

# Geothermal Heat Pumps (GHPs)

## In a Nutshell

Geothermal heat pumps use the Earth's relatively constant temperatures for indoor heating and cooling. Only a few feet below the surface, temperatures stay relatively consistent and do not fluctuate. This means that during the summer the pumps cool your house and in the winter they heat it. Geothermal energy is an example of [renewable energy](#) and is also an [energy efficient solution](#). A [home energy audit](#) can help you identify other energy efficient technologies, including [passive solar](#) (another solution that draws from the Earth's natural heating).

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## The “How To”

Geothermal Heat Pumps are designed to cool in the summer and heat in the winter, using the constant temperature just below the surface of the Earth. In most parts of the continental United States, sub-grade temperatures vary between 45 and 75 degrees.

The installation of a geothermal heat pump system is as simple or as complicated as any home or building improvement project, which is highly dependent on the case-by-case specifics of the situation. The U.S. Department of Energy [offers an overview](#) of the technology, design, and reasons for the use of this technology. They also provide a [buying guide](#) for the process of working with a contractor, designing your system, and the installation process.

There will be a [series of decisions](#) related to:

- Available land and geology
- Type of system:
  - Closed Loop
  - Horizontal
  - Vertical
  - Pond/Lake Access
  - Hybrid Systems
- Long-term Maintenance Plans

## Planning & Zoning

As part of OneSTL, St. Louis County drafted [ordinances](#) that could be used for alternative energy including geothermal heating. For local governments their primary role is assessing their local regulatory code environment and ensuring municipal/county building codes permit geothermal systems. In [Rebuilding America: APA National Infrastructure Investment Task Force Report](#) published in 2010, the American Planning Association highlights the importance of geothermal systems as part of a diversified energy production system, with implications for local governments.

Cities or counties may want to look into actively promoting the use of alternative energies. [Green Teams](#) and other advisory panels can also work with a local government to lead community efforts.

## Dollars & Cents

### *The Economics & Cost of Geothermal*

The U.S. Department of Energy offers a review of [the economics of installing a geothermal heat pump system](#), including links to state and local incentive and tax credit programs. There is [anational database](#) of incentives for all types of renewable energy resources. In addition, many regional HVAC and building contractors can perform a structural and site assessment and provide not only installation cost estimates but also long-term savings forecasts.

### *Financial Impact on Local Government*

Local governments may choose to install Geothermal Heat Pumps in their buildings. Beyond that, cities must be sure to properly enforce building codes that concern geothermal energy. Although only requiring staff time, the initial evaluation of municipal codes for geothermal or other renewable energy technologies can be extensive. However, there is generally little cost to a city or county other than staff time. Once codes are adopted and established, managing them and performing inspections is integrated into on-going operations. Cities may want to consider specialized training for their inspectors on what to look for when inspecting these pumps.

## Measuring Success

### *For the Homeowner*

As with any energy-efficiency improvement, the ultimate success-metric for a geothermal heat pump system is the quality of HVAC service compared against the cost savings yielded. Geothermal systems are safe and reliable with strong track records in the heating and cooling industry. By working with your contractor and analyzing your utility bill histories, you can design a system to track and monitor your energy cost savings over time. Additionally, the U.S. Department of Energy offers [a fact sheet](#) with links to other resources that describes the overall effectiveness of geothermal systems.

### *For a Local Government*

Ultimately, the success of these projects will largely be a homeowner's success. A city or county can be more engaged by creating a building permit tracking system within existing systems that identifies geothermal heat pumps, as well as other renewable energy technologies, at homes and businesses in the community. A local government could monitor the increase in installation and use of such technologies over time. Public information campaigns could be evaluated for effectiveness and increases in requests for information and the installation of such systems by residents. In individual cases, a mayor, city council/county board, or other individuals within the community may want to publicly recognize homeowners with particularly energy efficient homes. Some communities have found success with home tours featuring properties that are particularly "green" and/or energy efficient. If the community begins to have a high percentage of energy efficient homes it may want to work with the local utility to estimate the cost savings and pollution reduction associated with the community's efforts - such case studies could likely yield regional if not national media

attention.

## Discover More

The U.S. government's Energy Star program offers very detailed information on specific [geothermal heat pumps](#).

The [Geothermal Alliance of Illinois](#) offers resources for geothermal heating and cooling in Illinois.

The [Illinois Geothermal Coalition](#) at the University of Illinois at Urbana-Champaign published a [white paper](#) examining technological solutions for geothermal energy, focusing on building heating and cooling for residential, commercial, and educational sectors.

## Case Studies

### Geothermal Heat Pumps in St. Louis County

#### Contact

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#### Description

Geothermal heat pumps have been permitted in the County for some time. We included them in our sustainability updates because we wanted people to know that they are allowed, much like solar and wind turbines.

#### Cost

There are permit fees associated with geothermal heat pumps.

#### Lessons Learned

The updated ordinances have not been adopted, so I can't tell you pros or cons at this point.