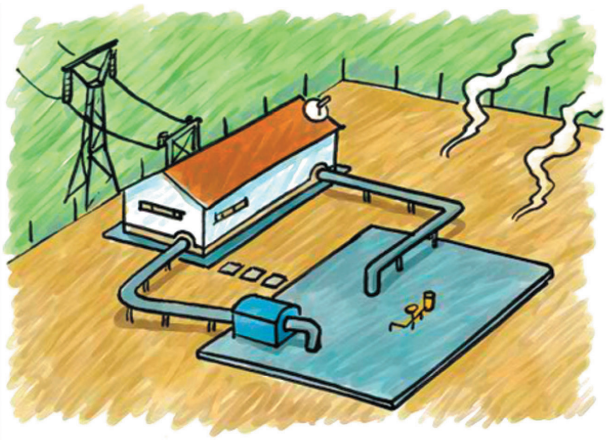
Geothermal power



Geothermal power (from the Greek words geo, meaning 'earth', and therme, meaning 'heat') is energy generated from heat stored beneath the Earth's surface, or by the collection of heat absorbed in the atmosphere and oceans.

Turbines and generators can be used to convert heat from thermal water into electricity. The largest group of geothermal power plants in the world is located in The Geysers, a geothermal field in California. Iceland also generates a lot of heat from its thermal waters. In 2007, geothermal power supplied less than 1 percent of the world's energy.

Using geothermal energy causes thermal pollution, but this problem is characteristic of other energy sources as well. A specific problem associated with this type of energy is that geothermal waters often have high salinity and cause active corrosion. This dictates the need to use special materials, as well as the need for frequent maintenance shutdowns. In addition, if water temperatures are insufficient to produce the superheated steam necessary for the turbines, different heat-transfer materials need to be used (e.g. liquid sodium). These materials are expensive, cause corrosion, and can actually pose a threat to the environment.

Heat-pump systems are especially interesting and operate as follows:

- During the summer months, the Earth warms up and is able to store the heat for the winter because of its poor thermal conductivity and high thermal mass. A heat-pump system extracts and concentrates this low-grade heat from the air, ground or water to heat water or open areas. The energy output of this system is four times greater than the amount of energy expended to concentrate the heat.
- Surprisingly, heat pumps can also be used to cool spaces during summer. The heat pump extracts high-grade heat from a building and converts it into lower-grade heat that is then diffused back into the ground or atmosphere. A heat-pump system thus serves a threefold purpose: cooling air, heating air and heating water.

The first heat-pump system was installed in 1862 to extract heat from a lake in Austria. Improved technology and new designs are capable of increasing an already high level of efficiency.

Heat-pump systems can easily replace conventional methods of heating homes. As is typical for all energy efficiency products, these systems are characterised by an initial investment cost. It is therefore important that the size of the heat-pump equipment is appropriate for the size of the dwelling and the amount of heat loss. If the building is more than 20 years old, it is always cost effective to add extra insulation to further reduce heat loss.

A simplified heat-pump system using subterranean heat comprises:

- a ground heat exchanger;
- a heat pump, including two heat exchangers (an evaporator and a condenser) and a compressor;
- a collector;
- a heating/cooling distribution system; and
- a heating/cooling agent (or refrigerant), which is pumped through the system.