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GEOTHERMAL ENERGY

Geothermal energy is the natural heat of the earth stored deep below the earth's surface. The energy is found near areas where volcanic activity has taken place, either recently or many years ago. It can be in the form of steam, hot liquid, or hot dry rock. Wells drilled deep into the ground bring steam and hot water to the surface.

In areas where geothermal steam or hot fluids are thought to be within economic reach of drilling equipment, wells are drilled to bring the steam or hot fluids to the surface. The steam, or steam produced by the fluids in a heat exchange process, is used to drive a turbine generator to make electricity. Modern technology allows spent geothermal fluids and non-condensable gases to be reinjected back into the ground, eliminating surface disposal and air pollution.

GEOTHERMAL TECHNOLOGIES:

Exploration

Geological, geochemical, and geophysical techniques are used to locate geothermal resources.

Drilling

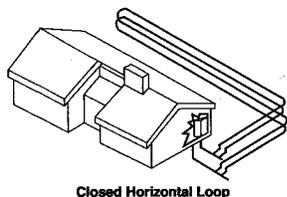
Drilling for geothermal resources has been adapted from the oil industry. Improved drill bits, slim hole drilling, advanced instruments, and other drilling technologies are under development.

Direct Use

Geothermal hot water near the Earth's surface can be used directly for heating buildings and as a heat supply for a variety of commercial and industrial uses. Geothermal direct use is particularly favored for greenhouses and aquaculture.

Geothermal Heat Pumps

GEOTHERMAL HEAT PUMP



Closed Horizontal Loop

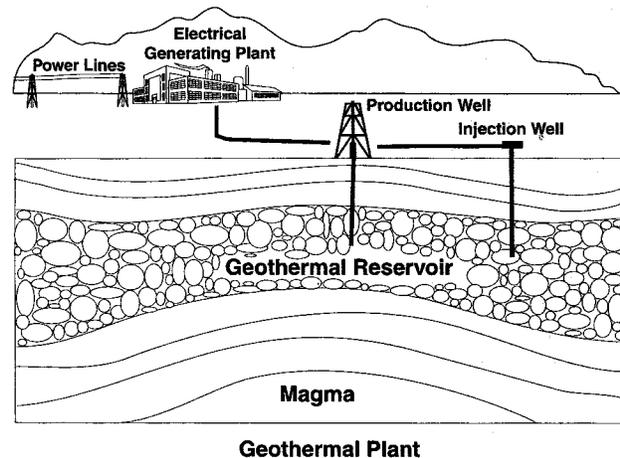
Geothermal heat pumps, or ground-source heat pumps, use the relatively constant temperature of soil or surface water as a heat source and sink for a heat pump which provides heating and cooling for buildings.

Electricity Production

Underground reservoirs of hot water or steam, heated by an upwelling of magma, can be tapped for electrical power production.

Advanced Technologies

Advanced technologies will help manage geothermal resources for maximum power production, improve plant-operating efficiencies, and develop new resources such as hot dry rock, geopressed brines, and magma.



ADVANTAGES AND DISADVANTAGES

Advantages: Geothermal energy can be used instead of fossil fuels to produce electricity. Replacing fossil fuels will reduce the amount of air pollutants that can cause acid rain and contribute to global warming.

Direct-use geothermal heat and some of its mineral by-products have been successfully demonstrated in aiding agricultural production; drying lumber, fruits and vegetables; assisting certain manufacturing processes; and for art purposes.

During normal operations, stringent permit conditions, state-of-the-art abatement systems, and process design should virtually eliminate unpleasant odors and mitigate noise impacts from new geothermal facilities.

Disadvantages: The exploration and development of geothermal resources can be permitted within conservation, agricultural, rural, and urban residential areas where some residents may not want geothermal activities to occur.

Geothermal wells are sometimes vented for a few hours to clear the well and pipelines resulting in a temporary release of steam and abated gases. Such events can be noisy for a short time. Some continuous low-level noise is also generated during normal power plants.

ADDITIONAL RESOURCES

Geothermal Energy Program: www.eren.doe.gov/geothermal/

Geothermal Education Office: www.geothermal.marin.org

www.crest.org