RENEWABLE ENERGY

Solar hot water—straight from the garden

CASE STUDY BY MICHAEL VICKERMAN

BIOMASS

SOLAR

WIND

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Ben and Nancy Collins weren't only thinking about energy savings when they installed a solar hot water system at their Platteville residence to serve their family of six. They also wanted to influence their children's attitudes toward renewable energy use.

Says Nancy Collins: "We want our children to grow up thinking that it's normal for families to harvest solar energy."

"It's not space age or futuristic technology," she adds. "I was surprised at the simplicity of the system and the efficiency of the heat exchange. It is a sound investment for energy savings. Gas prices have gone up but our bills have stayed the same."

But there are aspects of the Collins' solar hot water system that are decidedly not normal. For example, due to heavy shading from nearby trees, the solar collectors could not be placed on the rooftop of the Collins' home. Instead, the installer, Todd Timmerman of Timmerman's Talents, Platteville, went searching for the least-shaded section of their yard, which turned out to be their garden.

But such is the Collins' commitment to harvesting solar energy that they decided to move the garden, and situate the collectors in its place, amidst the cilantro, basil and strawberries. On that space now stands a four-foot-tall wooden structure, housing two collector panels facing the sun at a 45 degree angle. Since its completion in September 2007, the ground-mounted system has become a neighborhood fixture, a few feet from where neighborhood children congregate and play in the Collins' yard.

The array installed by Timmerman captures radiant solar energy through a series of vacuum-sealed tubes (also called evacuated tubes). Inside each tube is a copper heat pipe. Sunlight striking each of the 40 tubes heats a liquid inside each heat pipe, which quickly turns into a vapor. The gas travels upwards and releases heat into a larger pipe running along the top of the array. At that point the heat is transferred to a glycol solution that is then pumped into the house to where it heats the water inside.

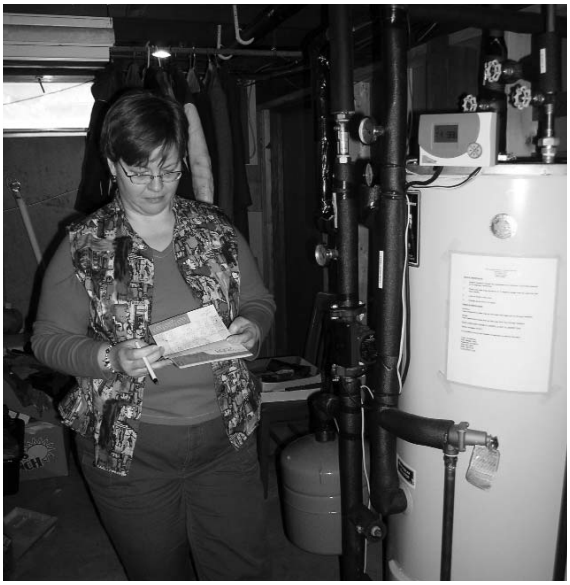

PHOTO COURTESY ED BLUME

Timmerman believes that evacuated tube technology is well-suited for the rigors of a Wisconsin winter. Between the cylindrical shape of the tubes and the space between them, snow rarely accumulates on the collector area, which would diminish output.

"Thanks to the unusually heavy snow this year, I made many trips out there thinking I'd have to brush it off, but was thrilled to find the tubes clean except for a tiny line of frost down the center of each one," Collins adds.

The loop connecting the collectors to the house travels 80 feet to the house, and 20 feet inside it. Notwithstanding this distance, Timmerman estimates a temperature loss of only two degrees by the time the glycol reaches the heat exchanger. The electricity consumed in pumping the fluid into the house and back to the array—seven kilowatt-hours per month–costs less than a dollar, Timmerman says.

En route to an 80-gallon water tank, the loop runs through radiators that can heat the basement family room just by flicking a switch. On a sunny day in January, the system is not only preheating the water used in the Collins' washing machine, but also the basement interior. The space heat that's delivered to the family room comes free of charge.

PHOTO COURTESY ED BLUME

"We keep our thermostat at 65 degrees," Nancy says. "It was interesting to find our five cats spending more and more time in the basement family room. It's pretty unusual that the basement is the warmest room in the house!"

Since last September, Nancy Collins has been keeping a daily record of the solar system's performance. Even on a frigid February day with full sunshine, the glycol solution would climb to 121 degrees by one o'clock. That dosage of sunshine was sufficient to preheat the water from 50 degrees up to 102 degrees.

"On February 27, I was stunned to the see the panel temperature reach 141 degrees!"

Based on calculations derived from Solar Rating and Certification Corporation (SRCC), which rates the energy performance of solar collectors and entire solar hot water systems, the Collins' system is estimated to offset 125 therms of natural gas per year. However, Timmerman believes actual evacuated tube performance might exceed that estimate because access to the sun is greater than what SRCC estimates for system energy output.

The Collins' decision to invest in a solar hot water system appears to be well-timed. Retail natural gas prices since October have increased by 20 percent and are now at to $1.20/therm. They should continue climbing throughout 2008, fueled by larger-than-anticipated inventory declines along with a weaker dollar.

"Our bills are pretty much the same as last year so that must mean we're saving 20 percent!" Collins says.
The installation was part of a solar hot water workshop organized by the Midwest Renewable Energy Association (MREA) and led by Timmerman. At these workshops, which usually run three to four days, the instructor leads the participants through an actual installation on the premises—mounting the collectors, plumbing and insulating copper pipe, and installing all the other components in a functioning system.

Formerly a machinist, Timmerman brings to a workshop more than 50 solar hot water installations' worth of experience. His most recent installation serves a new Habitat for Humanity house in Lancaster. Timmerman is slated to lead two MREA solar hot water workshops this year, one in Benton and the other in Willard. For more information about MREA's installer workshops, visit www.the-mrea.org.

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Types of system installations:
Solar hot water, solar electric, and wind electric

Service Territory:
Statewide

At a Glance – Solar Hot Water System
Ben and Nancy Collins
Panel: Solar Patriot 20
Manufacturer: BTF Solar Ltd.
Array length (two panels): 13 feet
Orientation: 180° (due south)
Tilt Angle: 45°
Annual fuel savings: 125 therms
Hot water load: 60 gallons
Date of installation: September 2007
SRCC Rating: OG-300