premier Power also built paved roads between each subarray, which are 300 feet

long, to facilitate snow removal equipment and provide easy access for system maintenance.

"The Truckee Sanitary District and Mother Nature placed some very demanding requirements on us, but the Premier Power design and operations team rose to each of these challenges and created a high-output engineering marvel that we, TSD and Enphase can all take pride in."

—Mark Santos, senior renewable energy specialist, Premier Power



## Equipment Specifications

**MODULES:** 535 SOLON Blue polycrystalline 220/01 modules, 471 of which are P220/6+/01 235 Wp (235 W STC, +3%/-3%, 8.05 Imp, 29.2 Vmp, 8.65 Isc, 36.9 Voc) and 64 of which are P220/6+/01 230 Wp (230 W STC, +3%/-3%, 7.95 Imp, 29.0 Vmp, 8.55 Isc, 36.65 Voc)

**INVERTERS:** 3-phase, 208 Vac service, 535 Enphase M190S, 190 W output, 54 Vdc maximum input, 22–40 Vdc MPPT range

**ARRAY, SUBARRAYS 1–3:** 140 modules with seven branch circuits of 20 parallel connected micros, each branch circuit center tapped to minimize voltage drop, 15 A breaker per circuit; each subarray includes 100 A panel and Enphase line communications filter unit; 400 A main solar aggregation panel located at subarray 1

**ARRAY, SUBARRAY 4:** 115 modules with five branch circuits of 20 parallel connected micros and one branch circuit of 15 parallel connected micros, each branch circuit center tapped to minimize voltage drop (the 15-module branch circuit is also tapped between modules 10 and 11), 15 A breaker per circuit; 100 A subpanel and Enphase line communications filter unit

**ARRAY INSTALLATION:** Custom modified ballast ground-mount system, 180° azimuth, 35° tilt

**SYSTEM MONITORING:** Four Enphase Envoy Communications Gateways (EMU); Enlighten module-level monitoring with real-time Web reporting

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