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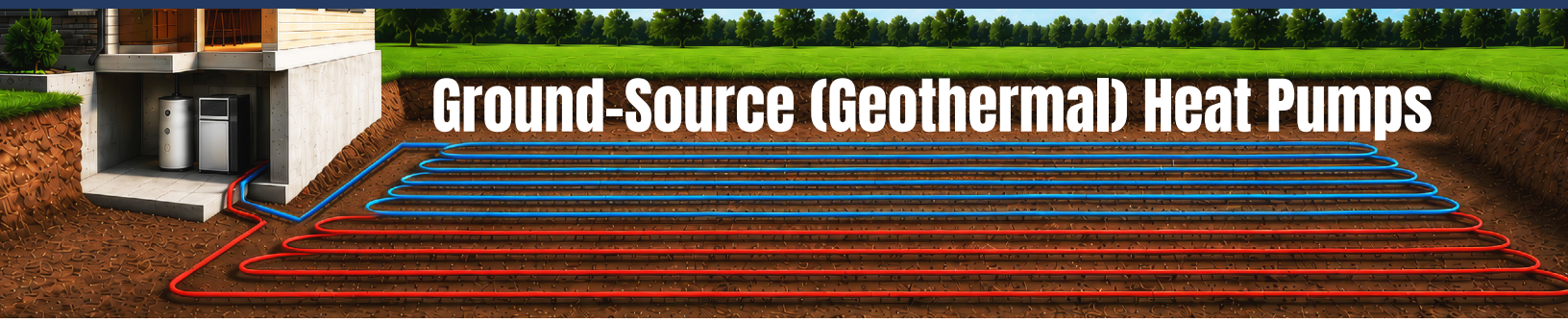

# Ground-Source (Geothermal) Heat Pumps

## Overview

Ground-source, or geothermal, heat pumps function similarly to traditional heat pumps: They use a refrigerant to move heat to the conditioned space in the winter and to the outside in the summer. However, unlike air-source heat pumps that exchange heat with the outside air, they use the ground to provide heating, air conditioning and, in some cases, hot water.

Using the constant temperature of the ground makes geothermal heat pumps among the most efficient HVAC technologies on the market. However, despite their high efficiency, their upfront cost, especially in rocky ground locations, can make the price of entry too high for some.

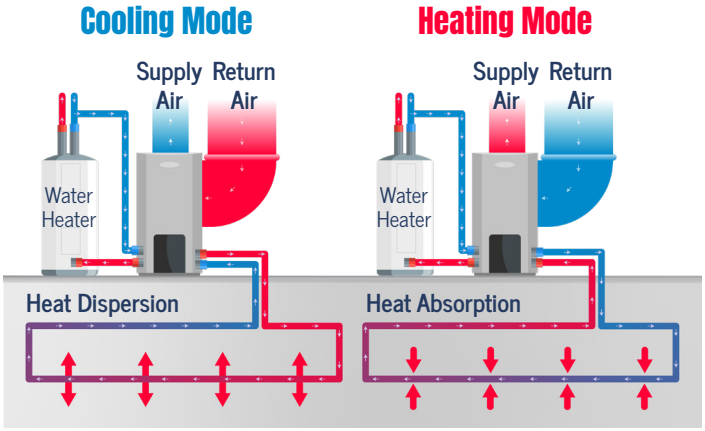


*Figure 1. Source: The Geothermal Exchange Organization*

**Features**

- Super-efficient
- Can save up to 60% in energy use compared to standard heat pumps
- Can last 12–15 years
- Option to also provide hot water

## 1. Types of Heat Exchange

There are two main types of heat exchange media: the ground (more common) and water (less common).

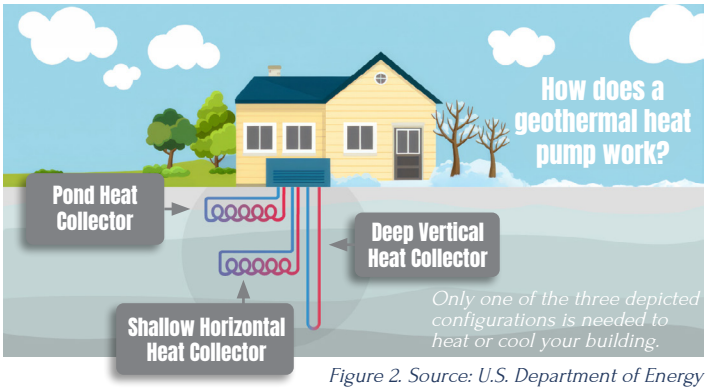


*Figure 2. Source: U.S. Department of Energy*

## 2. Styles of Heat Exchange Loops

The style of loops, either closed or open, can vary between systems. Closed-loop systems are more common and operate by circulating refrigerant or an antifreeze solution through designated loops to exchange with the ground or water media.

If a large water source is available nearby, an open loop may be used to pump water through the system once to heat or cool the indoor spaces.

## 3. Size of Loop Systems

The size and orientation of the loop system, generally horizontal or vertical, is another consideration and will depend on local ground conditions (e.g., sandy soil, clay soil, rock).

With a horizontal loop, the piping system isn't very deep but takes up a significant amount of horizontal space (e.g., in a lawn or yard) to offer the right amount of source heat and cool for the home.

With a vertical loop, the piping system doesn't take up much horizontal space but is drilled down into the ground as deep as it needs to go.

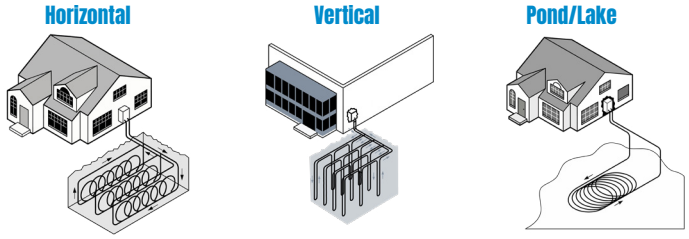


*Figure 3. Source: U.S. Department of Energy*

## 4. Working with a Professional

Just like other heat pump technologies, ground-source heat pumps should be installed and maintained by knowledgeable professionals who can help identify your heating and cooling capacity, determine the appropriate loop configuration and circulation pump speeds, and decide whether to incorporate water heating capabilities.

Remember to contact your local co-op with questions about or for more information on ground-source heat pumps.

## Resources:

- *Database of State Incentives for Renewables & Efficiency*
- *ENERGY STAR: Geothermal Heat Pumps*
- *National Conference of State Legislatures: Unlocking Underground Energy: Ground Source Heat Pumps*
- *U.S. Department of Energy: Geothermal Heat Pumps*