

Geothermal Heat Pumps (GHP)

What is a geothermal heat pump?

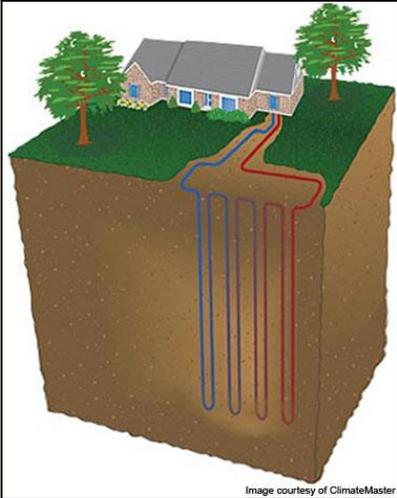


Image courtesy of ClimateMaster

The geothermal heat pump, also known as the ground source heat pump, is a highly efficient renewable energy technology that is gaining wide acceptance for both residential and commercial buildings. Geothermal heat pumps are used for space heating and cooling, as well as water heating. Its great advantage is that it works by concentrating naturally existing heat, rather than by producing heat through combustion of fossil fuels.

Resources

U.S. Department of Energy.
http://www1.eere.energy.gov/femp/procurement/eeep_groundsource_heatpumps.html

National Renewable Energy Laboratory.
http://www.nrel.gov/learning/re_geo_heat_pumps.html

Energy Star.
https://www.energystar.gov/index.cfm?c=geo_heat.pr_geo_heat_pumps

New York State.
<http://www.nyserda.org/programs/geothermal/default.asp>

How Does It Work?

The technology relies on the fact that the Earth (beneath the surface) remains at a relatively constant temperature throughout the year, warmer than the air above it during the winter and cooler in the summer, very much like a cave. The geothermal heat pump takes advantage of this by transferring heat stored in the Earth or in ground water into a building during the winter, and transferring it out of the building and back into the ground during the summer using a ground heat exchanger (ground loop as seen in the picture to the left).

What are the Cost Benefits?

The biggest benefit of GHPs is that they use 25%–50% less electricity than conventional heating or cooling systems. This translates into a GHP using one unit of electricity to move three units of heat from the earth. According to the EPA, geothermal heat pumps can reduce energy consumption—and corresponding emissions—up to 44% compared to air-source heat pumps and up to 72% compared to electric resistance heating with standard air-conditioning equipment. GHPs also improve humidity control by maintaining about 50% relative indoor humidity, making GHPs very effective in humid areas.

Geothermal heat pump systems allow for design flexibility and can be installed in both new and retrofit situations.

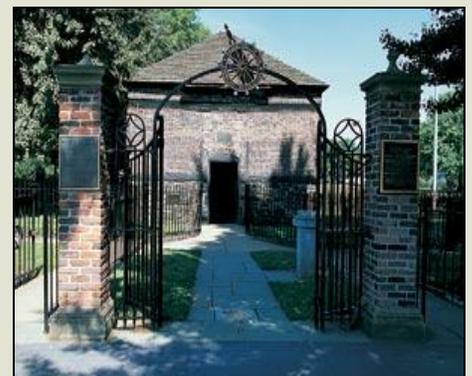
While geothermal systems cost more initially, they use 25-50% less electricity than a conventional system. These cost savings pay back

the higher installation fees within five to ten years.

System life is estimated at 25 years for the inside components and 50+ years for the ground loop.

In addition GHPs offer:

- aesthetic advantages,
- quiet operation,
- free or reduced-cost hot water,
- improved comfort year round,
- low operating costs,
- low maintenance,
- no supplemental heat required,
- low environmental impact,
- no required exposed outdoor equipment,
- level seasonal electric demand,
- no on-site combustion, and
- simplicity.



A geothermal system at Pittsburgh's Fort Pitt Museum, which administers the fort's original 1764 blockhouse, saves both energy and money.

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