Net zero electric building is model for federal facilities

Monitoring of energy use to be required

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A 42,000-square-foot commercial facility in Branchburg, N.J., is the first — and so far only — building to achieve net zero electricity usage in the United States. The roof has 1,276 photovoltaic panels that convert the sun's rays into electricity for powering the building.

When it came to building the first — and so far only — net zero electric building in the United States, designers deployed state-of-the-art energy-efficiency systems.

The prefab, two-story building in northern New Jersey, home to a local road construction firm, uses solar panels to generate all of its required electricity and heat its tap water. A highly efficient gas boiler warms water that is then dispersed through nine miles of tubing under the floors to heat the building. The building even has a smart heating and air conditioning unit that can draw cold air from outside the building to cool the inside, without turning on the compressor.

But perhaps the most critical piece of technology is a metering system, built by the project developers, for monitoring and tracking the performance of those systems. The tracking system, complete with easy-to-understand graphics, allows the building owners to document and verify how much energy they are using and saving in real time. It even detected a critical flaw in the air conditioning unit that was causing excess energy use.

"Being able to monitor what you're doing is as important as the design itself and the implementation," said John Grabowski, a team member on the project and vice president of American Energy Partners, an oil and gas exploration firm.

Congress recognizes the importance of monitoring energy use in buildings, and last year passed legislation requiring agencies to install meters in their buildings within four years.

To help agencies meet that goal, and the overarching requirements to reduce energy consumption, a small federal agency called the National Technical Information Service (NTIS) has tapped Grabowski to help it identify solutions such as the one deployed at the New Jersey building.

NTIS, a fee-for-service division of the Commerce Department that houses federal scientific and technical records, will help agencies identify their needs and select the appropriate technical solution. NTIS will host the Web platforms for the monitoring systems on its data center and verify the information that's being tracked.

There are a dozen or more technologies in the marketplace to help agencies monitor their energy consumption, and Grabowski said NTIS will be "vendor agnostic."

Water for sinks, showers and a dishwasher is heated with solar energy captured by solar panels on the building's roof.

A real-time monitoring system, complete with easy-to-navigate computer graphics, allows building owners to track how much energy the building is using and generating.

"What they're looking at is developing a collection of best-in-breed services that can serve the federal government across many different areas and allow the agencies themselves to more or less determine their own solution," he said.

By helping agencies pinpoint the right solutions and hosting the systems on its server, NTIS will help agencies reduce the cost of doing it on their own, said Shannon Burrington, associate director of business development at NTIS.

NTIS has just started talking with about a half-dozen agencies that are interested in monitoring their buildings, Burrington said. Agencies are all over the place in terms of measuring their energy consumption, she said.

"Some of them have put on their advanced meter infrastructure, some of them haven't even looked at those yet. Some people are still just looking at their light bills," she said.

NTIS is going to practice what it preaches. It's a week or two away from installing meters to measure electricity, natural gas and water consumption at its facility in Springfield, Va., where about 120 employees work.

At the net zero building in New Jersey, owners discovered an unexpected benefit of metering their systems and displaying the data on computer monitors in the lobby, Grabowski said. Employees became invested in reducing the energy they consume by using the stairs instead of the elevator, turning off lights when not in use and turning off computers before leaving each day.

The overall result was an 86 percent reduction in carbon emissions, an 80 percent reduction in overall energy use and a perfect score from Energy Star. The $6 million project will be paid off in between five and seven years.

Grabowski said agencies can get to net zero, too, but it all starts with proper monitoring. Metering is key to helping agencies understand what parts of their facilities use the greatest amount of energy and where they can reduce that load to meet federal energy-savings requirements.

"If you went to the doctor and said you didn't feel good, he wouldn't hand you a pill. He would first do some tests on you. You need to do a building EKG in essence," he said. ■