

# GeoExchange Heating and Cooling Systems: Fascinating Facts

- The U.S. Environmental Protection Agency has identified geothermal heat pumps as a technology that significantly reduces greenhouse gas and other air emissions associated with heating, cooling and water heating residential buildings, while saving consumers money, compared to conventional technologies. 1 For every 100,000 units of typically sized residential geothermal heat pumps installed, more than 37.5 trillion Btu's of energy used for space conditioning and water heating can be saved, corresponding to an emissions reduction of about 2.18 million metric tons of carbon equivalents, and cost savings to consumers of about \$750 million over the 20-year-life of the equipment.
- Geothermal heat pump systems, also known as “geoexchange,” are the most energy-efficient, environmentally clean, and cost-effective space conditioning systems available, according to the Environmental Protection Agency<sup>1</sup>.
- Geothermal heat pumps strengthen U.S. energy security. Every 100,000 homes with geothermal heat pump systems reduce foreign oil consumption by 2.15 million barrels annually and reduce electricity consumption by 799 million kilowatt hours annually.
- Geothermal heat pumps are efficient. The use of geoexchange lowers electricity demand by approximately 1 kW per ton of capacity.
- Geothermal heat pumps are environmental. They generate no on site emissions and have the lowest emissions among all heating and cooling technologies 1.
- Geothermal heat pumps save money. Schools now using geothermal heat pump systems save more than \$25 million in energy costs – meaning more money for books, equipment and teachers. Homeowners can save 25 to 50 percent on home electric bills compared to conventional heating and cooling systems. Electric bills for a 2,000 sq. ft. home can be reduced to as low as \$1 a day, using a geoexchange system.
- Geoexchange systems represent a savings to homeowners of 30 to 70% in the heating mode, and 20 to 50% in the cooling mode compared to conventional systems.
- EPA found that geoexchange heating and cooling systems can reduce energy consumption—and corresponding emissions—by over 40% compared to air source heat pumps and by over 70% compared to electric resistance heating with standard air-conditioning equipment.
- Geoexchange systems use the Earth's energy storage capability to heat and cool buildings, and to provide hot water. The earth is a huge energy storage device that absorbs 47% of the sun's energy – more than 500 times more energy than mankind needs every year – in the form of clean, renewable energy. Geoexchange systems take this heat during the heating season at an efficiency approaching or exceeding 400%, and return it during the cooling season.
- EPA found that, even on a source fuel basis – accounting for ALL losses in the fuel cycle including electricity generation at power plants – geoexchange systems are much more efficient than competing fuel technologies. They are an average of 48% more efficient than the best gas furnaces on a source fuel basis, and over 75% more efficient than oil furnaces. In fact, today's best geoexchange systems outperform the best gas technology, gas heat pumps, by an average of 36% in heating mode and 43% in cooling mode!
- The U.S. General Accounting Office estimates that if geoexchange systems were installed nationwide, they could save several billion dollars annually in energy costs and substantially reduce pollution<sup>2</sup>.

- Surveys by utilities indicate a higher level of consumer satisfaction for geexchange systems than for conventional systems. Polls consistently show that more than 95% of all geexchange customers would recommend geexchange to a family member or friend.
- Geexchange systems represent a savings to homeowners of 30 to 70% in the heating mode, and 20 to 50% in the cooling mode compared to conventional systems.
- Today, there are now more than 900,000 geexchange installations in the United States. The current use of geothermal heat pump technology has resulted in the following emissions reductions
  - Elimination of more than 5.2 million metric tons of CO<sub>2</sub> annually
  - Elimination of more than 1.4 million metric tons of carbon equivalent annually
- These 900,000 installations have also resulted in the following energy consumption reductions:
  - Annual savings of more than 7 billion kWh
  - Annual savings of more than 36 trillion Btus of fossil fuels
  - Reduced electricity demand of 2.3 million kW
- The monumental impact of the current use of geothermal heat pump technology is equivalent to:
  - Taking more than 1,165,000 cars off the road
  - Planting more than 346 million trees
  - Reducing U.S. reliance on imported fuels by 19.3 million barrels of crude oil per year.

<sup>1</sup> Environmental Protection Agency, Space Conditioning: The Next Frontier, Office of Air and Radiation, 430-R-93-004 (4/93)

<sup>2</sup> General Accounting Office, Geothermal Energy, Outlook Limited for Some Uses but Promising for Geothermal, (6/94)