

AllEarth Renewables

South Burlington Solar Farm



Courtesy Engineers Construction

Overview

DESIGNER: Doug MacDonald, project engineer, AllEarth Renewables, allearthrenewables.com

INSTALLATION TEAM: AllEarth Renewables, project EPC; Engineers Construction, engineersconstruction.com; J.A. Morrissey, jamteam.com; Omega Electric Construction, omegavt.com; Timberline Electric

DATE COMMISSIONED: July 2011

INSTALLATION TIME FRAME: 4 months

LOCATION: South Burlington, VT, 44.2°N

SOLAR RESOURCE: 5.5 kWh/m²/day

HIGH/LOW DESIGN TEMPERATURES: per Solar ABCs solar reference map: 88°F/-15°F

ARRAY CAPACITY: 2.13 MW

ANNUAL AC PRODUCTION: 3,400 MWh

The South Burlington Solar Farm is unique in that it utilizes a decentralized design with 382 SMA string inverters integrated with dedicated AllEarth Renewables AllSun dual-axis trackers. This distributed approach provides a high degree of redundancy—eliminating the single point of failure common to systems that employ high-capacity central inverters and minimizing potential downtime from an inverter failure—while optimizing power output and energy harvest. The 2.13 MW PV system is the largest solar farm in North America deployed using a distributed inverter approach.

The project received financing from a local lender, Merchants Bank, and is owned by Chittenden County Solar Partners. It participates in Vermont's first-in-the-nation Standard Offer Program, which is a feed-in-tariff program that offers 20-year contracts at a fixed

price. The program supports solar projects up to 2.2 MW. Because of the high level of interest, projects were chosen by lottery. The South Burlington Solar Farm received a \$0.30/kWh contract.

AllEarth Renewables, the tracker manufacturer and EPC contractor, chose a decentralized inverter configuration for this 25-acre solar farm to maximize reliability and production. Each top-of-pole-mounted subarray has its own dedicated MPPT input to optimize performance. Since inverters can be replaced individually, O&M expenditures should be reduced over the life of the system compared to centralized designs. This design also keeps dc wiring costs down since the PV source circuits are connected to the inverter at the tracker.

The field wiring is exclusively ac circuits. Cable-in-conduit connects the output of each string inverter from line to neutral inside one of twenty 200 A



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480/277 Vac 3-phase panelboards. Each panelboard aggregates 14 to 22 inverter-output circuits and is fed through a dedicated 200 A fused-disconnecting means. Four 500 kVA step-up transformers—configured for 480/277 Vac on the low side and 12 kV on the high side—are daisy-chained together and distributed across the solar farm. Five inverter aggregation subpanels are fed from each transformer. MV cable, buried 4 feet below grade in conduit, is used for the 1,700-foot run to the utility connection point.

Because the PV system is grounded and each transformer-isolated inverter is connected line to neutral, the utility considers the solar farm to be a solidly grounded generation source as a whole. Therefore, the utility requires no additional protective relay or main contactor beyond the circuit breakers used to

protect the individual inverters and the fused overcurrent protection devices on the secondary and primary sides of the transformers.

The radio communication and tracker control equipment are housed in a central location, which includes a high-speed data modem and a central radio designed to communicate and receive hourly power, energy, voltage and wind speed data from each tracker. The site's innovative use of wireless technology allowed the Vermont governor to formally commission the system last July with an Apple iPhone.

"Having 382 trackers in one field outperforming our expectations not only confirms the reliability of our product, but also allows us to test new code to boost tracker performance further."

—David Blittersdorf, president and CEO, AllEarth Renewables

Equipment Specifications

MODULES: 9,168 Astronergy CHSM6610P-235, 235 W STC, -0/+5 W, 8.06 Imp, 29.2 Vmp, 8.56 Isc, 37.6 Voc

INVERTERS: 382 SMA Sunny Boy 6000-US inverters; 6.0 kW, 600 Vdc maximum input, 250–480 Vdc MPPT range, single-phase 277 Vac output, strings paralleled at inverter disconnect, 15 A fuses; 2,292 kW inverter capacity total

TRACKERS: 382 AllEarth Renewables AllSun Series 24 Trackers, dual-axis, GPS-based azimuth and tilt control

ARRAY: 12 modules per source circuit (2,820 W, 8.06 Imp, 350.4 Vmp, 8.56 Isc, 451.2 Voc), two source circuits per inverter (5,640 W, 16.12 Imp, 350.4 Vmp, 17.12 Isc, 451.2 Voc); 2,154 kW array capacity total

ARRAY INSTALLATION: Dual-axis tracked ground mount

SYSTEM MONITORING: AllEarth Renewables AllSun Tracker proprietary monitoring system, web-based data display