Ohio home's geothermal system reduced electric use by 90%

Dave Waltermire, who lives in rural Wapakoneta, Ohio, knows what he wants when it comes to all of the electrical functions in his home, including his heating and cooling system. His electrical expertise is well founded: Waltermire has worked for 20 years as an energy adviser, providing professional recommendations regarding various home and building systems to co-op member/owners of St. Marys, Ohio-based Midwest Electric Inc. A subsidiary of Buckeye Power, Midwest Electric serves 12,000-some members in a seven county area comprised of lush, green hills and fertile fields.

But Wapakoneta, birthplace of first moonwalker Neil Armstrong, does not supply Waltermire's drinking water. "We're in a rural setting, where we don't have city water available to us," said Waltermire. "So everybody in our area has well systems and pulls groundwater for domestic-water purposes."

Dave Waltermire at his home in Wapakoneta, Ohio.

A DIY guy

Waltermire's water well is also now supplying the flow for an open loop geothermal split-system with electric submeter for energy monitoring. He installed the system himself in 2006.

"In my previous life — going back to the early 1980s — I installed and serviced a lot of geothermal heating and cooling systems," said Waltermire. "Later, I did large industrial heating and air conditioning mechanical work on a mix of different systems, so I probably have a little more background than a lot of folks."

So it's no surprise that Waltermire is confident about retrofitting his home's heating and cooling system, a task he's now accomplished twice.

"This house was built in the '60s, and we bought it in '92," Waltermire said. "When we moved in, it had a liquid-propane furnace that was way oversized for the house, which is 1,800 square feet, plus a finished basement of maybe 1,200 square feet that is now ducted, but we keep the ducts closed unless we're using the basement while entertaining guests. When we bought the house, there was no ductwork at all because there was a hot water radiant heating system.

"We decided to put in all of the registers, ductwork, a new furnace and a very good air-source heat pump for the air conditioning," said Waltermire. "Just doing that reduced my propane use enormously, because we went from about a 50 or 60 percent efficient boiler, which was oversized by about 300 percent, to a correctly sized furnace. I did all of that work back in 1994."

Dave Waltermire prepares to connect to the ClimateMaster's refrigerant ports for routine check of system performance.

Software reveals solution

"A couple of years ago, I used ClimateMaster's GeoDesigner software to run some projected numbers on how we might benefit from geothermal in our house. I use the software on a daily basis in the work I do. The results were eye-opening. It was clear that we could begin to save a lot of money if we'd install a 'geo' system, especially considering that energy rates were quickly outpacing our income."

Waltermire decided to buy a high-efficiency geothermal split system from ClimateMaster. In October of '06, just before an unusually harsh winter season, he installed a four-ton cooling coil matched with a three and a half ton heat pump condensing unit.

"Through the years, performance has been flawless," said Waltermire. "It got very cold that first winter, and then again last winter, but the geo system kept us very comfortable."

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Inside the Waltermire home.

Among the factors Waltermire looks for in recommending heating and cooling systems to Midwest Electric's member/contractor base, as well as for evaluating his own system, is efficiency. And Waltermire calculates efficiency on a no-nonsense basis of sound cost/benefit analysis.

"I work with commercial customers, and I also work with residential members, advising them on energy efficient heating and cooling systems," Waltermire said. "Even standard model geothermal systems are many times more efficient than traditional HVAC systems."

Unexpected energy savings

To be sure, he installed a submeter to separately monitor electric draw for the geothermal system and domestic water heating. Validating the investment he made in his own home, Waltermire offers some very impressive numbers.

"Over the six-month period right after I set the electric meter at zero and started up the geothermal equipment, the system used 3,265 kilowatt-hours," said Waltermire. "At that time, Midwest Electric had a standard rate of 7½ cents per kwh. It cost me $245 to heat my house and to provide domestic water for those six months, through the entire heating season. On average, we now spend $350 a year for all electricity use within the home."

Waltermire relates that about two years ago he met a member who has a house that's comparably sized and was built about the same time as his. "He shared with me that his natural gas hot water/boiler system, which is exactly what my house had originally, required a $256 a month budget. Basically, he pays $11 more for only one month on a 12-month basis than I just paid for the entire six-month heating season. If I stretch it out over a year, comparing my system to his, I'm seeing a return of greater than 90 percent."

Open loop or closed loop?

Another interesting point of discussion revolves around the reasons Waltermire selected an open loop water well "pump-and-dump" system over a more traditional closed loop arrangement.

"It's important to understand that it's the same theory, whether you have a closed loop or an open loop; just different mechanics," Waltermire said. "The theory is based on the fact that at a certain depth, maybe around five feet in my area, the earth's temperature stabilizes year-round at about 54 to 55 degrees."

Any water at that depth or below will be in the same temperature range. That's where the ground-to-water heat exchange process takes place. Water circulated within the system taps the earth's abundant thermal energy, is warmed in the winter and cooled in the summer. Yet, while outdoor air temperatures swing wildly, underground temperatures, the source of geothermal energy, remain stable.

In a closed loop geothermal system, water or special antifreeze solution is sealed in to circulate within the geo-exchange loops. The solution is pumped from the loops to a condensing unit, where thermal energy is efficiently exchanged with compressed, non-ozone-depleting refrigerant. That energy is then used to heat or cool the home, with the added benefit of availed heat for domestic water use.

"But with an open loop system like ours, we pull water from a well at water-table depth, bring it up to exchange the thermal energy and then pump it back into another well, placing the clean, unchanged water back into the water table. My system's desuperheater takes the thermal energy from the home and puts it directly into my water heater during the summer months," said Waltermire. "The result is that I basically have 'free' hot water from May through September or October."

"Whenever I'm dealing with our Midwest Electric members, probably 95 percent of the time my suggested method on loop installation is a closed loop ground system or a closed loop pond system," he said. "The reason I went with an open loop system is because my home is located directly over a huge underground aquifer called the Teays River, which dates back to before the last Ice Age. It saved us a lot on the cost of deeper drilling or ground excavation, which we would have had to do had the river not been there."

Although Waltermire himself feels very strongly about the benefits of geothermal heating and cooling systems, he admits that taking the geothermal route on a home retrofit isn't necessarily for everyone. The only time geothermal is not practical on a retrofit basis is when the house can't be remodeled in a cost effective way to allow the system to be put in. But he has no qualms about recommending geothermal when the situation is right.

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"By encouraging the installation of geothermal systems, we achieve a couple of very important things," Waltermire said. "We save a lot of energy, and that's important to our nation. We reduce our foreign energy dependency. And we also do something that's good for the environment, which is beneficial for generations to come. It's hard to imagine a greater 'win/win.'" ●