

Down to earth

More homeowners are tapping into clean, renewable geothermal energy



Architect Julian R. Dawson's home, in Chicago's Bronzeville neighborhood, includes large south-facing windows with insulated shutters that can be opened to admit passive solar energy. (Photo for the Tribune by Anthony Robert La Penna / January 30, 2008)

By Judith Nemes | Special to the Tribune
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Steve and Jackie Smith were early adopters of geothermal energy in the 6,000-square-foot home they built in Prairie Grove in 2002. Their three geothermal units provide almost all the heating and cooling, as well as hot water, they need in their McHenry County house.

"Since we were building a bigger house, we thought a geothermal energy system would reduce our impact on the environment," said Steve Smith.

It also slashed the couple's monthly energy expenses. Smith estimated they spend about \$200 per month of their electricity bill on running the compressors and pumps of the geothermal system, compared to possibly \$100 more per month if they had gone the traditional natural-gas route.

When the system doesn't generate enough heat on the coldest days, electric coils built into the units kick in to provide the boost they need, said Smith.

Using geothermal energy to heat and cool your house is about 500 percent more efficient than natural gas and can save homeowners 20 percent to 70 percent on their monthly energy bills, said Sachin Anand, a mechanical engineer and principal at dbHMS, a Chicago firm that designs heating and cooling systems. That offsets its installation costs, which are higher than a traditional heating and cooling system.

"With oil [flirting with] \$100 a barrel and natural gas prices rising, there's a lot of concern about energy consumption for homeowners," said Keith Dinehart, vice president of marketing and sales at Goldberg General Contracting, a local residential and commercial builder using these systems in a handful of projects. "Application of this technology isn't out of reach anymore for the average homeowner. It costs far less than the Euro kitchen you're planning to throw in."

Besides, it's a renewable resource.

Getting thermal energy out of the ground requires a small amount of electricity to raise or lower the temperature and pump it through the home via ductwork or radiant floors, a network of pipes just below the flooring. A geothermal heat pump replaces a furnace, taking up the same amount of space.

Some Chicago architects and engineers report inquiries about geothermal systems have increased. "Last year was the tipping point in how people talked about energy efficiency," says Doug Farr, an architect and president of Farr Associates, who recently wrote a book, "Sustainable Urbanism: Urban Design with Nature," published by John Wiley & Sons. "Three years ago, it was rare that anyone would raise the issue of geothermal energy. Now we get clients who say they want a green home and geothermal increasingly comes up as one of the technologies they ask about."

Since 2005, 14 Chicago homes have received fast-track permits from the City of Chicago's Green Permit Program that have included a geothermal system, said Richard Rodriguez, commissioner of the Department of Buildings.

The cost of these systems can present a drawback for some homeowners. Depending on the size of your home and the number of holes that must be drilled into the ground, a geothermal system can run about \$17,000, said Anand, with the payback taking up to 10 years.

Currently, only about 10 companies in the Chicago area install the systems, said Anand. He foresees a significant decline in prices and increase in providers here in the next five years.

Michael Yannell, a self-described environmentalist, said he was tired of spending \$500 a month to heat his 3,600-square-foot home in Lakeview with natural gas. Yannell, a

clinical pharmacist at Rush University Medical Center, last year decided to rid himself of the "energy-hog home."

So the 43-year-old is building a 2,700-square-foot house in Ravenswood that will incorporate many forms of renewable energy, including geothermal.

Jonathan Boyer, a principal at Farr Associates and the architect in charge of the project, says it's expected to be one of the first homes in Chicago that produces more energy than it consumes -- a "net-zero energy" home.

The well-insulated home will have solar panels on the roof and huge windows facing south for passive solar energy. In the yard, drillers have dug nine wells, each about 250 feet deep that will connect to heat pumps in the house to supply radiant heat and cool air, said Boyer. Other features include a green roof and specially designed walls that store energy in a thermal space that's emitted at night.

The house is pricey at about \$500 to \$600 per square foot, or at least \$1.3 million, Yannell said. That compares with a typical home with conventional heating and cooling systems that costs about \$160 to \$175 per square foot. The higher price tag also includes photovoltaic solar panels, a gray water system, and other sustainable features. (So the cost of Yannell's home is approximately 2.5 to 3 times the cost of a traditional single-family home.)

However, Anand says Yannell should start recouping his renewable energy investments in about seven years -- sooner than most homes with geothermal -- since he'll be generating his own electricity to run the system. The home won't even have a hook-up for natural gas, he said.

On some colder, darker days, the home will draw some electricity from an outside source (such as Commonwealth Edison). However, on other sunnier, warmer days, the design team anticipates the home's photovoltaic panels will generate more electricity than the home needs and will send some of that energy back onto the "grid" for ComEd use for other customers.

They expect the home ultimately will send more electricity back to the provider than it will use in a year's time (hence the description "net-zero energy" home).

"I wanted to make changes in my life where I could have a big impact on reducing consumption of fossil fuels," Yannell said. "The natural heat of the earth is unlimited, and it's clean."

Here, here, says Julian Dawson, an architect and structural engineer keen on reducing his carbon footprint.

He moved into a 2,000-square-foot home in Bronzeville last December that he designed to run largely on renewable energy, including geothermal.

The house cost about \$300 per square foot, or about \$600,000, Dawson said. He estimated the same home using conventional heating and cooling would cost about \$245 per square foot. In his calculation, he excluded the geothermal system, as well as the photovoltaic solar panels, higher-grade insulation, solar water heating system and insulated shutters.

The geothermal system, which he plans to use as a backup heating-and-cooling source, cost only \$9,000. Without passive solar energy, Dawson estimated he'd have to spend closer to \$18,000 on his geothermal system, but the home would have cost significantly less.

Geothermal is not just for new construction, as existing ductwork can be retrofitted to a geothermal system, said Anand. The challenges generally lie in where to drill the holes for the ground loops in small Chicago lots.

Geothermal systems also are beginning to crop up in multifamily dwellings around Chicago. An upscale, 22-unit condo slated to break ground in late spring is Deming on the Green, which touts geothermal radiant heat as one of its eco-friendly attractions, according to Scott Borstein, an attorney representing Silverleaf Development Corp. The apartments, steps away from Lincoln Park, range in price from \$500,000 to \$3.3 million. Assessments will range from \$125 to \$800 per month, he said.

Kevoork Derderian and his wife Rolanda purchased a penthouse unit in the building after scouring the city for a condo with renewable energy features.

"We were looking for value over the long-term," said Derderian, a real estate developer and an originating board member of the U.S. Green Building Council. "We bought in a high-end designed building, but we know that geothermal will help keep our assessments low, as well as [lower] energy costs for our own unit."

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