

# Geothermal Heat Pump Fact Sheet

## What are Geothermal Heat Pumps and How Do They Work?

Geothermal heat pumps (GHPs), also known as ground-source or groundwater heat pumps, are one of the most efficient ways to provide heating and cooling to homes, schools, hospitals, as well as commercial and government buildings. GHPs may also supply some or all of a building's hot water. GHP systems move heat (thermal energy) stored in the earth or groundwater to the building during winter and remove heat from the building to the earth or groundwater during summer months.

## Benefits of Geothermal Heat Pump Systems



- **GHPs Put Americans to Work** – Approximately, 99% of the GHP units installed in the U.S. are made here. The use of GHPs also provides jobs in the engineering; architectural; heating, ventilation, and air-conditioning; groundwater; supplier; and contracting sectors.
- **GHPs Reduce Energy Use** – Buildings dominate our nation's energy use, with space heating and cooling accounting for close to half of all building energy usage. GHPs can reduce energy consumption up to 44% compared to air-source heat pumps and up to 72% compared with electric resistance heating with standard air-conditioning equipment, according to U.S. EPA.
- **GHPs Reduce the Need for New Power Plants** – GHPs use 1 kWh of energy from the grid to operate the system and 3 to 5 kWh of renewable thermal energy absorbed from the Earth to yield 4 to 6 kWh of total energy for the building. Oak Ridge National Laboratory estimates that 48% of new electric generation capacity could be avoided nationwide by 2030 by aggressive deployment of GHPs.
- **GHPs Can Effectively Be Used Almost Anywhere** – Shallow ground or water temperatures are relatively constant throughout the U.S. allowing GHPs to be used effectively almost anywhere.
- **The Nation Would Benefit from Greater GHP Use** – An Oak Ridge National Laboratory study concluded that increasing residential GHP use to a 20% market penetration rate results in substantial energy savings, reduced peak electric demand, and lower carbon emissions

Benefits* of Retrofitting Homes with GHPs Based on a 20% Market Penetration Rate	
Primary Energy Savings (Quad BTU)	0.8
Percentage Savings	9.0%
CO2 Emission Reduction (MM ton)	54.3
Percentage Savings	9.1%
Summer Peak Electrical Demand Reduction (GW)	40.4
Percentage Savings	11.0%
Energy Expenditure Savings (Billion \$)	10.4
Percentage Savings	9.6%

\*Compared to primary energy consumption for space heating, space cooling and water heating in US single family homes

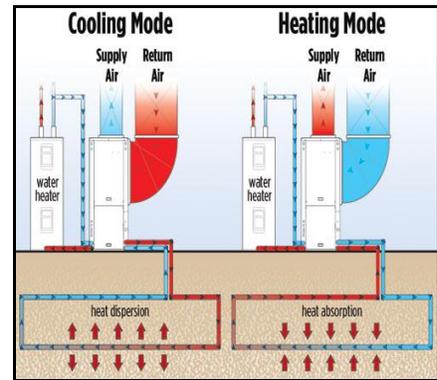
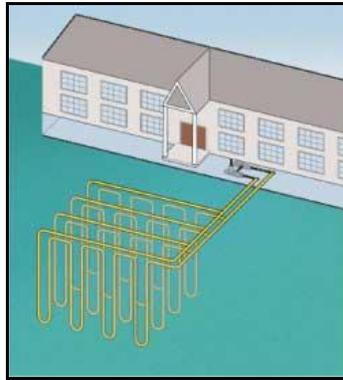
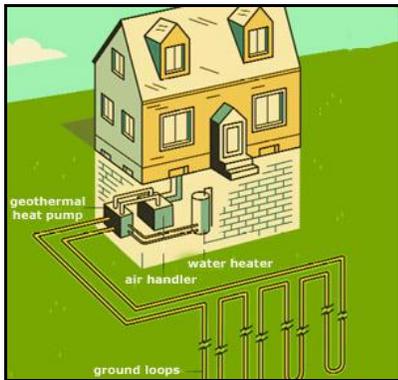


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## Example of Residential and Commercial GHP Configuration



For several hundred feet below the earth's surface, the ground temperature is typically constant and similar to the average annual air temperature. This means that the ground is warmer in winter and cooler in summer than the outdoor air. GHPs save energy by using the warmth of the ground as a starting point for heating in winter. In summer, they use the coolness of the ground as the starting point for cooling. GHPs use 1 kWh of energy from the grid to operate the system and 3 to 5 kWh of renewable thermal energy absorbed from the Earth to yield 4 to 6 kWh of total energy for the building. GHPs operate rain or shine, providing the heating and cooling needs of homes, hospitals, schools, as well as commercial and government buildings.

For further information about GHPs or the National Ground Water Association (NGWA), contact:

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The National Ground Water Association is a not-for-profit professional society and trade association for the groundwater industry. Our members from all 50 states include some of the country's leading public and private sector groundwater scientists, engineers, water well contractors, manufacturers, and suppliers of groundwater-related products and services. The Association's vision is to be the leading groundwater association that advocates the responsible development, management, and use of water.



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