

# Geothermal Heat Pump is Ultra-Efficient

**Q:** *I have thought about installing a geothermal heat pump for its efficiency and the tax credit. How efficient is one and how does it work?*

**A:** Geothermal heat pumps are extremely energy efficient and generally yield the lowest utility bills of any residential heating and cooling systems. With the high cost of energy today and the available energy tax credit, installing one makes economic sense for some families.

A geothermal heat pump operates similarly to a standard heat pump, except it exchanges heat with the ground instead of the outdoor air, essentially using

renewable energy from the sun's rays that are stored as heat in the ground.

The temperature of the outdoor air can vary greatly, but the temperature several feet below the ground surface varies relatively little.

To capture the heat energy from the ground in the winter or exhaust the heat during the summer, a long pipe

is usually buried in the ground. An antifreeze/water solution running through the pipe acts as the heat transfer medium.

Since no outdoor condenser coils and fans are needed, the entire heat pump and all mechanical components are in an indoor unit. With no outdoor fan or compressor, it operates quietly.

In the heating mode, a geothermal heat pump can produce up to \$5 worth of heat for each dollar on your electric bill. Unlike standard heat pumps, which lose efficiency and maximum heat output as the outdoor temperature drops, the efficiency and heat output from a geothermal pump is relatively constant.

Moist ground has a huge thermal energy storage capacity, so the amount of heat your system pulls out to warm your house has little effect on the ground temperature. The most efficient models use a two-stage compressor and variable-speed indoor blower for the best comfort.

During summer, a regular heat pump or central air conditioner loses efficiency and cooling output when it is hotter outdoors. Unfortunately, this is when your house requires the greatest cooling capacity. Cooling efficiencies for geothermal units are as high as 30 EER (energy-efficiency ratio). A standard heat pump or central air conditioner is typically less than half as efficient.

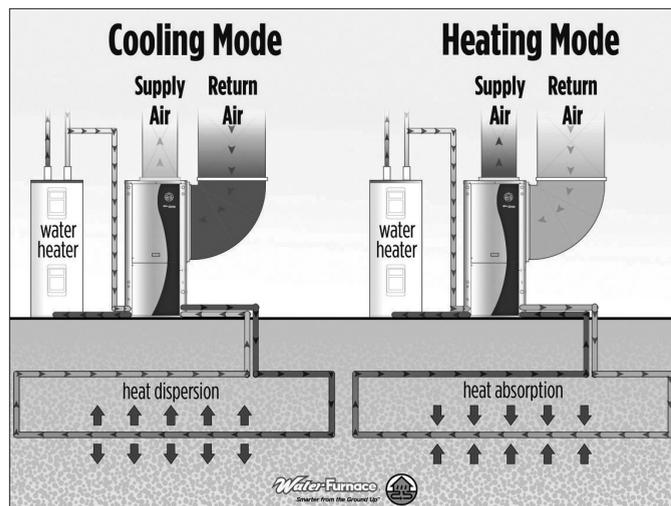
Another summertime advantage is free hot water when the geothermal heat pump is cooling your house. Waste heat is diverted to your water heater.

The initial cost of installing a geothermal heat pump is significantly more than a standard air-to-air heat pump. But the federal energy tax credit, which provides a 30-percent tax credit covering the entire cost of installing a geothermal heat pump, makes the initial expense more affordable.

To qualify for the credit, the efficiency of the unit must meet or exceed Energy Star requirements and be installed after December 31, 2007, and before December 31, 2016. Units installed in 2008 were subject to a \$2,000 cap on the credit, so if you already have installed one during 2008, you can amend your 2008 taxes and still take the credit.

For any units installed in 2009 through 2016, you can take advantage of the full 30-percent tax credit.

File for the credit by completing the Renewable Energy Credits subsection on your tax return forms. No proof of purchase is required; however, in case of an audit, keep a detailed invoice of your purchase. The contractor who sold and installed the product should list the purchase as a "Geothermal Heat Pump" on the invoice and note that it "exceeds requirements of Energy Star program currently in effect." ■



The schematic shows how a geothermal heat pump works during summer and winter.

Photo courtesy of WaterFurnace..



To ask a question, write to **James Dulley**, Energy Report, 6906 Royalgreen Dr., Cincinnati, Ohio 45244, or check his Web page, [www.dulley.com](http://www.dulley.com).

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