


Homeowner's Guide to
Geothermal Heating, Cooling,
and Hot Water Systems



geoexchange.org

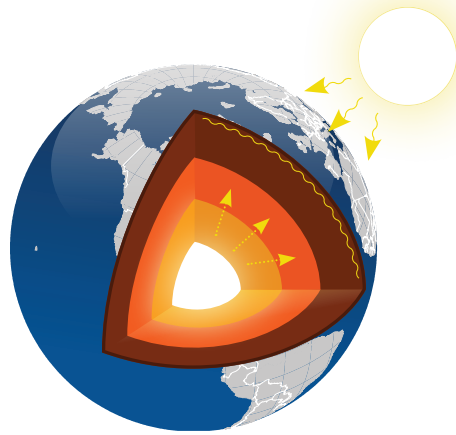




Geothermal systems offer the best solution for clean, efficient heating, cooling, and hot water. These units are flexible, so you get a personalized system powered by nature that fits your home's needs. Unlike traditional systems, *geothermal systems are a renewable technology that doesn't use fossil fuels or large amounts of electricity to keep your home comfortable.*

Your home deserves the best. The Earth deserves the best. With our systems, you join a movement that accomplishes both.



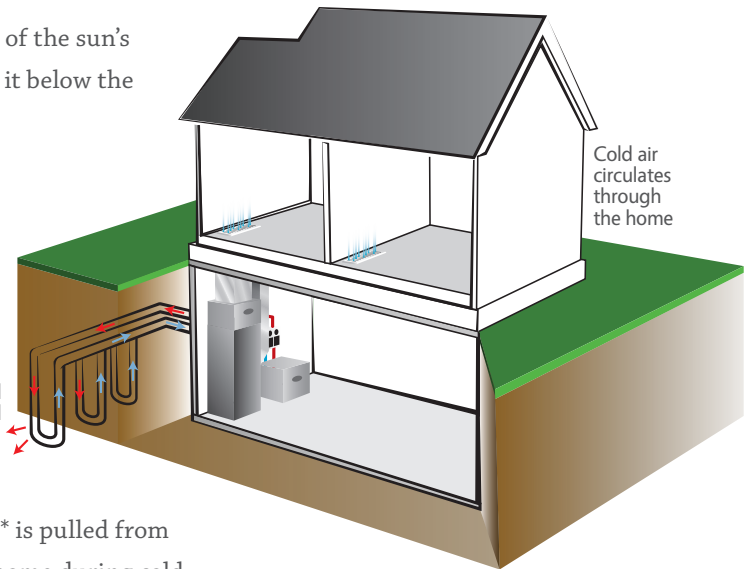
What is Geothermal Heating and Cooling?



Ground Source Energy 
Geothermal Energy 

The earth is used as a heat exchanger to keep your home comfortable all year long by simply moving heat from one place to another. Because geothermal uses the solar energy closer to the earth's surface, it can be installed almost everywhere in the world. This is unlike geothermal energy, which pulls heat from the earth's core and is only available in certain geographic locations.

The earth absorbs **48%** of the sun's solar energy and stores it below the surface.



The stored solar energy* is pulled from the earth to heat your home during cold months, and in the warmer months, heat is removed from the home and deposited back to the earth. All this is done through the combination of a geothermal unit located inside the home and high-density polyethylene pipe buried outside.

*You may hear geothermal systems called ground source heat pumps. This is because geothermal systems use ground source energy (stored solar energy) to heat and cool homes.

Comparing Geothermal to Traditional Systems:

In some ways, comparing the investment of a geothermal system to the cost of a traditional HVAC system is comparing apples to oranges. What may appear at first glance as a 'good deal' on a traditional system may not be the most economical and environmentally sound choice, so it's important to look at all the factors when making your decision.

	Geothermal	air-source heat pump	electric resistance	propane	natural gas	fuel oil	wood burner
Efficiency Rating	500%*	250%*	100%	95%	95%	83%	**
Capable of Zoning	✓	✓	✓	✓	✓	✓	
Does Not Use Fossil Fuels or Release Harmful Emmissions	✓	✓	✓				
No Combustion	✓	✓	✓				
No Carbon Monoxide or Oil Leaks	✓	✓	✓				
Not Impacted by Volatile Operating/Fuel Costs	✓	✓	✓				
Heating and Cooling in One Unit (and hot water capabilities)	✓	✓					
Most environmentally friendly (According to the EPA)	✓						
No Outdoor Equipment	✓						
Uses the Earth's Free Heat (For every 1 unit of electricity used, you get 4 units free)	✓						

■ Electric Technologies
■ Fossil Fuel Technologies

* Ground loop conditions up to 5.0 COP/17°F outdoor air temperature for air-to-air heat pumps

** Varies dependent on wood type, type of fireplace, and method of operation



The Benefits of Geothermal Heating, Cooling, and Hot Water Systems

Peace of Mind

Fossil fuels are not needed to power geothermal heating, cooling, and hot water systems, **which improves quality of life indoors** by providing better air quality and removing the possibility of harmful gas and oil leaks, fires, and carbon monoxide poisoning.

Return on Investment

Heating, cooling, and hot water from a geothermal system costs less than a traditional HVAC system like those reliant on natural gas, propane, or oil. **If you choose to finance your geothermal system, you can make payments with the money you'll save on utility costs.**

Comfortably Connected

The most popular geothermal systems are available with connected controls. **Equipped with flexible, transparent, and insightful monitoring tools**, you can rest assured that your home is kept comfortable from anywhere and on almost any device.

Extras Are Standard

Geothermal systems are **very quiet, reduce humidity levels, and allow for zoning** – so you can have different temperatures in different areas of your structure. Smart thermostats are compatible with our systems, so you have control, no matter your location.

Free Hot Water

Geothermal systems for homes come standard with hot water assist. The heating and cooling system captures unused heat and transfers that to your hot water supply, **cutting water heating costs 25% - 40%** in a 4-person household!

Dependable

Geothermal equipment is built to high standards in the USA. Each geothermal system is started up and monitored in heating and cooling modes before it's delivered. **Geothermal manufacturers stand behind their products through their warranties.***

*Ask your local geothermal dealer about warranty, as it can vary by product and installer.

Aesthetically Pleasing

Geothermal systems are whisper quiet – some people have thought their unit wasn't running correctly because it was so quiet. The ground loops are buried outside, and the unit is kept indoors, so you do not have to worry about hiding noisy outdoor equipment.

Long-Lasting

Geothermal systems have a **20- to 25-year lifespan, on average, which is significantly longer than traditional systems**, which typically last 13 to 15 years. The ground loops powering the geothermal system last a lifetime.

Financial Incentives

Local municipalities, state entities, and utilities offer rebates or other financial incentives when you install a geothermal system. Right now, the federal government is offering a tax credit, as well:



30% tax credit

for geothermal systems placed in service from **January 1, 2022** until **December 31, 2032**

Since the Inflation Reduction Act is a piece of federal legislation, it is subject to change. For the most up-to-date information, visit <https://www.irs.gov/newsroom/energy-incentives-for-individuals-residential-property-updated-questions-and-answers>.

How Does Geothermal Heating and Cooling Work?

Even though outdoor air temperatures vary throughout the year, temperatures underground stay fairly constant because the earth absorbs and stores approximately 48% of the sun's solar energy. As a result, the temperature of the earth four to six feet below ground is moderate and stable staying between 45°F - 70°F depending on your location.

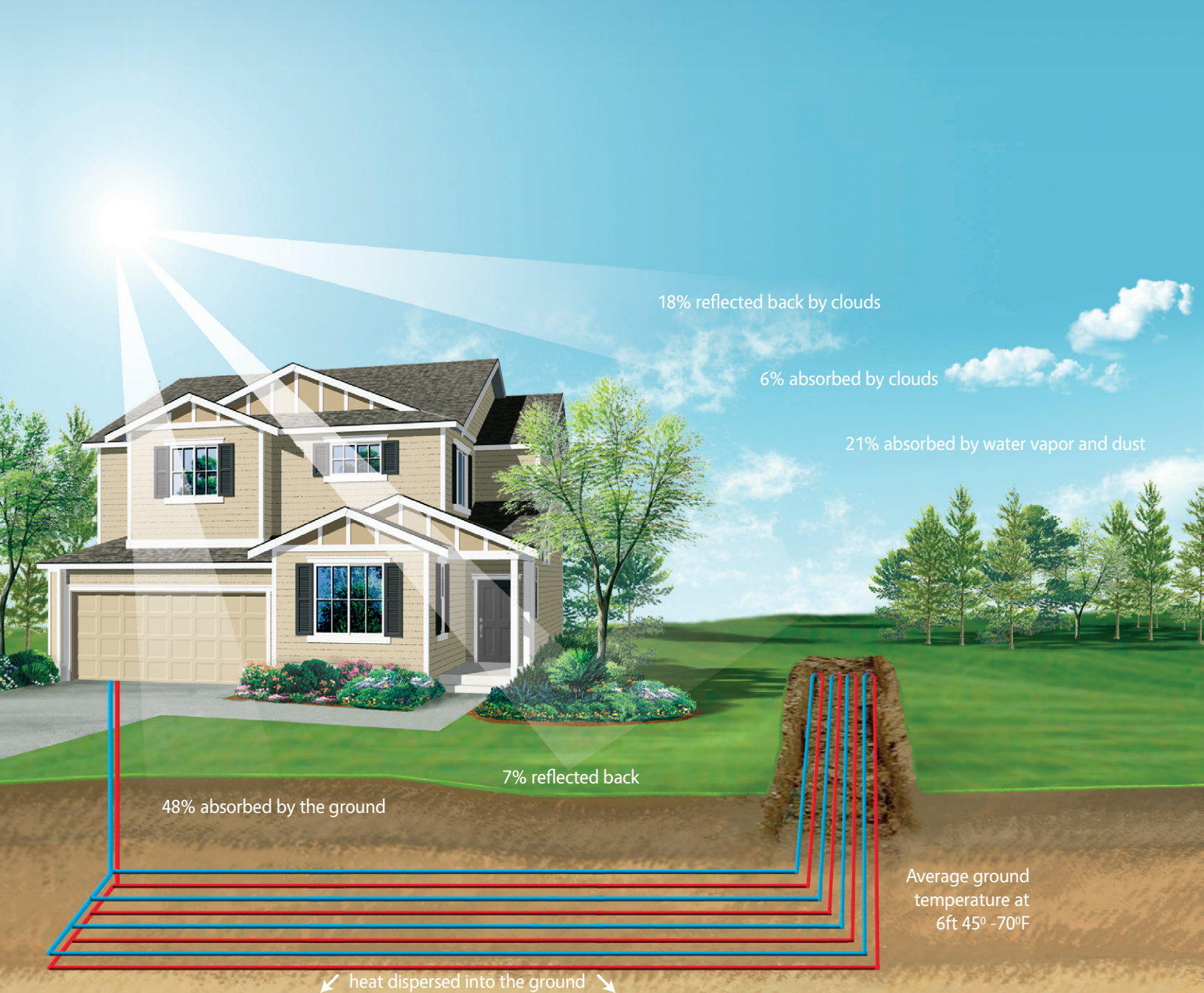
The geothermal system takes advantage of this by using it to provide the most

energy efficient heating and cooling available.

Rather than generating heat, a geothermal system transfers heat from one place to another. The heat exchanger, commonly referred to as a closed loop system, is buried in the ground and circulates a water-based solution through a series of pipes. This solution captures the stored solar warmth and delivers it back to the unit located in the house.

The geothermal unit then transfers the solar heat throughout the house using standard forced air ductwork or radiant floor heat to deliver comfortable indoor temperatures during the winter.

The same geothermal unit will reverse this cycle during the cooling season to provide air conditioning. The system removes heat and humidity from the air, transfers, and deposits that heat back into the earth through the same loop system.



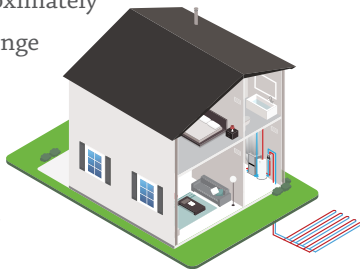
The Power Behind a Geothermal System: The Ground Loop

The loop system is the heart of geothermal technology. Regardless of the option you select, it will deliver energy-efficient comfort and offer 30% - 70% savings on utility bills for many years.

Your local geothermal dealer will help you select the proper loop system based on a site survey and by conducting a detailed energy analysis of your home. Installing a geothermal loop system is like getting a 70% discount on energy for the life of your home. The ground loop options include:

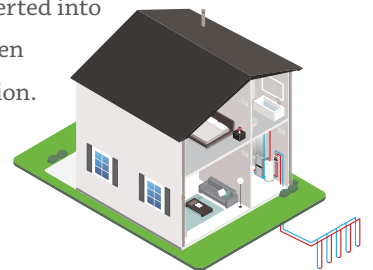
Horizontal Loop

Commonly used when adequate land area is available (the home should sit on 1/2 acre, at least). Loop installers use excavation equipment such as chain trenchers, backhoes and track hoes to dig trenches approximately 5-8 feet deep. Trench lengths range from 100 to 250 feet per ton, depending on the loop design and application. Directional bore machines can also be used.



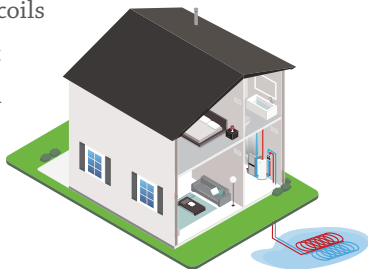
Vertical Loop

Used mainly when land area is limited in new construction or retrofit applications of existing homes. A drilling rig is used to bore holes at a depth of 150 to 250 feet per ton. A U-shaped coil of high density pipe is inserted into the bore hole. The holes are then backfilled with a sealing solution.



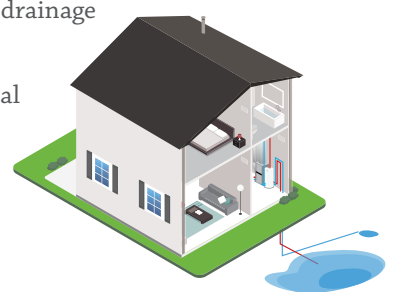
Pond Loop

This loop style is an option if a large body of water is available within approximately 200 feet of the home. A 1/2 acre, 10 to 12-foot deep body of water is needed to support the average home. The system uses coils of pipe typically 300 to 500 feet in length. The coils are placed in and anchored just above the bottom of the body of water.



Open Loop

This loop type can be installed if an abundant supply of high-quality well water is available. A typical home will require a well producing 4 to 8 gallons of water per minute. A proper discharge area such as a river, drainage ditch, stream, pond, or lake must be present. Check for local restrictions before selecting a specific discharge method.



FAQs

Can a geothermal heating and cooling system be installed in a small yard?

Yes, it can! In this scenario, your local geothermal dealer would more than likely recommend vertical loops, which usually only need a 10x10 space for the ground loop system. This means geothermal can work in densely populated, suburban, and rural areas.



Is there a cost difference with the types of ground loop systems?

The cost to install the ground loop system varies based on where you live, but typically, vertical loops are a bit more expensive than their counterparts because of the drilling equipment needed. Your local geothermal dealer will do a thorough analysis to see what's possible with your home and what will provide you with the best return on investment. Overall, each ground loop system will provide you with more long-term savings and comfort than any traditional HVAC system.



Can I install a ground loop system on a hill?

You can! Here's why it still works: The water-based solution flowing through the ground loop system and into the geothermal unit in the home is not being pushed. It's constantly flowing so there's no force upward to get it started and keep it going.



Will a geothermal system work with a traditional HVAC system?

Yes, it will! We call these hybrid systems. If you live in a particularly cold area, a geothermal system can be supplemented with a traditional heat source (gas, propane, etc.). The geothermal system provides 90% of your home's heating requirements, and the traditional system kicks in when the outdoor air has reached a certain low temperature. Geothermal systems can work on their own in very cold temperatures, but when paired with a traditional system it sometimes creates the perfect solution for the most efficient heating. It's about what works best for you and your home's needs.



It's Possible to Heat and Cool Your Home in Different Ways

Radiant In-Floor Heating: Also called hydronic heating, radiant in-floor heating is known as the most comfortable type of heating. It requires no ductwork. Warm water is circulated through tubes installed under your floor (or patio, driveway, etc.), which causes heat to radiate from the floor up. This keeps your feet nice and cozy, eliminates hot and cold spots in your home, and it further reduces energy costs. Radiant systems eliminate noise, dust, and draft issues and save you money in the process.

Whether you're building a new home or undergoing a renovation, there are a variety of radiant configurations for you to choose from.

Forced Air Heating and Cooling: With a forced air system, hot and cold air (depending on your thermostat setting) is dispersed throughout your home using a ductwork system. This is an energy-efficient type of heating and cooling, and with proper filter maintenance, this system will help purify the air in your home.

Zoned System: Both radiant heating and forced air systems can be zoned with geothermal heating and cooling. This allows you to keep different areas of your home hotter or colder than others. When paired with wi-fi connected thermostats, this set up makes it so you have complete control of the comfort level in each room or section of your house no matter where you are.



What Can Geothermal Do for You?

There is no job too big or too small for a geothermal system. Our versatile equipment can be installed in existing homes, new construction homes, small shopping centers, and even the largest commercial structures. It also pairs well with other renewable energies, such as PV solar systems. In addition to heating and cooling homes, geothermal can be used to:

- Heat your pool
- Provide 100% of the domestic hot water for your home
- Patio heat
- Snowmelt

And more!

Meet Some Geothermal Homeowners

BRIAN'S MID-CENTURY ABODE | Stamford, CT



 CONSTRUCTION TYPE
Retrofit

 SYSTEM TYPE
Forced Air System

 LOOP TYPE
Vertical Loop

Since the geothermal system was installed, this home has consistently seen **50-60% savings on heating and cooling costs**. “It’s been steady and free of problems,” the homeowner, Brian, said. “I cannot recommend this enough.”

“Even during this bitter cold snap that is catching so many folks by surprise, our home is staying at a comfortable 73°F and our garage at 40°F. I am impressed!” —Gilbert

MARK'S NET ZERO DREAM HOUSE | Milford, MI



 CONSTRUCTION TYPE
New Construction

 SYSTEM TYPE
Forced Air System

 LOOP TYPE
Vertical Loop

Installing a geothermal heating and cooling system lowered the energy usage of this home, which greatly assists the 14-kW solar array provide enough power for all the home’s yearly needs.

About GeoExchange

About GeoExchange – The Geothermal Exchange Organization (GeoExchange) is the Voice of the Geothermal Heat Pump (GHP) Industry. Our mission is to promote sustainable growth of the GHP market by removing barriers to adoption and fostering awareness of the many benefits of GHP technology.

GHPs are the most efficient heating and cooling systems in existence and they are a renewable environmentally friendly way to meet the needs of homes and businesses around the country. GeoExchange engages a wide variety of stakeholders at federal, state, and local levels and advocates for policies and programs to increase adoption.

Please contact us to learn more about how you can Go Geo! We have a wealth of resources available to assist with planning systems of all sizes and configurations. From a small single-family home to a large and complex commercial installation, GeoExchange pros can help you through every step in the process. We look forward to helping guide you on your geothermal journey!



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