RENEWABLE ENERGY

Solar-heated pool passes the test at Osceola school

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If you're wondering if a solar hot water system can also be an effective teaching tool for students and community residents alike, look no further than Osceola Middle School. Since going online in August, 2008, Osceola's solar installation has done double duty, quietly heating three indoor pools and the building's domestic water while demonstrating to school children how renewable energy can be harnessed and put to productive use.

The school has plenty of water to heat. Near the gymnasium is a cluster of swimming areas—a community spa, a wading area and a competition pool—that serves during the school year as a recreational magnet for the entire community.

But for school leaders, the project was as much about educating Osceola residents, young and old, as it was an investment in lower operating costs.

"This is about being a leader in our community," says Bob Schmidt, who heads the maintenance operations at the middle school. "If we want to walk the talk with young people, we need to be out in front and show the way to the future. There is a lot of teaching potential in having solar panels on the roof."

"We have to prepare our students for a renewable energy future, because that's where the jobs of tomorrow will be found," adds Schmidt.

Perched above the school's front entrance, the solar arrays are impossible to miss. As students enter the building, they are reminded that their school harvests the sun's radiant energy every day. The visual power of the panels is reinforced in science class, where students gain a new appreciation for and understanding of solar energy. A sophisticated monitoring system enables them to track how much heat the system captures and delivers on a sunny day compared to its output on an overcast day. The system archives time and temperature data in 15-minute intervals, allowing future science classes to draw comparisons with real-time data. Indeed, if ever there was a solar energy system that came with its own lesson plan, this is the one.

For the school district, the installation's educational value is equaled by its estimated impact on its bottom line. With the aid of a $46,000 Cash-Back Reward from Focus on Energy, Osceola's $170,000 investment in solar energy should be fully recouped in 18 years. From that point onward, the installation will save taxpayer money as it helps to sustain a valued recreational activity for the 2,700 residents in this northwestern Wisconsin village, especially during the long winters.

It's estimated that each year, Osceola's solar hot water system will offset the consumption of 3,612 therms of natural gas that would otherwise heat the 200,000 gallons of pool water inside the building.

Schmidt and school officials researched projects at other Wisconsin schools before deciding on a proposal by a renewable energy engineering firm, Energy Concepts (ECI) in nearby Hudson. ECI's Craig Tarr, a licensed professional engineer, has worked in building and facility engineering for two decades.

He is now using this background to merge renewable energy into specialized solar and wind applications for large-scale public and commercial buildings.

Of the many features that Tarr custom-designed for this installation, he is most proud of the controls package that allows each of the pools to be solar-heated at different temperatures. The system is configured to allow the solar-heated fluid to transfer heat, in series, to the pool that needs the most

heat. The system features one primary loop to the collectors, as well as four secondary loops—one for each of the four independent loads. The secondary circuits are configured with the solar fluid serving the warmest body of water to the coolest.

Each pool is equipped with its own sensor, pump and solar-to-pool-water heat exchanger that operates independently of the others.

If the temperature difference between the solar fluid and any of the pools is more than 12°F, the solar system will provide heat to that body of water. The pools are allowed to increase several degrees in temperature so that even when the sun goes down, they can "cool down" throughout the evening without triggering supplemental heating from the natural gas-fired boiler. During the fall of 2008, Schmidt reports, the back-up natural gas boiler was used sparingly until mid-November. As the seasons move from fall into winter, the fossil fuel input will increase.

The first pool in the series is the community spa, which is maintained at 104°F. Downstream from the spa, the system heats the wading pool, which is kept at 88°F, and then the competition pool, which is maintained at 86°F. At that point, any residual heat in the fluid is directed into preheating domestic water. On a sunny day, the solar fluid may drop by as much as 40°F as it cycles through the system and each loop extracts heat from it.

Normally, solar hot water collectors are mounted as close to a pool or storage tank as possible to minimize piping runs. However, when ECI's installers climbed up on the single-membrane, precast roof above the pools to size up its supporting capacity, they discovered that the concrete top layer on the roof was not thick enough to anchor the arrays against the lift of wind loading. ECI to adjust its design to locate the arrays over the adjacent steel deck and bar-joist roof above the gymnasium.

For optimal performance and protection from overheating, ECI also incorporated a drainback piping configuration and a variable-speed primary pump. According to Schmidt, the drainback design was selected to accommodate the usage pattern of the pools. Each summer, the pools are drained over a two-week period for cleaning and maintenance. With a drainback design, whenever the pools are fully heated or shut down for maintenance, the primary pump turns off and the solar fluid drains back into a holding tank. The variable-speed pump feature saves electricity by using only as much horsepower as is necessary to circulate the solar fluid.

An investment such as Osceola's usually prompts customers to think of new ways to reduce their use of fossil fuels. With the sun now supplying energy to the middle school, district officials are considering other ambitious renewable energy and energy efficient initiatives. Whatever direction the school district settles on, it can count on Focus on Energy to provide the technical, financial and project facilitation support it needs to successfully reach its goals.

Full-Service Installer & Lead Contractor
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Types of System Installations:
Solar hot water, solar electric and wind electric

Service Territory:
100 miles

Installation Partner:
Steiner Plumbing and Electric
Paul Steiner
River Falls, Wis. 54022
715.425.5544
steinerinc.net

Distributor:
Hot Water Products
Milwaukee, Wis. 53209
888.430.5971
hotwaterproducts.com

At a Glance—Solar Hot Water System
Collector space: 1,280 sq. ft. (32 4'x10' panels)
Tilt angle: 50°
Panel manufacturer: Solar Skies Mfg.
Annual fuel savings: 3,612 therms
Avoided CO2 emissions: 20 tons/year
Preheated water volume: 240 gallons
Incoming water temperature: 55°F
Installation cost: $170,000
Focus on Energy incentive: $46,000
System payback: 18 years

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