

# PUTTING WATER TO GOOD USE



This Madbury home, owned by Ken and Brenda Bouchard, uses its well water to generate geothermal heating and cooling. The system is deemed more energy efficient, but dependent on a productive well.

COURTESY PHOTO

## Geothermal systems save energy, costs

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**M**ADBURY — With the concern over high energy prices and the environment, my wife, Brenda, and I were interested in building an energy efficient home. We bought a piece of land and decided to build a house that would use a geothermal heating/cooling system.

What does geothermal mean? "Geo" refers to the ground and "thermal" refers to heat. It refers to heating and cooling through the use of ground water taken from a well.

Most people find the concept difficult to understand, especially because they think of water in the ground being cold, or at least cool. Indeed it is. Typically, in New England, our groundwater a few hundred feet below the ground is about 50-55 degrees virtually year-round, and one would think that those temperatures are not really suitable to heating.

However, there is actually quite a bit of heat in water of that temperature. You just have to find a way to extract it.

While water will boil and turn into steam at 212 degrees, there are other fluids such as Freon, which will boil at 20 degrees below zero. A geothermal heating system exposes such a Freon-type fluid, trapped inside copper piping, to 50-degree ground water. To the Freon, this is downright hot.

The Freon immediately boils and turns into a gas, much like boiling water turns into steam. The Freon is then compressed by an electric compressor.

It turns out that when any gas is compressed, it gets hotter (this is noticeable if you fill your car tire). Indeed, the Freon will go from a really cold liquid with a temperature of minus 20 degrees, to a gas with a temperature of 120 degrees or more after it is compressed.

This compressed hot gas runs through sealed pipes, which are exposed to the air in the home in a heating duct warming the

air. The air is then circulated in the heat ducts throughout the home exactly like any other heating system.

The Freon returns to a liquid state after the heat is taken out of it, and it is exposed once again to the groundwater, and the cycle continues.

Of course, this is not free energy. The compressor is, after all, using electricity.

However, the surprising part is that for every kilowatt of electricity used, the equivalent of about 4 kilowatts of heat is produced. In other words, for every dollar put in, \$4 comes out. Not a bad deal and better than Vegas!

In addition, the compressor itself will get hot, but this is a bonus because the heat from the compressor is used to heat the domestic hot water, so that heat is not wasted. The duct system is virtually the same as in any house; it is only the way of heating the air that is different.

What about air conditioning? Simple. You run the system in reverse, as if it were a window air conditioner.

The Freon, trapped in pipes, is exposed

See HEATING, Page D3

# HEATING: Geothermal systems an alternative

Continued from page D1

to the hot house air and boils like crazy. That means that the house air is giving up its heat and becoming cooler.

Downstream, the compressor makes the Freon hotter, but instead of wasting the heat by dumping it outside like a window air conditioner, it is again used for hot water heating, which is typically one-third of the home's energy demand. The air ducts used for heating are used for air conditioning as well.

The temperature of the well water will fall, but not more than a few degrees or so. In any event, the water will be put back into the well and warmer water will be brought up.

What are the advantages of a geothermal heating/cooling system? First, there is nothing burning. This avoids the dangers of heating with heating oil or gas.

There is no flame and no odors. In fact, you do not need a chimney at all, which saves considerable expense.

There is no truck delivering oil or propane. The hot water in the summer is almost free, and in the winter it is supplemented by the compressor heat.

The heating and air conditioning uses the same ducts, and the system can keep your entire living areas to within one degree of temperature set by the thermostat.

What are the limitations of a geothermal system? You have to put in a well, and the well has to produce a good amount of water. Thus, if you are on city water, the well

is a significant extra expense.

If you are building a new home in the country and need a well for domestic water anyway, or if you are on city water and want to drill a well, the extra expense of the geothermal is minimal.

Most areas in New Hampshire can get good water flow from a well, but there are no assurances. Thus, you should drill the well before committing to a geothermal system to make sure you will have enough ground water. The bigger the house, the more water needed.

What are the costs? If you are putting a well in anyway, the cost of the heating/cooling system would be perhaps 10-20 percent higher. However, PSNH provides a 30-percent discount for electrical use in all geothermal systems (it is metered separately).

In addition, there are subsidies depending on the size of the home, and these can amount to thousands of dollars. My son-in-law and daughter are building a house, and he carefully examined the installation cost of geothermal, propane and heating oil systems. His conclusion was that if the well was no deeper than 300 feet, the geothermal was worth doing.

However, to get the subsidy and the lower rates, you will have to prove that your house is insulated extremely well. We used foam and it was not a problem. Having good insulation saves money in the long run. In the end I suspect there is not much difference in cost. In fact, PSNH has tracked geothermal homes and they

feel they are no more costly than other systems.

In addition, the installer, John Sherill, claims that it is cheaper than heating oil in his house.

What about the cost of electricity over time? Keep in mind that the prices utilities pay for their fuel is lower than what we pay because of volume discounts.

Because of the Public Utilities Commission, which has to approve electricity rates, the cost of electrical power goes up more slowly than the cost of heating oil or gas to a homeowner, which is not regulated and can fluctuate wildly in any given year, as has become painfully clear this winter.

What about the environment and your carbon footprint? It can reasonably be assumed that the power plant generating the electricity has better control over emissions than a homeowner would for any other fuel, so a geothermal system is somewhat environmentally friendly.

In addition, you are taking all of your heat out of the land through the groundwater (remember one dollar put in produces four dollars out). The heat in groundwater is a renewable and inexhaustible energy source. It is cheaper and better to do that than to burn conventional fuels.

Finally, it makes you feel good to use a renewable source for heat, hot water and air conditioning.

Lastly, if you want to put in a geothermal system, I highly recommend that you use a builder and a heating company who have experience in this area.

## SHOER: Is business ready for Web networking?

Continued from page D1

strongest hold in the business community. It describes its site, [www.linkedin.com](http://www.linkedin.com), as "an online network of more than 19 million experienced professionals from around the world, representing 150 industries."

They suggest that the benefit of being a member of this site will help you connect with others in your profession, find new clients, partners, job candidates (or find a job if you are the one in the job market), and get introduced to other business people through the ones you are connected with on their site.

Is that what actually happens on these sites? That's up for debate.

I have been a member of LinkedIn for a few years, and while I have been in touch with various people through the site, I can't say for certain that I would not have been in touch with them anyway. By the same token, I did learn about a few companies that were looking to hire people to fill certain jobs.

I can't say that I would have known that particular information through another source, so if I had known a good candidate to potentially fill those openings, this

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would have facilitated and introduction.

FaceBook, [www.facebook.com](http://www.facebook.com), is another of the major social networking sites that is making a strong play to the business community. Unlike LinkedIn, FaceBook has been most popular with individuals who want to post information about themselves and invite others to both view and interact with them via the site. It even has its own version of instant messaging, via "the wall."

When you visit the FaceBook web site, the main page says you can use FaceBook to keep

up with friends and family, share photos, plan parties and more. It clearly has more of a personal appeal than a business appeal.

That being said, you'll notice throughout the site, subtle business references where they are clearly trying to blend the personal aspects of social networking with business opportunities. Will it work? It's probably too soon to tell, but is something to keep an eye on.

As technology continues to mature and new environments, like social networking, emerge, it's always smart business to stay abreast of the developments and whether or not they have value for your business. In the case of social networking, I think it's too early to tell.

Will we ultimately use Web sites like this to seek out and qualify prospects and partners for our businesses? Perhaps not in 2008, but it's not out of the realm of possibility.

Thanks for reading.

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