nbi new buildings institute

Project Profile

Emerging Zero Net Energy K-12 School

Photo courtesy of Turkey Foot Middle School

Overview

Site Details

Building Size: 133,000 SF

Location: Edgewood, Kentucky

Construction Type: K-12 Education

Construction Year: 2010

Building Type: New Construction

Climate Zone: 4A

Measured Energy Stats

22 - 11 = 11

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.

TURKEY FOOT MIDDLE SCHOOL

The Kenton County School District believes "schools should use less energy, demonstrate sound environmental practices and serve as a fundamental tool for learning." Since the District had experience with a formal energy management program that saved over $2 million since 2007, they were well acquainted with energy efficiency opportunities. That context made it easy for the School Board to decide to pursue zero net energy goals in new construction projects like Turkey Foot Middle School.

Turkey Foot is revolutionizing the way kids learn, all within a new building that uses half the energy of the previous school despite being twice the size. Turkey Foot leveraged the practices and experience on other high performance goals in the District. With funds from the American Recovery and Reinvestment Act, the District worked with the Kentucky Department for Energy Development and Independence and the U. S. Department of Energy to make the net zero schools a reality.

Planning & Design Approach

With the Turkey Foot Middle School net zero building the Kenton County School Board aimed to:

- Save taxpayers money
- Develop state-of-the-art facility and learning environment
- Prepare the next generation for the jobs of tomorrow

Strategies and Features

High Performance Envelope - Turkey Foot has significantly less glazing than other schools in the District. The District learned from previous projects that windows can be strategically located to enhance daylighting, minimize glare and

over

Project Team

Owner: Kenton County School District

Architect: PCA Architecture

Engineer: CMTA Engineers

Contractor: Turner Construction

Financing & Cost

Cost/SF: $172/SF before solar
$190/SF with solar

For more information:

Kenton County School District:
http://goo.gl/v8QUro

Videos: http://goo.gl/nvedml

Association of Energy Engineers:
http://goo.gl/KoFGc0

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.

improve thermal performance. Reduced glazing, plus increased insulation levels through the use of insulated concrete form walls, allowed the design team to downsize mechanical systems, thus saving first costs.

Daylighting and Advanced Lighting Design- Designers convinced the Kentucky Department of Education to allow for reduced foot-candle levels required by electric lighting system as long as it was supplemented through high quality daylight design. This allowed for a substantial first-cost reduction as fewer light fixtures were needed in the 36 classrooms. Side lighting high on the window wall as well as solatubes direct daylight deep into spaces. Additionally, two light sensors per classroom monitor the amount of natural light available and adjust the electric lights as needed.

High Performance HVAC - The building utilizes a ground-source heat pump and demand-controlled ventilation systems.

Process Energy Loads - Careful attention was paid to energy loads in kitchens. During the design process, cafeteria workers were engaged in a rigorous appliance testing and selection process. Energy Star equipment is specified throughout.

Renewable Energy - The school boasts a 385 kW array mounted on the roof and a 58 kW canopy array on the site. The systems include crystalline and thin film photovoltaics. Net metering allows the school to return energy to the grid during summer when the building is only lightly occupied. Overall the PVs are estimated to save approximately $60,000 per year.

Monitoring and Feedback - Meters can parcel the energy consumption in a way that can be easily evaluated. This provides information for students to investigate and analyze and also helps ensure that energy efficiency measures are maintained over time.

Lessons Learned

- In 2007 the District hired a Strategic Energy Advisor to identify and facilitate energy efficiency improvements. In addition to managing energy savings projects, the Strategic Energy Advisor engages students in achieving energy goals. The District's experience with the ongoing process and savings associated with energy efficiency prompted them to support and pursue net zero goals in new construction. The position has been directly responsible for over $2 million in avoided energy cost, money that is now available to employ teachers and lower the burden on taxpayers.
- Net zero energy is more than simply adding solar panels. High performance designs evolve from building to building, leveraging and advancing on lessons learned along the way.
- While Turkey Foot has a goal of net zero energy, the District was well aware that additional solar panels might be required to offset the total energy use. However, high performance energy efficiency measures were maximized in the initial design to save energy and minimize the amount of PVs that needed to be purchased.