nbi new buildings institute

Project Profile

A Zero Net Energy Building

Photo courtesy of William Sheffall, UF Extension Leon County

Overview

Site Details

Building Size: 13,000 SF

Location: Tallahassee, Florida

Construction Type: Retrofit

Construction Year: 1960, 2001, 2012

Building Type: Office

Climate Zone: 2A

Measured Energy Stats

19 - 19 = 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.

LEON COUNTY COOPERATIVE EXTENSION OFFICE BUILDING

The mission of the Leon County Cooperative Extension is to educate the community about research performed at the University of Florida through interactive opportunities and demonstration sites. A recent retrofit of their 13,000 SF office was the perfect opportunity to inform the community about cost-effective energy savings opportunities and net zero energy.

Planning & Design Approach

In 2007, the Leon County Board of County Commissioners formalized their priority on reducing greenhouse gas emissions from county buildings. A combination of in-house expertise and consultants helped them develop the Cooperative Extension office building as their demonstration project. Saving taxpayer's money, stewardship of the environment and improving the quality of life in Leon County were the primary reasons for pursing net zero energy goals. Special attention was paid to minimizing peak demand and associated utility costs. The net zero approach also serves to protect the county from risk associated with increasing energy costs and utility bills.

Energy Efficiency Strategies and Features

High Efficiency HVAC - A closed-loop geothermal well field of 60 vertical wells 90 feet deep is divided into three loops that manifold into a single loop that runs to the building's mechanical rooms. This allows for the repair of a single loop without disabling the entire system. The stable ground temperature serves to moderate water temperature, allowing the system to either dump or recover heat, depending on the

over

Project Team

Owner: Leon County

Architect: Barnett Fronczak Barlowe Architects

Engineer: H2 Engineering

Financing & Cost

Geothermal: $178,000

Solar array: $236,000

Solar ground mounting: $146,000

For more information:

Leon County Extension Office brochures: http://goo.gl/ZadUKY

Energy Dashboard: http://goo.gl/cGFI12

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.

season. Inside the building, this water flows through a "water jacket" around the refrigerant coil to exchange heat, passively conditioning refrigerant and reducing the work required of the air handler. This allows for a downsized compressor and provides for a 40% energy savings.

Renewables - The 60 kW array consists of 253 panels that can each produce up to 240 Watts of electricity. The array is mounted on a steel beam structure and doubles as a canopy for the parking lot. These allow the building to generate approximately 79,000 kWh of AC electricity annually. Through a net metering arrangement with the City of Tallahassee Utilities, this saves the county approximately $6000/year. The success of the building occupants in reducing peak demand has resulted in an additional $4,000 savings.

Lighting retrofit - Lighting fixtures were upgraded from 40-Watt T 12 lamps with magnetic ballasts to 32-Watt T8 lamps. A survey of the tasks in the space revealed that some of the fixtures would adequately serve occupant needs with only three T8 lamps instead of four, thus saving energy. Additionally, private offices were retrofitted to include occupancy sensors.

Efficient Operations - Achieving a ZNE goal required careful attention to building operations. HVAC control setpoints were adjusted to set back to 80 degrees on nights and weekends. Additionally, phasing the start up of HVAC units during morning operations was found to be an effective way to manage peak demand charges.

Domestic Hot Water - Instead of a conventional hot water heater, waste heat from the geothermal system is used to heat hot water used in the kitchen.

Lessons Learned

- Energy efficiency strategies helped reduce the number and cost of solar panels.
- The building's flat, circa 1960's roof was not capable of supporting the 6,120 SF solar array, so the solar array was ground mounted in the parking lot.
- Micro-inverters on each of the 253 solar panels help to prevent a situation where a malfunction on a single panel takes the entire system offline.
- Seventeen months post-retrofit, the building qualified for an electric utility customer status change from "Demand Customer" to "Non-demand Customer." While the photovoltaics allowed the County's electric bill charges to drop to nothing, they still incurred base customer charges. The change to a non-demand customer saves an additional $2400/year on top of the $1600/year saved when the retrofit first reduced their billable peak demand to net peak demand. Thermostat management was the key to success. County Facilities Management technicians worked with staff occupying the building to balance base load for maximum green house gas reduction, with the need to stagger power-up of HVAC units prior to sun-up and PV production.