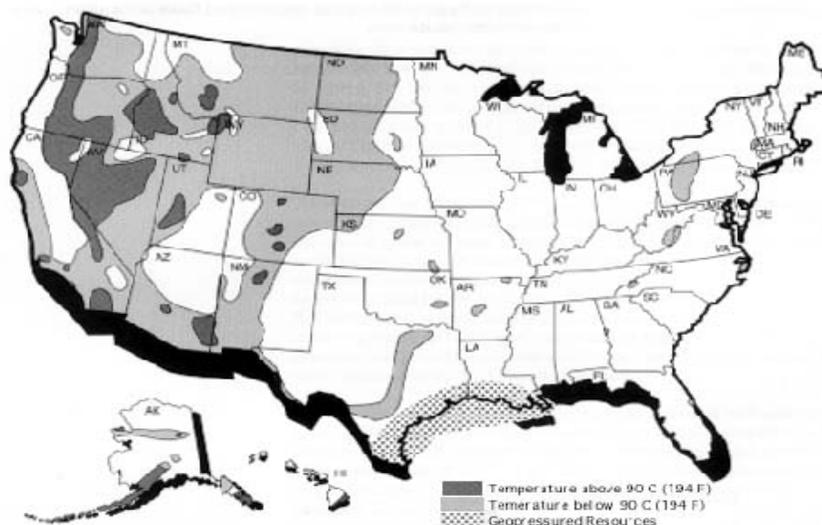


Geothermal Fact Sheet

- Geothermal energy comes from the heat within the earth. The word geothermal comes from the Greek words *geo*, meaning earth and *therme*, meaning heat.
- The outermost layer of the earth, the insulating crust, is broken into pieces called plates. These plates drift apart and push against each other in a process called plate tectonics. This process can cause the crust to become cracked or thinned, allowing plumes of magma to rise up into the crust. The magma can reach the surface (volcanoes) but most stays under the surface as geothermal heat.
- The underground heat can take 1000 to 1 million years to cool.
- In areas where there is underground water, the magma heats the water and creates either hot springs or underground reservoirs.
- Geothermal energy is renewable because water is replenished with rainfall and heat is continuously produced within the earth.
- Geothermal energy is harnessed by drilling wells into the underground geothermal reservoirs. The steam and heat is used to drive turbines in electric power plants.
- The water and steam from these reservoirs range in temperature from 250 to 700 degrees Fahrenheit.
- The hottest geothermal regions are found along major plate boundaries where earthquakes and volcanoes are concentrated. Most of the world's geothermal activity occurs in an area known as the Ring of Fire, which rims the Pacific Ocean bounded by Indonesia, the Philippines, Japan, the Aleutian Islands, North, Central and South America.
- Geothermal energy accounts for 0.3% of the energy in the U.S. That is enough to provide power to 3 million households.
- It costs 4.5 to 7 cents per kWh to produce electricity from the average geothermal system.
- Geothermal steam and hot water contain naturally occurring traces of hydrogen sulfide and other gases that can be harmful in high concentrations. Sometimes these gases are extracted and used to make marketable products like liquid fertilizer.
- Geothermal plants release only 1% of the carbon dioxide emitted by comparable fossil fuel plants.
- The earth has no shortage of geothermal activity, but not all geothermal resources are easy or economical to use.

- Today there are geothermal power plants in 21 countries, providing electricity to 15 million people.
- There are four types of geothermal power plants.
 - Flashed Steam Plants
 - Most geothermal power plants are flashed steam plants.
 - Hot water from production wells explosively boils, or flashes, into steam when it is released from the underground pressure of the reservoir. The force of that steam is then used to spin the turbine-generator.
 - Dry Steam Plants
 - The steam from the geothermal reservoir shoots directly through a rock-catcher into the turbine-generator.
 - The rock-catcher protects the turbine from small rocks that may be carried along with the steam from the reservoir.
 - The Geysers dry steam reservoir in California has been producing electricity since 1960 and produces enough electricity to supply a city the size of San Francisco.
 - Binary Power Plants
 - Binary power plants transfer heat from geothermal hot water to other liquids to produce electricity.
 - Geothermal water is passed through a heat exchanger, which transfers the heat to a working fluid (isobutane or isopentane) which boils at a lower temperature than water. The vapor is then used to spin a turbine-generator. This way electricity can be produced from lower temperature reservoirs.
 - Hybrid Power Plants
 - Flash and binary systems are combined to use both the steam and the hot water from a reservoir.
 - A hybrid system provides about 25% of the electricity to the big island of Hawaii.
- Water from geothermal reservoirs is used in many places to warm greenhouses that grow flowers, vegetables, and other crops.
- Heat from geothermal water is used worldwide for drying cloth, drying fruits and vegetables, washing wool, manufacturing paper, pasteurizing milk, and drying timber products.
- In Klamath Falls, Oregon, hot water is piped under sidewalks and roads to keep them from freezing in the winter.
- Geothermal Energy for heating and cooling

- The most widespread use of geothermal resources is to heat buildings.
- In the capital of Iceland, 95% of the buildings use geothermal heat.
- Geothermal systems at home
 - Use the Earth's constant temperatures to heat and cool buildings. These heat pumps transfer heat from the ground to buildings in the winter and vice versa in the summer.
 - Geothermal systems cost more to install than conventional heating and cooling systems but they can reduce heating costs by 50-70%. Over the lifetime of the system, the average homeowner can anticipate saving about \$20,000.
 - Today more than 300,000 homes and building in the U.S use geothermal heat exchange systems
 - The U.S. Environmental Protection Agency has rated geothermal heat pump systems among the most efficient heating and cooling technologies.
- The most important economic aspect of geothermal energy use is that it's homegrown — using geothermal energy reduces our dependence on foreign oil, creates jobs here in the U.S., and more favorably balances our global trading position.



Information gathered from:
 The NEED Project Secondary Energy Infobook
<http://www.eere.energy.gov>
<http://www.energy.gov>
http://www.ucsusa.org/clean_energy/renewable_energy
<http://www.darvill.clara.net/altenerg/geothermal.htm>