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## **Ground source heating and cooling is a cost-effective source of energy management for buildings**

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There is a growing awareness of the problems associated with greenhouse gases generated by the burning of fossil fuels. And, a growing awareness of the benefits of "green, renewable energy" as an appropriate response to issues caused by excess energy consumption. Wind and solar power are becoming two of the more visible contributors to reduce reliance on fossil fuels, and to reduce production of greenhouse gasses. But there is another solution for heating and cooling almost any building, in any location on the planet: That solution is Ground Source Heating and Cooling. This type of energy management is sometimes referred to as geothermal heating and cooling, but to be clear, true geothermal energy utilizes heat located deep inside the Earth to generate steam and drive electric power plants. Ground Source Heating and Cooling, which is based on drawing from the earth's relatively constant surface temperature (i.e. for heat in the winter, and for cooling in the summer) is now becoming a popular, cost-effective source of renewable energy.

Ground Source Heating and Cooling relies on using the earth as a heat sink, by drilling and installing heat transfer wells into the earth's surface where the temperature remains relatively constant. Heat transfer (for heating or cooling) can be accomplished by installing either a closed loop system, a standing well system, or an open loop system. With closed loop systems, water or a mixture of water and food grade anti-freeze is circulated in a continuous closed loop; with a standing column, water is circulated continuously in a deep well without using continuous piping in the well; and with open loop systems, well water is pumped in a constant flow, then discharged to another location. All of these types of systems utilize the constant 50 degrees F that is available almost anywhere in the world.

More and more, closed loop systems are becoming the industry standard, and by circulating fluid through a Ground Source Heat Pump (GSHP) it is possible to create temperatures of up to 120 degrees! A heat pump can also be used to lower temperatures - in the same way that air conditioning or refrigeration systems work. The heat pump process extracts heat by flowing the 50 degree water through a coil that transfers energy via an environmentally friendly gas called R410A, which is the industry replacement for Freon gas. The 50 degree gas is compressed to a little less than half its original volume, thereby creating temperatures between 100-120F that can be used to heat buildings!

Depending on the fuel source that your power plant uses to generate electricity, installing a GSHP can reduce enough green house gas to equal the permanent removal of one automobile from our highways for every 1,500 s/f of heated/cooled space! Not only does it save on green house gas emissions, it saves a both energy, and money! Installing a GSHP in your home or business will save you 50-65% over traditional fossil fuel heating systems, and up to 80% over electric systems. Heat pumps use electricity only to circulate the ground loop, to compress the 50 degree gas, and to

deliver the hot or cold air to the space being conditioned.

The cost to install a GSHP system can be higher than a traditional HVAC system, but the cost is typically recovered within 5-7 years through energy cost savings. There are currently many state and federal tax incentives to install GSHP's - including a 30% federal tax credit for residential installations, and a 10% Federal grant for commercial installations. By taking advantage of these tax incentives it is now possible to achieve a much lower payback period than 5-7 years. And, once the cost of the system is paid, the energy cost savings are substantial. Many federal, state and local governments (e.g. schools and other institutions) are installing GSHP's across the country. Many in New England have been running successfully for years. For example, Gorham, Maine currently has a public school using a closed loop heating system, and is installing another one next year. Harvard and Yale have both made commitments to the technology and have multiple buildings being heated and cooled using GSHP's. In addition, there are numerous projects for public and private schools that are in the design and installation stage throughout our area. Liberty Island, N.Y. will soon be heating and cooling a concession area next to the Statue of Liberty with ground source heat pumps. The installation will eliminate the need to transport fuel by barge to the island while saving thousands of gallons of fossil fuel each year.

As you prepare to design and construct your next building, or if you realize that your current HVAC system is outdated and needs to be replaced, then you may want to evaluate the many benefits of using GSHP systems to heat and cool your building. There are very few locations where GSHP technology cannot be utilized; and there are few energy technologies available today that provide so many economic, environmental, and health benefits.

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