

### SKYFIRE ENERGY

## Okanagan College Centre of Excellence



Courtesy SkyFire Energy (4)

### PV Overview

#### DESIGN & INSTALLATION LEADS:

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**DATE COMMISSIONED:** May 2011

**INSTALLATION TIME FRAME:** 50 days

**LOCATION:** Penticton, BC, Canada, 49°N

**SOLAR RESOURCE:** 3.9 kWh/m<sup>2</sup>/day

**HIGH/LOW DESIGN TEMPERATURES**  
83°F/-17°F

**ARRAY CAPACITY:** 260 kW

**ANNUAL AC PRODUCTION:**  
292.5 MWh

The solar energy systems at Okanagan College's newest building, the Centre of Excellence in Sustainable Building Technologies and Renewable Energy Conservation, include both the largest PV system developed in western Canada and dual-technology solar water heating that uses flat-plate and evacuated-tube collectors. The systems are designed to produce 100% of the facility's energy on-site. In addition to energy production, the systems provide students with access to operating arrays to enhance their education. The Centre was built to meet the ambitious targets of the International Living Future Institute's Living Building Challenge (ilbi.org), which requires net-zero

energy and water consumption, among other prerequisites. Achieving the highest energy production density possible was the key challenge for this project.

SkyFire Energy, a solar EPC contractor with offices in Calgary, Alberta, and Toronto, Ontario, served as the project developer. The building's original design included PV and solar water-heating arrays, as well as multiple energy-efficiency features such as light wells and solar chimneys, which had to be accounted for during the layout and installation of the solar arrays. Low PV array tilt angles (10° typical, but seven different tilt angles are present) were specified to minimize interrow shading between arrays and increase the total



array capacity and power density. The project's location receives a limited amount of annual snowfall, and the annual energy output will be minimally affected by the low module-tilt angles, which are atypical for this latitude.

Satcon Solstice inverters were specified, due in part to the wide variation in array-tilt angles. The Solstice inverters are paired with Satcon Solstice Subcombiners, which provide string-level MPPT and a boost function that fixes each string's output voltage to 575 Vdc. In turn, the inverter design is optimized based on a fixed input voltage. These features enabled SkyFire to design and install a system that accounts for varying string lengths and tilt angles, allowing installation of modules in locations that would not have been viable if conventional central inverters with a single MPPT channel had been used. For example, the building includes four solar chimneys that have enough

space for nine modules each. Due to the inverter system's flexibility, the top of each chimney holds a single series string of modules without complicating wire management issues.

Conergy PV modules were chosen for the project due to Conergy's value-added services, including technical support during the unique design and installation process. The entire array utilizes multiple racking systems to accommodate the various roof surfaces. The majority of the array uses DPW Solar's POWER-FAB PLP ballasted racking system. The only penetrations made for the PV mounting system were on the solar chimneys, where a top-down mounting system was specified. SkyFire utilized a customized wire tray system between the source circuits and the individual combiner boxes. The Satcon source-circuit combiners were located as close as practical to the modules to keep the source-circuit conductor lengths as short as possible. ☺

## PV Equipment Specifications

**MODULES:** 1,106 Conergy P 235PA, 235 W STC, +/- 3%, 7.81 Imp, 30.1 Vmp, 8.44 Isc, 36.8 Voc

**INVERTERS:** 3-phase, 120/208 Vac service, two Satcon Solstice SDMS-100-UL/CSA, 100 kW, 575 Vdc fixed-array input voltage, 208 Vac output; 12 Satcon Solstice Subcombiners provide string-level MPPT and dc-to-dc conversion

**ARRAY:** 42 source circuits per inverter; modules per string varied between nine and 14. Nine modules per source circuit (typical) for elevated arrays (2,115 W, 7.81 Imp, 270.9 Vmp, 8.44 Isc, 331.2 Voc), 14 modules per source circuit (typical) for lower roof areas (3,290 W, 7.81 Imp, 421.4 Vmp, 8.44 Isc, 515.2 Voc)

**ARRAY INSTALLATION:** DPW Solar POWER-FAB racking, single-ply membrane roof, 180° azimuth, 10° tilt (typical)

**ARRAY STRING COMBINERS:** 12 Satcon Solstice Subcombiners (SSB2509LNU), 2.9 kW maximum power, 50–600 Vdc input range, fixed-level 575 Vdc array output, 15 A fuses

**SYSTEM MONITORING:** Integrated with building automation system

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