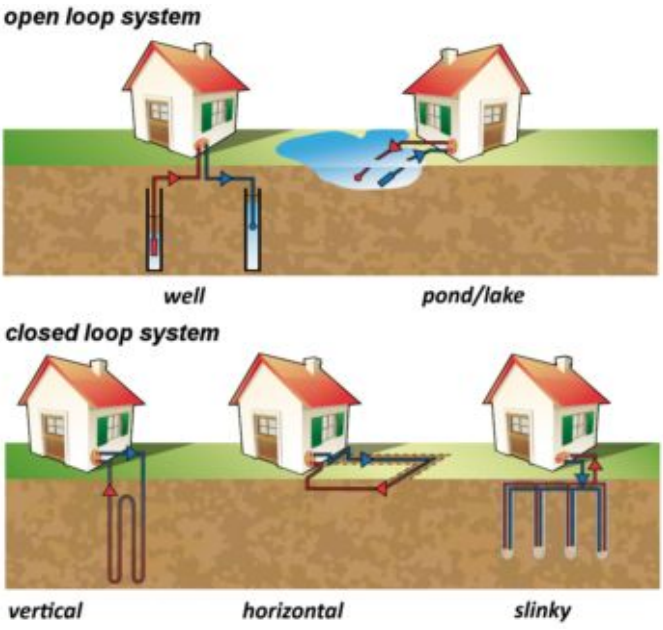
Geothermal Technology: an Energy Transfer System with Terry Nother and Darlene Pratt



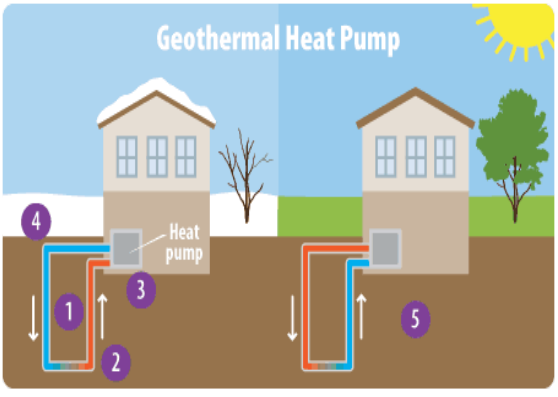
Geothermal Heat Pumps

Powering a home with a geothermal heat pump allows harnessing of the temperatures below the surface of the earth to heat or cool a structure. Even though the temperatures above ground fluctuate during the seasons throughout the years, the temperature below the surface remains consistent between 10˚ - 15˚ year-round.

Geothermal heat pumps can be used all over the country due to the constant temperature below the surface, but they vary in efficiency and cost savings.

There are several types of ground loop designs that can be made, but they all fall under two basic categories: closed-loop and open-loop. More specifically, of these two types of pumps, there are three closed-loop systems, and one open-loop systems. Each depends on the type of soil, climate conditions, and land available.

Here is an example of how a Geothermal Heat Pump system works:



1. Water or a refrigerant moves through a loop of pipes.
2. When the weather is cold, the water or refrigerant heats up as it travels through the part of the loop that's buried underground.
3. Once it gets back above ground, the warmed water or refrigerant transfers heat into the building.
4. The water or refrigerant cools down after its heat is transferred. It is pumped back underground where it heats up once more, starting the process again.
5. On a hot day, the system can run in reverse. The water or refrigerant cools the building and then is pumped underground where extra heat is transferred to the ground around the pipes.

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Different types of loop geothermal systems

A **closed-loop geothermal system** continuously circulates a heat transfer solution through buried or submerged plastic pipes. The loop is filled just once and requires only a moderate amount of solution. The same solution is used again and again in a closed-loop. These underground pipes connect to an indoor heat pump to provide heating and cooling.

In closed-loop systems, a water/antifreeze mixture circulates through a loop of pipes underground (or beneath a body of water) and into a building. In the winter (as shown above), the temperatures underground are warmer than the air, so the fluid pumping in is warmer. Then the electric compressors and heat exchangers transfer the heat through ducts in the building.

In the summer, the pipes draw heat away from the building and it is absorbed into the earth or water. Since the fluid is already cool in the summer and warmer than the air in the winter, the heater/AC system doesn't have to work nearly as hard.

In **open-loop systems,** the water is taken directly from a water source and into the heat pump where it then can either be recycled back into the same source or pumped into another water source (without polluting). In this type of system, groundwater from an aquifer is piped directly from a well to the building where it transfers its heat to a geothermal heat pump.

The only difference between the water going in and out is a slight change in temperature. After the transfer of heat between the extracted water and heat pump takes place, the water is then expelled back into a well, into a pond, or into a drainage ditch depending on local codes.

This type of ground connection method is used less frequently but can be employed cost-effectively if groundwater is plentiful in order to power your home. Because open-loop systems utilize water on a "once-through" basis, they are often referred to as "pump and dump" systems.

Since geothermal energy is a renewable natural resource, think of it like a gift from the earth that keeps giving. Although over time it is often necessary to drill additional wells to maintain levels of energy production, the earth is constantly giving off heat that was generated when our planet was formed billions of years ago.

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