

Bucking The Trend

A Plainfield Solar Hot Water System That Eschews Anti-Freeze

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One winter down, and Bob Atchinson, a Washington Electric Co-op member, likes his “drain back” solar domestic hot water system just fine. What’s not to like? He’s had to do only minor tinkering since he and his accomplice, Jarrod Moninger Galvin, mounted the solar collectors on his Plainfield rooftop last fall and connected them, through insulated pipes, to the tanks and equipment in the basement. The results weren’t long in coming: the system relegated his original hot water – heated by the home’s basement boiler – to a backup function in the winter and nearly an afterthought once warm weather came. Bob figures the components (two solar panels; a 160-gallon tank filled with 55 feet of coiled copper tubing, like intestines; a small, adjacent drain-back tank and monitoring system that controls the circulation to and from the rooftop collectors; plus assorted gauges, pipes and other parts) totaled around \$5,000 – not bad for a system that significantly reduces Bob and Carolyn’s fuel bill.



Bob Atchinson, with the tanks and apparatus that control his solar hot water system in Plainfield.

As an inveterate tinkerer – which is a characteristic fully on display in Bob’s basement, a veritable jungle of “parts” seemingly of every device known to man – he clearly enjoys the technical aspects of the system. In fact, he pretty much designed it, after doing considerable reading and with coaching from his “mentor,” Ed Butler of Sunrise Solar Services, Inc., in Randolph.

And here’s the kicker: One of his favorite aspects of the drain-back system is that it uses water for a heating medium, rather than propylene glycol (also known as anti-freeze). Some people might think you’d have to be nuts to install a water-based system in Vermont. Wouldn’t the water freeze, expand, and crack the pipes and panels, when exposed to the cold weather and wind up on a roof? Aren’t they better designed for Florida?

Well, here’s why it works in Vermont. When there is not enough heat in the collectors to warm the water, it simply drains back down into the safety of the house.

Drain-back systems are “closed” systems that don’t allow air inside the pipes (consequently, there’s no rust). Winter or summer, the solar-heated water descends through Bob’s house from the rooftop collectors to the big tank in the basement; it enters a little below its midsection, then loops down and around through the coiled tubing, heating water within the tank (which comes from the family’s well).

And that – not the water in the closed system, which continually re-circulates – is the family’s hot water.

A wire connected to the solar array tells the thermostat on the small drain-back tank how warm the collectors are; the thermostat also reads the temperature of the available, cooled water within the closed system, and when there’s at least an 8-degree differential it kicks into gear, pumping the cooled water back from the tank to the rooftop to be warmed.

When there is no solar advantage – at night, or on cold, overcast winter days – the system is idle, so there’s no danger of freezing the water.

However, Bob has been surprised to learn how much solar advantage he can glean in the winter. The two solar panels are erected at a 60-degree angle on a roof with direct southern exposure. In the summer, Bob explains, the sun strikes the collectors “a glancing blow,” which is plenty enough heat. In winter, due to changes in the earth’s rotation, it’s a direct hit.

“In the dead of winter it can easily get up to 75 degrees up there,” he says. “And the panels function with snow on them. They pull heat through the translucence of the snow pack.”

‘Doing better’ without petroleum

There are myriad reasons why Bob, a 59-year-old employee of the Vermont Agency of Transportation, bucked the New England trend and went with a drain-back, water-based solar hot water system. He recounts them, standing beside the equipment in his basement.

“For one thing, I do it for the reason anybody else would – for the earth,” he says.

“Also a drain-back system is easier to understand, and you don’t have to bleed the system when you’re making repairs. With a glycol system, you do. And guess where you have to bleed it?” His eyes glance upward, as if through the floors above him to the solar equipment on the roof. “At the highest point. I’ve had my days working as a chimney sweep. Everything can be done to service this system right down here.”

But Bob sees still more advantages to a water-based system.

“Water has the best heat-transfer properties of any liquid,” he says. “And water is cheaper [than glycol]. Water is not a petroleum product. I think we know where our soldiers are, and I think we can do better.”

In fact, Bob Atchinson is already scheming how he can do better. He’s not one to be satisfied if there’s a kilowatt-hour of electricity yet to be saved, or a BTU left un-generated by his hot water system. He and Carolyn live in a modular home constructed two years ago by Huntington Homes of East Montpelier, with modifications Bob requested that qualified the structure for a 5 Star-Plus rating in the Vermont Energy Star Homes program.

That rating provided them an incentive award return on part of their construction costs, saves on their operating costs every day, and attests to a very high level efficiency and conservation. They consume a mere 5 to 6 kWh per day, compared to the average WEC residential use of around 18 kWh a day. (Although Bob remarks, “I’d like to see it lower.”)

So as the first anniversary of his domestic hot water system approaches – on November 5, which, Bob notes, is Guy Fakes Day, the anniversary of Britain’s failed but famous 1605 “Gunpowder Plot” – he’s thinking of adding a third solar collector when spring comes. His goal would be to virtually eliminate any use of the boiler system for hot water, at least in the summertime.

Plus, the mind wheels are turning in Bob’s head. The floors in the basement and first story of the two-story house employ radiant heating systems. Wouldn’t it be nice to connect those to the solar heated water?

“The cost of fuel and electricity do nothing but go up,” says Bob. “If this is a way to ward off that cost in the future, I’m all for it.”

