

Taking Heat from the Earth

By Gene Austin of *The Philadelphia Inquirer*, Sunday, February 27, 1994

Homeowners who dig a few feet may come up with an energy gold mine. Geothermal heat-pump systems not only keep houses warm in winter and cool in summer, they save cash. No wonder they are being called the wave of the future.

Converting a onetime barn into a model of energy efficiency might appear to be an uphill battle, but Robert Mayfield of Devon thinks he has won it. Mayfield, who, with his wife, Ellie, bought a remodeled barn near Church Road last summer, equipped it last fall with a geothermal heat-pump system, a type of heater and cooler that is being hailed by some as the wave of the future. □

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To heat the Mayfield's house, the geothermal system pumps warmth from the earth through copper tubes threaded into dozens of 60-foot holes that have been drilled in the lawn. Each hole is two inches in diameter. "They had horrendous energy costs in this house," said Robert Mayfield, a health-insurance executive. "And the old heating system looked like Frankenstein's lab down there in the basement." The new geothermal equipment in the Mayfield basement is relatively compact, and Mayfield expects to cut the Home's heating and cooling costs sharply. "It's been under quite a test, and did well even in the great cold weather," Mayfield said. "I feel like a bit of a pioneer." □

Geothermal systems that tap heat directly from the earth (called earth-source) or from underground water (water-source) is an old technology "whose time has arrived," according to Frank S. Mayberry, manager of residential marketing for the geothermal heat-pump program of Pennsylvania Power & Light Co., of Allentown. "It's a natural, renewable source of heat, so the environmental impact is less than other heating and cooling systems," Mayberry said. □

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Geothermal heating is possible because earth and water more than a few feet below the surface maintain a constant, year-round temperature of about 50 degrees. Underground pipes, carrying refrigerant fluid or a water-antifreeze mixture, absorb the heat and carry it to an indoor compressor and heat exchanger, which increase the heat and convert it to warm air for circulation throughout the building. In summer, a geothermal system is reversed and heat is pulled out of the building and moved to the ground, cooling the air in the building. Geothermal heating has great potential because of the heightened concern for the environment and the desire to find effective alternatives to fossil fuels such as oil and gas, many experts say. The Environmental Protection Agency, for example, estimates that "annual sales of

[geothermal heat pumps] can increase tenfold, from the current level of 50,000 units per year, by the year 2000."

"We're starting to see them catch on because they are probably the cheapest way to heat homes," said Harry Roth, executive director of the New Jersey Heat Pump Council, a trade group in Mount Laurel.

Conventional heat pumps, called air-source because they extract heat from the air, have a sizable outside unit that is sometimes noisy. Air-source pumps lose effectiveness in cold weather, since cold air contains little or no heat for pumps to extract.

"The geothermal heat pump has become a really viable source for very efficient, environmentally sound heating and cooling," said Jack DiEnna, energy manager of Heatac Energy Group, a division of Adwin Equipment Co., of Lester. Heatac has supervised the installation of hundreds of earth-source geothermal heat pumps in the Philadelphia area since 1986, said DiEnna.

Peco also is monitoring six area homes with geothermal systems with an eye to seeing how residential geothermal fits into Peco's future, according to Andy Bakey, senior engineer for Peco. Michael Wood, a Peco spokesman, said the utility also is trying to foster geothermal use by offering a \$1,000 incentive to home builders for each geothermal unit installed in a new home.

Pennsylvania Power & Light Co., which services much of northeastern and central Pennsylvania, gives \$1,000 rebates against installation costs to homeowners who install qualified geothermal systems. PP&L also conducts contractor-training programs with the goal of making geothermal installations cheaper and more efficient. PP&L has been formally pushing geothermal installations for about two years and, Mayberry said, has seen installations "doubling every year" in its area.

Mayberry expects 800 to 1,000 installations this year and says some housing developers "have indicated they want to make this the standard type of heat in their homes. The big challenge is to create an infrastructure that results in competitive pricing of the product, and that's where our effort is. We're also trying to develop an awareness of this technology" among consumers. Mayberry said many other utilities throughout the nation have been beating the drums for geothermal heating and cooling. □

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Owners of geothermal systems get a bonus beyond heating and cooling- the systems also produce hot water for household uses such as baths and showers.

Mayfield said his barn house, prior to installation of the earth-source geothermal system, was using electric-resistance heat, one of the most expensive heating methods. Electric-resistance heat uses hot wires as the heat source, and, according to Mayfield, the home's electric bills were running at \$800 per month. Mayfield is enthusiastic about the geothermal system. "The guarantees I've been given are such that I think our [electricity] costs will now settle in the \$200-\$300 [per month] range," Mayfield said. "I don't pay for the system until I'm sure I'm getting the savings." He said the four-bedroom barn-house has about 4,500 square feet of living space.

The guarantees came from Advanced Geothermal Technologies of Shillington, Berks County, manufacturer of Great Aire earth-source heat pumps of the type installed in the Mayfield house.

William J. Rolli, owner of American Geothermal, of Bridgeport, Montgomery County, installer of the Mayfield system, said the four-bedroom barn-house also was given a high-tech energy audit to help put it in peak energy-efficiency condition. He said repairs were made to some of the house's insulation, air leaks were plugged, and undersized ductwork repaired.

Mayfield selected earth-source geothermal pumps after considering a variety of options, including oil, propane and conventional heat pumps.

Rolli said he installs all type of heaters, including conventional air-source heat pumps, but considers earth-source geothermal "by far the best of all sources." He concedes that installing an earth-source geothermal system is expensive, but says the investment pays off. "The average heating system lasts 12 years; earth-source geothermal will put you into the 25th year, and then you probably will need only replace the compressor," he said. Rolli estimated it would cost about \$11,000 to replace a warm-air heater with earth-source geothermal in a 2,000-square-foot house. "Installing [geothermal] is typically about double the cost of an air-source heat pump or a high-efficiency gas or oil furnace," Rolli said.