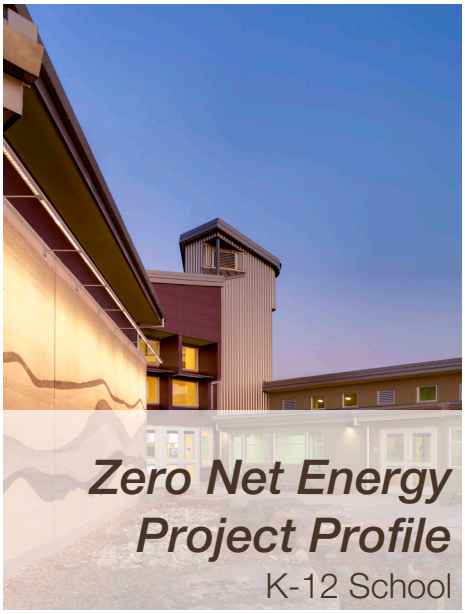

Zero Net Energy Project Profile

K-12 School

Photos: Steve Whittaker

OVERVIEW

Site Details

Building Size: 77,000 SF

Location: Redding, California

Construction Type: New

Construction Year: 2011

Building Type: Education

CA Climate Zone: 11

Measured Energy Stats

16	-	8	=	8
BUILDING'S TOTAL EUI		RENEWABLE PRODUCTION EUI		BUILDING'S NET EUI

Site Energy Use Index (EUI) kBtu/SF/year

The Energy Equation: **the building energy use** *minus* **the renewables production** *equals* **the net energy of the building**. Buildings may be 'Getting to Zero' and have a net EUI above zero. If renewable production exceeds energy use its net EUI is below zero (negative) and it is creating surplus energy.

nbi new buildings institute

For more information:
newbuildings.org/zero-energy

REDDING SCHOOL OF THE ARTS

Redding School for the Arts in Northern California connects education and arts for K-8 students in a community of 90,000 people. The school was originally created in August 1999 in response to the rapid decline of arts programs in local schools. In 2011, the charter school opened a new facility with an ambitious goal of zero net energy, while dedicating only 2% of the budget to renewable energy systems. In this project, these systems were characterized as photovoltaic solar panels, wind generation and included geothermal bore fields. The two-story, 77,000 square feet building includes classrooms, art rooms, music and dance spaces, a library and information center, a cooking classroom and a technology room.

Planning & Design Approach

Overarching project goals were:

- Use the facility as a teaching tool
- Connect the indoor and outdoor environments to create a series of continuous learning spaces
- Use appropriate solar orientation strategies to maximize daylighting opportunities and take advantage of outside views
- Significantly reduce energy use by locating 39,000 SF of learning space in protected outdoor areas

Energy Efficiency Strategies & Features

Daylighting: The design orients classrooms to the north to maximize daylighting with minimal heat and glare. Lighting controls reduce or eliminate electric lighting in response to daylighting to encourage natural light as the primary source of illumination in spaces and 'learning streets.'

Efficient HVAC: The school utilizes a geothermal HVAC system. Windows are sized and located to provide occupant control and cross air airflow through classrooms.

Photos: Steve Whittaker

Improved envelope: The building envelope consists of a rain screen wall system with cement siding and ultra-high-efficiency glazing and rammed earth walls.

Maximize outdoor learning spaces: Despite being in a climate with hot, dry summers and rainy, cool winters, more than half of the school's learning spaces are outdoors, protected by roof overhangs and operable garage-style doors.

Building dashboard: The web-based building dashboard system monitors and reports energy and water use, separating out lighting energy use and renewable systems production. Information from the dashboard is used to teach students about the school and their environment.

Renewables: Photovoltaics (PV) systems include a large roof-mounted PV array, vertical axis wind turbine and solar thermal hot water systems. Both the PV and wind turbine are connected to the utility grid via net metering, thus allowing the school to be credited for energy it produces in the summer even when the school's energy use is minimal.

Lessons Learned

- Building occupant use in summer is higher than expected. Ongoing commissioning would be helpful to draw attention to minimizing HVAC operating hours, managing set points and ensuring that lighting and plug loads are turned off when the building is unoccupied.
- Lighting systems are operating at an average of 0.35 watts per square foot, or 60% less than code. Two occupant use factors that may be impacting daylighting performance are that window blinds are closed more often than was expected during design and the windows themselves are used to pin up student's art work, which may be contributing to less-than-optimal daylighting performance.
- Plug load energy use, such as refrigeration, space heaters and terrarium lights, is higher than expected. Procurement of high efficiency equipment is recommended to manage plug loads. For example, using powerful display projectors to increase contrast and/or locating projection screens on walls perpendicular to windows to help prevent use of blinds may help optimize daylighting performance.

Team/Owner Details

Owner: The McConnell Foundation

Architect: TRILOGY Architecture

Contractor: Gifford Construction

Structural Engineering: Kibler & Kibler Architecture and Engineering

Mechanical/Plumbing: M/E Systems Engineering

Electrical Engineering: PACE Engineering

Lighting Designer: Benya Lighting Design

Sustainability Consultant: Green Building Services

Financing & Cost

Total Construction Cost: $28 million

Awards

LEED® Platinum for Schools 2009

zero net energy