

# A Simple Science Creates Affordable Comfort

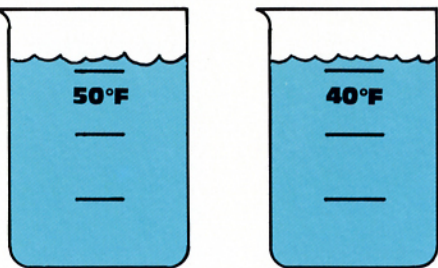
The basic principles of ground water heat pumps are simple. Well water maintains a constant temperature all year long. Consequently, it can effectively heat cold winter air and cool hot summer air. The National Water Well Association has been promoting groundwater heat pumps for use in heating and cooling systems for many years. They are now being joined by contractors, engineers, architects, and equipment manufacturers taking advantage of the large savings that can be provided by this most abundant source of free energy.

Conservationists are becoming very excited as they discover that groundwater heat pumps are an efficient, economical alternative to diminishing fossil fuels.

## Well Water Most Efficient

Well water can store large amounts of energy because of its high specific heat, (i.e., the amount of energy required to raise the temperature of a unit weight of any substance 1°F).

## Specific Heat of Water = 1



**1 lb. Water at 50°F = 1 lb. Water at 40°F + 10 Btu's\***

It takes significantly more energy to raise the temperature of water than it does for any other liquid. Therefore, when the water temperature is lowered by 1°F, more energy is extracted per unit weight than any other substance. Heat energy is extracted from groundwater by using a geothermal heat pump.

## Heat Pump

The heat pump works like a reversible refrigerator, relocating the heat from groundwater to the home in winter and from the home back to the ground in the summer.

## Heating Mode

A liquid refrigerant flows through the heat pump, absorbing heat energy from the groundwater. This liquid refrigerant evaporates to a gas at low temperatures and pressures. After the refrigerant evaporates, it is passed through a compressor which efficiently raises its temperature as its pressure increases, thus enabling the heat pump to give off heat into your home.

## Cooling Mode

The opposite of this process occurs in the summer. As the refrigerant evaporates, it absorbs heat from the inside of the house and transfers this heat to the groundwater through the heat pump.

## Domestic Hot Water

The hot refrigerant from the compressor can be routed through a water-heating

generator. This allows the process to produce domestic hot water for your home both winter and summer.

## Efficiency

Because the temperature of the groundwater remains constant all year, the output from the heat pump remains constant all year — warmer than air in the winter, cooler than air in the summer. Scientists call groundwater — “nature’s most efficient energy-storing system.”

## Where Does The Energy Come From?

The Planet Earth is a sphere with a diameter of about 8,000 miles. Beginning just below the surface of the earth, scientists have found that for the first

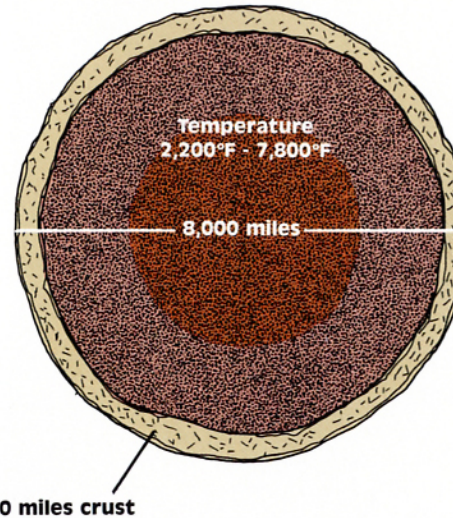
several miles the temperature remains relatively constant (50°F± in the Temperate Latitudes). Below this, the temperature rises gradually to about 2,200°F at a depth of about 100 miles. For the next 7,800 miles, the temperature rises from 2,200°F to 7,800°F at the center.

**Our Planet Earth is absolutely packed with heat energy.** It only depends upon man’s ability to find safe and economical ways to extract and use it.

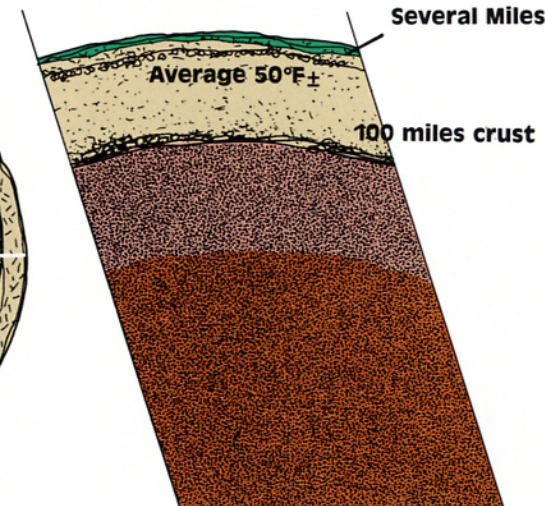
Happily, this methodology has been found in the device called a Geothermal Heat Pump which allows us to tap the entire energy of the earth at the upper 50°F zone without having to deal with the much greater temperatures of the deeper levels.

**Range of Atmospheric Temperatures**  
-30°F - +100°F  
(Temperate Zone)

**Cross Section of Planet Earth**



**Segment of Earth's Crust**



**“There’s a World of Heat Beneath Your Feet”**

\*Unit Measures of Heat