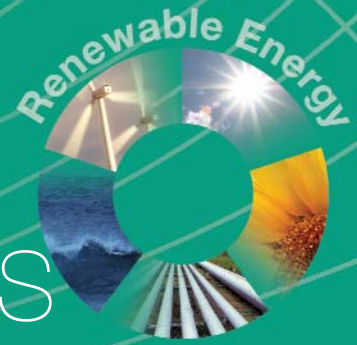


Geothermal Heat Pump Technologies



About the Canadian Geothermal Heat Pump Industry

Canadian winters are cold and harsh while summers can be very hot. This fact, combined with ever increasing energy costs, is driving Canadian firms to develop highly efficient and cost competitive geothermal heat pump (GHP) expertise and systems. The Canadian GHP industry can provide the following expertise:

- ❖ Manufacturing of a wide variety of residential and commercial GHP system products designed for use in cold climates;
- ❖ Small-scale residential and large-scale commercial GHP project feasibility studies, design, engineering and construction;
- ❖ A developed network of dealers and distributors of GHP systems and peripheral components;
- ❖ Design, manufacturing and installations of solar, and geothermal hybrid systems.

What Is Geothermal Energy?

Heat contained underground or underwater represents a significant and mostly untapped renewable energy resource. Three types of applications utilize geothermal energy: power plants, direct-use and GHPs. The former uses high-temperature hydrothermal fluids to generate electricity while direct-use refers to systems that make use of direct heat from the geothermal energy. GHPs extract low-temperature heat from below the frost line for space or process heat in the winter. In the summer, the same GHPs channel heat back below ground, under water, or to other thermal masses, to provide cooling. Storage tanks, arena ice and buildings are examples of types of applications that can make use of geothermal energy. All latitudes and longitudes in Canada have this constant renewable ground temperature resource.



A team of technicians getting ready to drill holes for a vertical geothermal energy system

GeoTility Systems Corp.



Government
of Canada

Gouvernement
du Canada

Canada



The Benefits of Geothermal Heat Pump Technology

Energy from the earth or deep waters is essentially free and never-ending, if managed appropriately. The use of GHPs presents the following advantages over the use of traditional energy sources:

- ✦ Lead to improved air quality and decreased greenhouse gas emissions by reducing the use of traditional fuels for heating and cooling;
- ✦ Free up traditional fuels, such as oil and natural gas, for export or for use in more energy-intensive applications;
- ✦ Provide heating and cooling at the lowest marginal cost of any system available;
- ✦ Provide flexibility in combination with other systems, such as solar thermal heating and hydronics or thermal storage.



Enertran Technologies

Installation of a closed lake loop for a commercial application

Canada's Track Record

In Canada, there are more than 40 000 GHP installations used for residential, commercial, institutional and industrial applications. Several thousand units are added each year. With this experience, Canadian firms have demonstrated over the years that geothermal technologies can be applied as a cost-effective solution that helps reduce energy consumption and improve energy efficiency.

The Canadian Experience



GeoSmart Energy

Geothermal heat pump system installation

Canadians have embraced GHP technology right across the country, enabling Canadian providers to become world class in this field. Canadian accomplishments include:

- ✦ Design, development and construction of an open loop energy exchange system that runs 4.7 kilometres into Lake Ontario to cool up to 4.6 million square metres of downtown Toronto office space — representing over 130 office buildings from Queen's Park to the Waterfront;
- ✦ Manufacturing, design and installation of thousands of GHP units over the past 30 years;
- ✦ Custom designed geothermal energy systems for everything from schools, recreation arenas and large university campuses to wineries, pools and fish farms;
- ✦ Design and manufacturing of small modular solar and geothermal systems, using a combination of geothermal and solar thermal technology for new homes;
- ✦ Geothermal energy systems for the 2010 Olympic Speed Skating Oval and Capilano Water Filtration Plant in British Columbia;
- ✦ Innovative cooling system that provides an alternative to traditional air conditioning used to cool building complexes.

Geothermal Power Generation

Geothermal power generation refers to a source of subterranean steam or hot water that can be used to power turbines in order to generate electricity. While most of the geothermal resources available to Canadians are low-temperature ones, there are known locations of high-temperature geothermal sources with significant potential for development, all located in Western Canada. Testing is underway to determine the viability of a geothermal power plant in British Columbia. Some Canadian firms are actively pursuing geothermal projects in other areas of the world, notably the United States and Central America.



Made-in-Canada Technologies



GeoTility Systems Corp.

A drilling project for a vertical borehole ground heat exchanger for a mixed use residential/retail building

Although the global market for GHP technologies is still very new, Canadian firms are well positioned to capture a significant share of this emerging market with their portfolio of technology strengths:

- ❖ Well established and thoroughly proven GHP technologies for applications in extreme climates;
- ❖ Off-the-shelf GHPs that are suitable for small scale residential to large-scale commercial and institutional applications;
- ❖ Established technology for geothermal hybrid applications in areas such as solar thermal applications.

Why Set Up Operations in Canada?

There is a large untapped market for geothermal systems in Canada. Thousands of new houses and buildings are built every year, representing great potential for expanding business. Canada's federal and some provincial governments offer incentives and tax benefits for companies installing GHPs in commercial and institutional facilities, as well as homes. This can make capital costs for these systems very competitive, especially when fuel savings are factored in.

Future Trends

Geothermal energy systems have a lower lifecycle cost than conventional systems, even in sub-arctic and arctic regions where the demand for heating is high. They also have long equipment lives — systems are often warranted for 25 years and ground loops for up to 50 years. The Canadian market for geothermal technology is currently underdeveloped, but many key factors are in place for further development: regulatory support, policy development, increased energy efficiency measures, budding consumer interest and increasing costs of traditional fuels.



For More Information

Canadian GeoExchange Coalition
www.geo-exchange.ca

**Industry Canada –
Canadian Renewable Energy Industry**
www.ic.gc.ca/rei

**Foreign Affairs and International Trade Canada –
Canadian Trade Commissioner Service**
www.infoexport.gc.ca

**Natural Resources Canada –
Canadian Renewable Energy Network**
www.canren.gc.ca

