

Geothermal

Geothermal energy comes from the heat stored in the earth's core, about 4,000 miles/ 1,609 kilometers below the surface, and heat from the sun warming the earth. The word geothermal originates from the Greek words *geo* (earth) and *therme* (heat).

The ground is a good insulator and stores the heat as energy. Pipes are run through a large area several feet underground. Water is heated as it passes through these pipes. New drilling technologies are being researched and developed to capture the heat in deeper areas.



How Geothermal Energy is Formed

Magma (layers of melted rock from the earth's crust) deep in the earth's core heats nearby rock and rainwater that has seeped into the ground. Some of this hot water reaches the earth's surface in the form of geysers or hot springs. But most stays trapped in porous rocks and cracks underground in what are called geothermal reservoirs.

Geothermal specialists drill into these reservoirs to access the hot water and steam and use it to generate electricity at geothermal power plants. The heated water and steam produce enough power to spin turbine generators that make electricity.

Geothermal heat pumps use the earth's relatively stable underground temperature to heat and cool buildings with very little energy use or environmental impact. The pumps, which use pipes buried next to buildings, circulate water or other liquids to either heat the buildings using energy from the earth's crust or cool the buildings by pulling heat from them and transferring it to the earth.

This form of heating and cooling is used in the US, Sweden, Romania, Japan and other countries around the globe.

Uses for Geothermal Energy

Geothermal energy can be used directly to:

- heat buildings
- grow crops in greenhouses
- melt snow on sidewalks
- pasteurize milk
- wash wool

- aid aquaculture, such as breeding fish
- spin a turbine to generate electricity

Demand for Geothermal Energy

More than 20 countries around the world use geothermal power in some capacity. The countries currently producing the most electricity from geothermal reservoirs include the US, New Zealand, Italy, Iceland, Mexico, the Philippines, Indonesia and Japan. These natural reservoirs can be found in places where magma has risen near the Earth's surface (and where it has even broken through the surface in the form of lava).

Geothermal heat pumps can be used virtually anywhere, since the temperature just under the earth's surface stays relatively constant everywhere.

Technology is being developed to expand the use of geothermal energy. For example, many areas of the planet sit atop hot dry rock—no water, but plenty of heat. Scientists are working on "enhanced geothermal systems" that would pump water into this rock, break it up and produce steam to power turbines and produce electricity. And as advanced drilling capabilities are discovered, more and more geothermal energy may become available.

Potential for geothermal energy also lies in oil and gas fields already in production. Many existing oil and gas reservoirs contain hot water that could be used to produce electricity and fuel at the same time!

In the US, 2009 legislation allocated \$400 million for the Department of Energy's Geothermal Technologies Program, which will go toward exploring new geothermal capabilities for the future.

History of Geothermal Energy

People have used geothermal power for thousands of years. The ancient Romans used geothermal water for medicinal purposes, from bathing in hot springs to treating skin ailments. Native Americans and New Zealand's Maori people have used the earth's hot water for cooking for centuries. In the last 50 years, people have improved the techniques and technology used to harness geothermal power for electricity and heating.

10,000+ years ago - Ancient peoples use hot springs for bathing and heating.

1904 - The first dry steam geothermal power plant was built in Larderello in Tuscany, Italy. The Larderello plant today provides power to about 1 million households.

1960s - The United States' first large-scale industrial geothermal energy power plant is built, producing 11 megawatts of geothermal electricity.

Today - Geothermal power is generated in more than 20 countries. While it currently makes up less than 1% of the world's energy, geothermal power is on the rise, with six new plants going online in the United States in 2009.