Ground Source (Geothermal) Heat Pumps for Wisconsin Homes, Businesses and Schools

FACT SHEET

For more information, call 800.762.7077 or visit focusonenergy.com

Here in Wisconsin we have a safe, reliable and affordable source of efficient energy right beneath our feet. The stable temperature of the ground can be used to efficiently heat and cool our homes and businesses. A ground source heat pump system is arguably the most efficient technology for heating and cooling Wisconsin homes and buildings.

HEAT PUMP SYSTEMS

Ground source (geothermal) heat pump systems consist of a series of underground tubes, other heat exchangers, electric heat pump units and ductwork or hydronic tubes that run throughout the building. The underground heat-transfer tubes are assembled in either a horizontal or vertical configuration, offering flexibility for space issues. Heat is transferred through the tubes, taking advantage of the fairly constant temperature beneath the earth's surface. In winter, circulating fluid in the tubes absorbs heat from the earth and delivers it to the heat pumps inside the facility. The heat pump boosts the temperature of the fluid, which heats the building. In summer, the process is reversed. Refrigerant in the heat pumps absorbs excess heat from the building then transfers it into fluid which is circulated through tubes in the ground where the heat is expelled. Ponds and lakes can also be used as stable heat sources and heat sinks.

These systems are used in homes, offices and schools throughout Wisconsin and the United States. Ground source heat pump systems provide exceptionally efficient heating, air conditioning and, in some cases, domestic hot water. When considering a ground source heat pump, take into account measures such as the addition of energy recovery ventilators, increased insulation, air sealing, and other building improvements that will increase the effectiveness of the system and make it more cost effective.

HOMES

Wisconsin homeowners can save energy costs year-round, conserve energy, and reduce home maintenance with a ground source heat pump system. The underground heat-transfer tubes are safely installed out of sight in the yard. Homeowners can also receive the benefit of supplying much of their home's hot water with this system, further reducing energy costs.

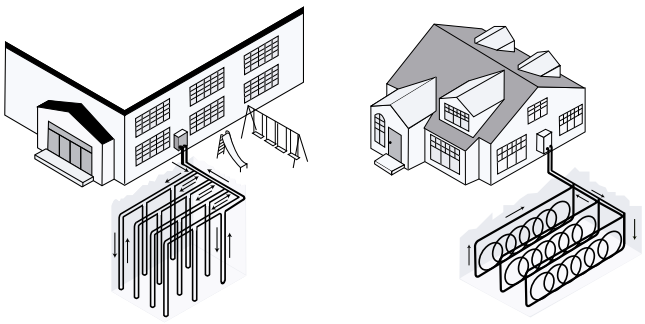
Ground source heat pump systems require no direct use of natural gas or propane and may cut total energy consumption. While they use more electricity than conventional systems that burn fossil fuels, most homeowners experience a decrease in net energy expenses.

It is difficult to assign a standard cost and energy savings estimate to homes with ground source heat pump systems due to the number of variables involved in installation. But models show that a typical home with a five-ton cooling load could save $540 in energy costs annually, even with the increase in electricity use. While the operating cost savings can be attractive, potential customers should consider the high cost of installation compared to traditional heating and cooling systems.

This high school in Fond du Lac, Wisconsin uses a ground source heat pump system (pond loop) for heating and cooling.

SCHOOLS

Wisconsin schools can benefit from ground source heat pump systems as well. Not only can they cut energy costs and adopt efficient heating and cooling practices, they can also increase comfort, lower maintenance, and save space. Many schools choose this technology because it allows individual room control to improve comfort in the classroom.



Ground source heat pump systems can save energy and money in residential and commercial settings.

Temperature control can be applied to heat or cool an entire building or just one room. With their long service life, ground source heat pump systems easily pay for themselves despite a higher up-front cost.

Several Wisconsin schools have taken advantage of this technology. For example, Fort Atkinson School District, a strong supporter of energy efficiency and renewable energy, has adopted geothermal and other energy efficient technologies. Several of its schools, including Barrie, Rockwell, Purdy, and the Fort Atkinson Middle School, have all implemented ground source heat pump heating and cooling systems. With the help of Focus on Energy, the district received financial incentives of $96,474 to fund new systems which are projected to save more than $30,000 annually. Other schools implementing ground source heat pumps include Fond du Lac High School, Evansville and Northland College.

BUSINESSES

Ground source heat pump systems can help Wisconsin businesses become more competitive. Because these systems cost less to run, businesses have more money to spend on other priorities. Lower heating and air conditioning costs can help make office leases more attractive. Savings can be invested elsewhere in the building or on other income-generating opportunities.

While ground source heat pump systems cost more up front, costs are starting to become more competitive with traditional heating and cooling systems. There are usually no roof-mounted components, which may reduce roof maintenance expenses. Because the systems may have fewer mechanical components, they can reduce operation and maintenance costs. The ground source heat pump systems have smaller space requirements than traditional systems and in many cases, the mechanical room can be eliminated, resulting in a significant decrease in construction costs and increase in available space.

The system has the ability to heat or cool the entire building or control temperature room by room. The system also allows the building to be more efficient by simultaneously cooling large occupied rooms, such as conference rooms or banquet halls, while heating other areas of the building with the excess heat.

The Schlitz Audubon Nature Center in Milwaukee employed a ground source heat pump heating and cooling system and heat recovery ventilation system in its new education and visitors building. With the help of Focus on Energy, the ground source heat pump system incorporated 90 130-foot-deep bore holes filled with piping to transfer heat to and from the building. This system is divided into 22 controllable zones, allowing staff to adjust the heating and cooling in specific building areas, saving energy and enhancing comfort.

With the number of variables involved in ground source heat pump system installations, it is difficult to offer an exact value of energy savings. However, in general, a typical office building with a 50-ton cooling load could see annual energy cost savings of about $8,200. The building will save gas while its electric use increases. But with natural gas priced at a higher rate than commercial electricity, a customer would see significant annual energy savings and the higher initial cost of the geothermal heat pump system may be offset by a positive cash flow from day one.

CONSIDERATIONS BEFORE INSTALLING

- The economics of ground source heat pumps depend largely on the time horizon and future trends of the electric and natural gas or propane prices.
- The success of a ground source heat pump system depends largely on the design of the ground (or pond) heat-transfer loop. Heat-transfer loops positioned more deeply, or with ground water (or in a pond or lake water) tend to perform well.
- Work with a well-established design and installation team. Focus on Energy recommends AEE Certified GeoExchange Designers (CGD) or professional engineers specifically trained in geothermal design, and IGSHPA Certified Geothermal Installers.
- Focus on Energy also recommends getting three bids and checking references.

FOR MORE INFORMATION

Focus on Energy
Contact Focus to learn more about smart energy choices and potential cash incentives. Call 800.762.7077 or visit focusonenergy.com for more information.

Wisconsin Geothermal Association
Call 866.GEO.7757 or visit wisgeo.org

Geothermal Heat Pump Consortium
Visit geoexchange.org

Focus on Energy works with eligible Wisconsin residents and businesses to install cost effective energy efficiency and renewable energy projects. Focus information, resources and financial incentives help to implement projects that otherwise would not be completed, or to complete projects sooner than scheduled. Its efforts help Wisconsin residents and businesses manage rising energy costs, promote in-state economic development, protect our environment and control the state's growing demand for electricity and natural gas. For more information, call **800.762.7077** or visit **focusonenergy.com**.

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