

Project Profile

Zero Net Energy School



Photo courtesy of Putney School

Overview

Site Details

Building Size: 16,800 SF

Location: Putney, Vermont

Construction Type: New Construction

Construction Year: 2009

Building Type: K-12 Education

Climate Zone: 7A

Measured Energy Stats

$$10 - 10 = 0$$

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.

PUTNEY FIELD HOUSE

The Putney Field House is located on a 461-acre parcel, with areas dedicated to forestry, education and agriculture. The site includes indigenous plantings and a production garden. The state-of-the art field house and wellness center was built to provide winter recreational opportunities to residents of the boarding school and includes a multi-purpose gym, offices, social gathering area, weight room, ski waxing room and yoga/flex space. When designing a new space, the school's strategic plan dictated that the construction conform to the highest environmental standards, namely LEED Platinum and Zero Net Energy.

Planning & Design Approach

The Putney Field House supports the school's key values of environmental-based learning, sustainability and social consciousness. Planners and architects facilitated an integrated design process that engaged everyone from students to trustees in early brainstorming sessions. The team modeled various options to identify and evaluate both first costs and operating costs. The options included a building built to minimum code standards, a high performance building, a carbon-neutral building and a net zero building. The net zero building was seen as providing the most value to the school over time. It also helped in fundraising efforts.

Strategies and Features

Building Orientation and High Performance Envelope - The building is elongated east-west to promote daylighting and passive solar. The building uses R-20 for under-slab insulation, R-45 in the walls and R-60 in the roof. Triple-paned windows have a U-value of 0.19. The steel frame is insulated under the concrete footings to decrease heat loss through conduction.

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Project Team

Owner: The Putney School

Architect: William Maclay Architects and Planners

Energy Consultant: Energy Balance, Inc.

Contractor: DEW Construction Corp

Commissioning: John F. Penny Consulting Services

Financing & Cost

Cost / SF: \$360/SF

Incentives: \$250,000 grant from the State of Vermont Clean Energy Development Fund for photovoltaics

Awards

LEED® Platinum

For more information:

The Putney School:

<http://www.putneyschool.org/>

Maclay Architects:

<http://goo.gl/nDfNGQ>

New Buildings Institute In Depth

Case Study: <http://goo.gl/yUXtl0>

Efficient HVAC- The building incorporates passive night flushing and stack ventilation for cooling. Four energy efficient air-to-air heat pumps with energy recovery ventilation keep the building warm in winter and cool in summer.

Daylighting - The building's massing and orientation promote good daylighting design. The gymnasium has diffuse skylights with double glazing. Clerestory windows are operable to promote airflow, and windows have redirecting blinds to bounce light off a white ceiling and send it deep into the space. Exterior motorized awnings on the west side of the building reduce solar gain and minimize glare. Window shades block direct light and glare while allowing occupants to enjoy the view even when the shades are lowered.

Renewable Energy - Building and site-mounted arrays amount to 36.8 kW of photovoltaic (PV) on the site. The PVs produced 51,400 kWh in the first year of operation - more energy than was consumed in the building.

Water Conservation - The building utilizes low-flow fixtures, waterless urinals and composting toilets. Hot-water pipes are insulated to reduce water waste during warm-up.

Lessons Learned

- Well-managed pre-design work by the general contractor and architect ensured a high level of communication with respect to the finished product. This process generated accurate cost estimates.
- Investment money was directed to increased first costs to construct to net zero instead of ongoing utility bills. Due to Vermont's progressive net metering laws, the school receives a credit of about \$2,500 from the electric utility each year.
- Building operators had a steep learning curve with regard to computer-driven building controls.
- Commissioning was critical to address the interaction of the various systems.
- Set high goals. They can be achieved.

New Buildings Institute

New Buildings Institute (NBI) is a nonprofit organization working collaboratively with commercial building professionals and the energy industry to improve the energy performance of commercial buildings.