Energy Efficiency Tax Credits

Ground-Source Heat Pumps

THE TERM "GEOTHERMAL" IN MONTANA usually brings to mind our state's well-known hot springs. From an energy-production standpoint, these hot springs offer modest potential. But useful energy can also be gleaned from less glamorous sources, such as abandoned oil, gas and water wells but perhaps most importantly from the ground around our homes.

The earth is a spectacular reservoir of heat, both from the sun and from deep within the planet's crust. At a modest depth of about eight feet at our latitude, temperatures stabilize and a low-grade heat source is available for extraction. Water from wells, ponds and streams is also considered a resource. The most remarkable feature of geothermal heat pump systems is that the geological resource is universally available. Every building sits on the ground after all — and when a system is designed properly, the resource remains totally renewable.

How it Works

Extracting heat from a seemingly cold source like the ground seems counterintuitive — the temperatures we are talking about range around 40 to 52-degrees Fahrenheit. Yet, geology keeps these sources at an almost constant temperature year-round. Heat can be withdrawn from geothermal sources and efficiently delivered to a living or work space. Further, many systems can be reversed, using the geological source to provide summertime space cooling.

Heat pump technology is akin to the workings of a home refrigerator, albeit in a backward way. Typically a "closed loop" of piping containing a glycol (anti-freeze-type) solution is buried in long, deep trenches where it absorbs the ambient ground temperature. The solution is then pumped into the building where its low-grade heat interfaces with a closed-loop of refrigerant. Like a refrigerator operating in reverse, the low-grade heat of the glycol solution causes the refrigerant to evaporate. The gas form of the refrigerant is then compressed and heat is drawn off as it condenses. The cooled glycol solution, having given off much of its heat, is pumped off to the trenches where it again absorbs the ground temperature, completing the closed loop cycle.

Systems that employ wells may dispense with the glycol solution altogether. Water is withdrawn from a well and interfaces with the refrigerant as described above. The cooled water is then reinjected into the same well, or more commonly a separate well or a drainage field. These systems and ones like it are called "open-loop," since the water has an intake and a discharge. A great variety of horizontal and vertical designs have grown around the open and closed loop systems. A third general variety, called direct exchange, uses piped refrigerant as the medium to collect the latent ground heat. See the Reference section for more detailed information about the various systems available for heat pumps.

Ground-source heat pumps can provide very efficient space heat to residential and commercial buildings. Operating costs are largely limited to the electrical pumps, compressors and condensers. According to industry sources, every kilowatt of electricity used to operate the system yields four to five kilowatts worth of heat, depending on the source temperatures. The low cost to heat building spaces over the years is unrivaled among competing systems.

As cheap as these systems are to operate, however, ground-source heat pumps are expensive to install. A great deal of plastic pipe is typically laid in trenches around or under a structure. When wells are employed, the depth is often much greater than is typical for a domestic water supply. Ponds and streams, while good geothermal sources, are rarely conveniently nearby, necessitating long insulated runs to the dwelling. Wells and other water sources typically involve permitting, as does any discharge. Access to the geological heat source is an expensive aspect of this technology. The cost of compressors and motors add to the up-front cost of ground-source heat pumps.

Check with your electrical service provider to see if rebates or incentives are offered for these systems.

The Tax Credits

The federal government has deemed ground-source heat pumps an underused technology. A recent commissioned study by the U.S. Department of Energy (DOE) claims that geothermal heat pump technology has the potential “to offset about 35 to 40 percent of the projected growth in building energy consumption between now and 2030.”

Early in 2009, the federal government established a 30 percent tax credit against the cost and installation of these types of systems. The thinking is that the technology will get a boost and design, engineering and manufacturing costs will decrease.

There is no maximum dollar amount for the federal credit and, unlike some other federal energy tax credits, engineering and installation costs can be claimed. Never claim expenses for standard plumbing fixtures ordinarily required of a dwelling, however. As with wind and solar installations, the credit is uncapped — at least for the 2009 and 2010 tax years. The heat pump must be installed before Jan. 1, 2017.

Montana Credits

One Montana incentive allows up to a $1,500 credit for geothermal heat systems under energy conservation. To claim this credit, the system must be installed for a primary residence, either newly constructed or an established home. This credit may be claimed only one time, although unused portions may be carried forward to another tax year. To claim this credit, use Montana form ENRG-A.

A second Montana incentive for ground-source heat pumps falls under the rubric of alternative energy. This credit is against the cost of the alternative energy investment, but is capped at $500 per taxpayer. Like the federal credit, this state credit can be claimed for installations on vacation homes and second residences. To claim the credit, file Montana form ENRG-B for alternative energy systems. The alternative energy credit and the geothermal energy conservation credit cannot both be claimed for the same project.

Resources

Oak Ridge national Laboratories offers a roundup of its work on geothermal heat pumps at: www.ornl.gov/sci/ees/etsd/btric/ground-source.shtml. An excerpt from a recent report prepared for the Department of Energy is available at: www.geoexchange.org/forums/viewtopic.php?f=37&t=481

The Tax Incentive Assistance Project (TIAP) is **a** coalition of public interest nonprofit groups, government agencies, and other organizations in the energy efficiency field. Its website is designed to give consumers and businesses the information needed to make use of the federal income tax incentives for energy efficient products and technologies. The TIAP website can be accessed at: http://energytaxincentives.org/

The Database for State Incentives for Renewables and Incentives (DSIRE) offers good descriptions of state and federal incentives at its national website: www.dsireusa.org/**.**

The Montana Department of Environmental Quality (DEQ) offers the Energize Montana website at: www.energizemontana.com**.** This website offers renewable energy and energy conservation information, data and statistics and links to state and federal resources.

The Montana Department of Revenue offers a website that shows the overlap of state and federal energy tax credits at: http://recovery.mt.gov/revenue/default.mcpx. The site also offers links for additional information about state and federal conservation tax credits. You can also access the Montana tax form ENRG-B, which is used for alternative energy projects such as ground-source heating systems. The specific geothermal tax credit is form ENRG-A. The form ENRG-C is used for energy conservation work. The forms include questions and answers on the back.