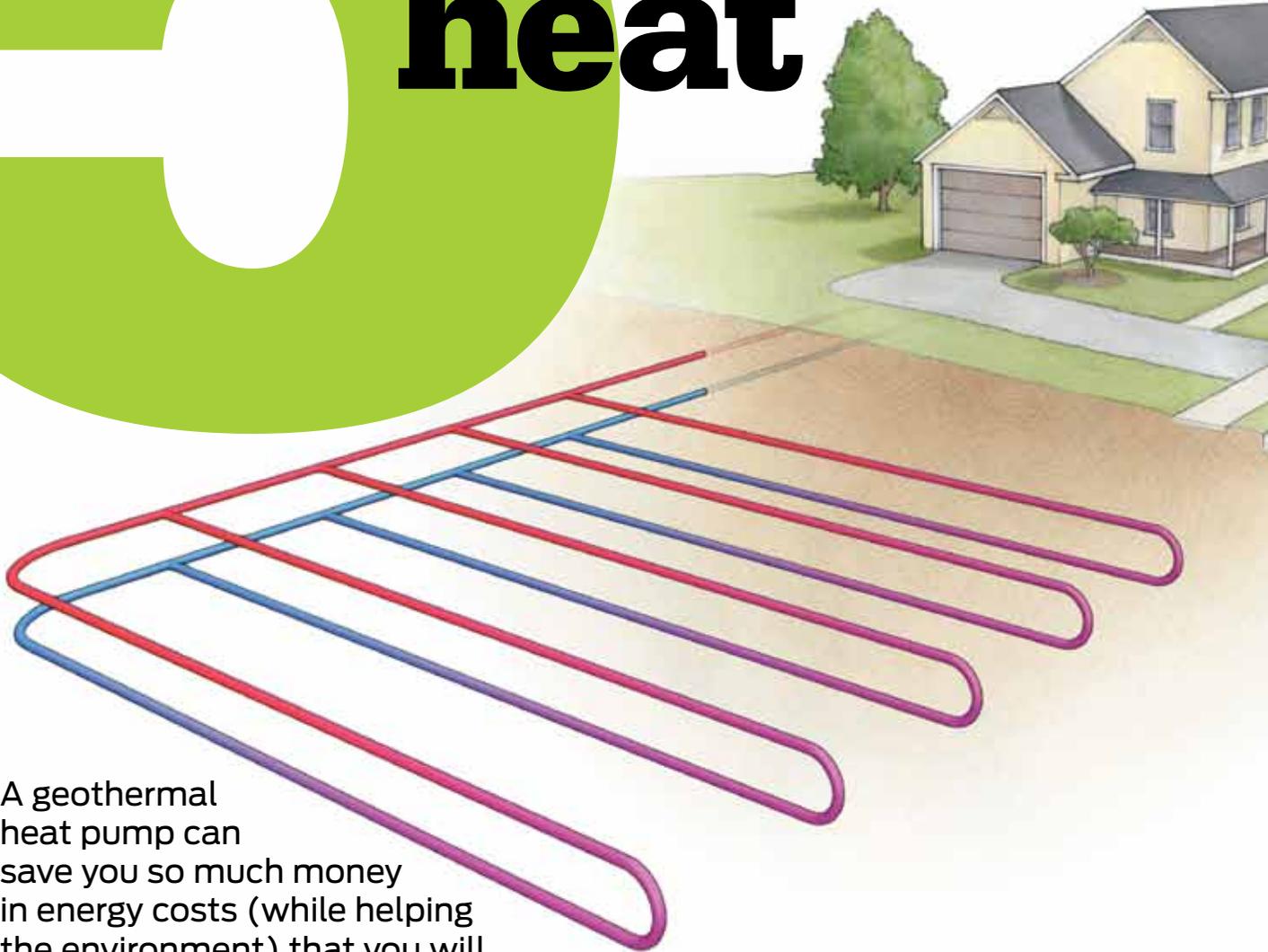


things you need to know about geothermal heat



A geothermal heat pump can save you so much money in energy costs (while helping the environment) that you will be tempted to install one immediately.

however...

A geothermal system costs so much to install that you will be tempted to forget the whole thing.

1

It works like your fridge

Your fridge removes heat from its interior and transfers it to your kitchen. A geothermal heat pump uses the same principle, but it transfers heat from the ground to your house (or vice versa). It does this through long loops of underground pipes filled with liquid (water or an antifreeze solution). The loops are hooked up to a geothermal heat pump in your home, which acts as both a furnace and an air conditioner.

During the heating season, the liquid pulls heat from the ground and delivers it to the geothermal unit and then to refrigerant coils, where the heat is distributed through a forced-air or hydronic system. During the cooling season, the process runs in reverse. The pump removes heat from your house and transfers it to the earth. Many units can provide domestic hot water as well.

A geothermal heat pump is vastly more efficient than conventional heating systems because it doesn't *burn* fuel to create warmth; it simply *moves existing* heat from one place to another. And because temperatures underground remain a relatively constant 50 degrees F year round, the system requires a lot less energy to cool your home than conventional AC systems or air-source heat pumps, which use outside air as a transfer medium.

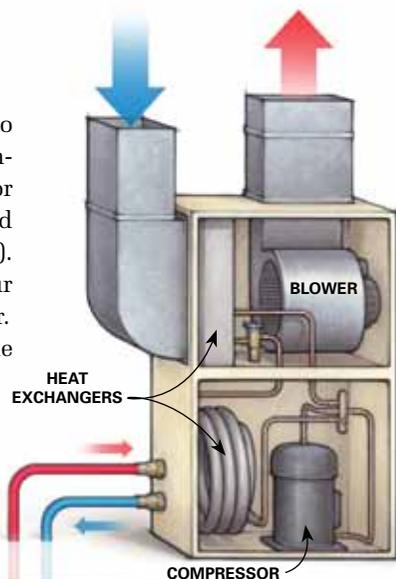
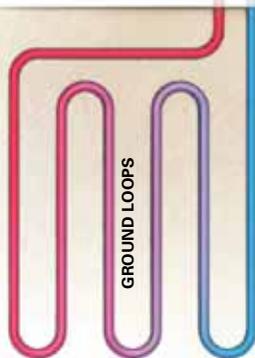


Figure A
Geothermal heat pump



3

2

The upfront costs are scary

Let's not sugarcoat it—installing a geothermal system is expensive. It costs \$10,000 to \$30,000 depending on your soil conditions, plot size, system configuration, site accessibility and

the amount of digging and drilling required. For a typical 2,000-sq.-ft. home, a geothermal retrofit ranges from \$10,000 to \$20,000. The system may require ductwork modifications along with extensive excavation. In a new home, installation costs would be on the lower end. Even so, a geothermal system will cost about 40 percent more than a traditional HVAC system.

Recouping these costs through energy savings could take as little as four years or as long as 15 years depending on utility rates and the cost of installation. It takes some homework and professional estimates to figure out whether a geothermal system makes financial sense in your situation.

It has real benefits

- **Much lower operating costs than other systems.** A geothermal heat pump will immediately save you 30 to 60 percent on your heating and 20 to 50 percent on your cooling costs over conventional heating and cooling systems.
- **Uses clean, renewable energy (the sun).** With a geothermal heat pump, there's no onsite combustion and therefore no emissions of carbon dioxide, carbon monoxide or other greenhouse gases. Nor are there any combustion-related safety or air quality issues inside the house. (However, the pump unit uses electricity, which may be generated using fossil fuels.)
- **Can be installed in both new construction and retrofit situations.** However, it's a lot more expensive in retrofits requiring ductwork modifications.
- **Much quieter than other cooling systems.** There's no noisy outdoor compressor or fan. The indoor unit is generally as loud as a refrigerator.
- **Low maintenance and long-lived.** The indoor components typically last about 25 years (compared with 15 years or less for a furnace or conventional AC unit) and more than 50 years for the ground loop. The system has fewer moving parts and is protected from outdoor elements, so it requires minimal maintenance.

4

There are downsides (besides the cost)

- **Not a DIY project.** Sizing, design and installation require pro expertise for the most efficient system.
- **Still relatively new,** so there are fewer installers and less competition (which is why prices remain high).
- **Installation is highly disruptive to the landscape** and may not be possible on some lots. Heavy drilling or digging equipment will definitely crush your prize petunias.

Type of loop affects the cost

The three closed-loop systems shown below are the most common. There is also a less common open-loop system that circulates surface water or water from a well through the system and returns it to the ground through a discharge pipe.

The best system, loop length and design for a particular home depend on a variety of factors such as climate, soil conditions, available land, required heating and cooling load, and local installation costs at the site.



Figure B
Horizontal

Layered coils or straight runs (see p. 50) of polyethylene pipe are placed in 6-ft.-deep trenches. This is the cheapest underground option, but it requires a lot of open space. A 2,000-sq.-ft. house requires 400 ft. of 2-ft.-wide trenches.

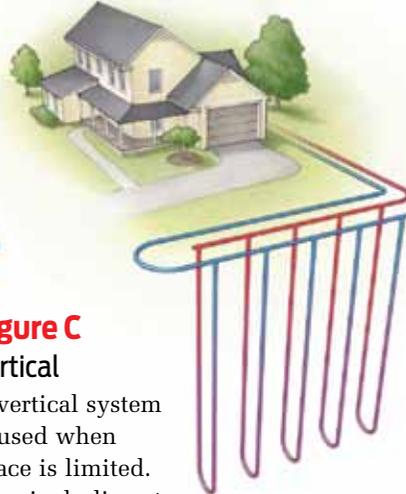
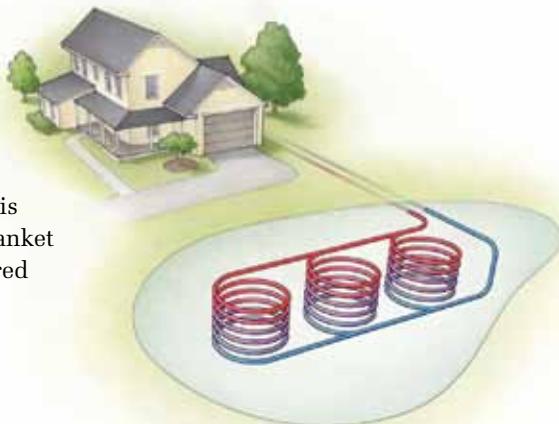


Figure C
Vertical

A vertical system is used when space is limited. Four-inch-diameter holes are drilled about 15 ft. apart and 100 to 400 ft. deep. Two pipes are inserted and connect at the bottom.

Figure D
Pond/lake

This system draws heat from water rather than from the soil. If there's a body of water nearby, this is the lowest cost option. A blanket of water covers coils anchored on racks about 10 ft. deep.



Is geothermal right for you?

About 100,000 geothermal heat pumps are installed in the United States each year, and according to Bob Donley, customer support manager at GeoSystems LLC in Minnesota, interest in geothermal is really on the rise. "In 2008 alone, the industry saw a 40 percent increase in homeowner interest." Donley says you're a good candidate for a geothermal system if you:

- Can stomach the upfront costs and plan to stay in your house for at least four to seven years (new construction) or 10 to 12 years (retrofit) to recoup initial costs through energy/cost savings.
- Live on a large lot with a pond or a well. This would allow you to use a less expensive loop system (see **Figure D**).
- Are building a new house and can roll the upfront costs right into the mortgage. You'll be saving on heating and cooling costs on day one.
- Have an existing house with very high energy bills. This most likely means you currently use propane, oil or electricity for heating and cooling.

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