



Geothermal

"Geothermal" comes from the Greek words geo (earth) and therme (heat) and geothermal means earth heat.¹ Geothermal heat pumps are one of the most efficient ways to heat and cool a home and provide hot water. More and more homeowners are discovering the benefits of these systems, which tap the relatively constant temperature of the Earth a few feet underground, for both new homes and retrofits in existing houses.²

What is geexchange technology? Geexchange technology uses the earth's renewable energy, just below the surface, to heat or cool a home or other building, and to help provide hot water.³

How does it work? A few feet beneath the surface, the earth's temperature remains fairly constant year round, ranging from 45° or so in northern latitudes to about 70°F in the deep south. Geexchange takes advantage of this constant temperature to provide extremely efficient heating and cooling. In winter, a water solution circulating through pipes buried in the ground absorbs heat from the earth and carries it into the home. The geexchange system inside the home uses a heat pump to concentrate the earth's thermal energy and then to transfer it to air circulated through standard ductwork to fill the interior space with warmth. In the summer, the process is reversed: heat is extracted from the air in the house and transferred through the heat pump to the ground loop piping. The water solution in the ground loop then carries the excess heat back to the earth. The only external energy needed for geexchange is the small amount of electricity needed to operate the ground loop pump and fan.

What are the major benefits to the homeowner? Homeowners enjoy lower utility bills (25% to 50% lower than with conventional systems), lower maintenance, and higher levels of comfort, year-round. Even more than that, though, they have the peace of mind of knowing they're being environmentally responsible. Since a geexchange system burns no fossil fuel to produce heat, it generates far fewer greenhouse gas emissions than a conventional furnace, and completely eliminates a potential source of poisonous carbon monoxide within the home. Even factoring in its share of the emissions from the power plant that produces electricity to operate the geexchange system, total emissions are far lower than for conventional systems.

¹ Definition comes from the Geothermal Education Office website. Retrieved on February 11th, 2005, from: <http://geothermal.marin.org/pwrheat.html#Q1>.

² Text comes from the U.S. Department of Energy's Energy Efficiency and Renewable Energy website. Retrieved on February 11th, 2005, from: http://www.eere.energy.gov/consumerinfo/factsheets/ghp_homeowners.html.

³ All questions and answers listed come from The Geothermal Heat Pump Consortium's Commonly Asked Questions link. Retrieved on February 7th, 2005, from: <http://www.geoexchange.org/about/questions.htm>.

Can you be more specific about the environmental advantages?

According to data supplied by the U.S. Department of Energy and EPA, a typical 3-ton residential geexchange system produces an average of about one pound less CO₂ per hour of use than a conventional system. To put that in perspective, if just 100,000 homes converted to geexchange, the country could reduce its CO₂ emissions by 880,000,000 lb. That would be the equivalent of converting about 58,700 cars to zero-emission vehicles, or planting more than 120,000 acres of trees. And the waste heat removed from the home's interior during the cooling season can be used to provide virtually free hot water—resulting in a total savings in hot water costs of about 30% annually, and lowering emissions even further.

Is geexchange used primarily in homes? While many homes have been fitted with geexchange systems, commercial enterprises, including factories, retail stores, office buildings and schools also use geexchange to save energy and protect the environment. In fact, there are more than half a million installations in the United States today. According to the U.S. EPA, schools are a particularly attractive place for the use of technology. Across the country, schools using geexchange right now are saving an estimated \$25,000,000 in energy costs, which can be used instead for educational equipment and teachers. These schools also save a half-billion pounds of CO₂ emissions per year.

What about a very hot or a very cold climate—does geexchange work in both? Yes, geexchange technology can be used in any part of the country. Why? Because it transfers heat to and from the earth, which remains at a relatively constant temperature, rather than the air, where temperatures can vary greatly.

Does geexchange cost more? That depends on how you measure cost. While they do cost more to install in homes than conventional systems, because of the ground loop piping, geexchange systems typically have the lowest life-cycle cost of any heating and cooling system. Heating and cooling costs for a typical 2,000-sq.-ft. home can run as low as \$1 a day. Moreover, installation costs have declined substantially in recent years, and they're expected to continue to fall, as more builders and contractors offer geexchange systems, and as the industry develops innovative ways to install the systems faster and more efficiently. Altogether, geexchange systems are a sound investment. The amount they save the homeowner every month in energy costs is more than enough to offset their higher installation cost. Remember, too, that geexchange means extra savings on repair, maintenance, and hot water bills. And the energy efficiency of geexchange adds value to the home.

Links:

Geothermal Heat pump Consortium: <http://www.geoexchange.org/about/questions.htm>.

Geothermal Resources Council: <http://www.geothermal.org/>.

Geothermal Education Office: <http://geothermal.marin.org/>.

U.S. Department of Energy: <http://www.eere.energy.gov/RE/geothermal.html>.