

Energy and Resources

It requires a lot of energy to power a world of seven billion people and counting. Both renewable and nonrenewable energy sources are essential. Renewable energy is energy that can be replenished from natural resources such as sunlight, wind, tides, hydroelectric energy, and geothermal energy. Nonrenewable energy resources are those that are not replenished or are replenished very slowly. Fossil fuels such as coal and gasoline are nonrenewable energy resources.

Fossil fuels have been in large supply and relatively cheap to access until recent years. Unfortunately, using these fuels produces pollution. When fossil fuels are burned for energy, they produce greenhouse gases, including carbon dioxide and methane. They also produce particulate matter and gases that contribute to smog and acid rain. It is not possible to combust fossil fuels without producing greenhouse gases.

Because of this, scientists are constantly studying ways to use renewable energy resources rather than harmful fossil fuels. These energy resources will contribute far fewer emissions and pollution. Often, the materials required for renewable energy technologies are very expensive, which is why they are not often used. However, one relatively inexpensive source of energy that is in widespread use is geothermal energy.



Most energy in the United States currently comes from fossil fuels such as coal (top) and oil (bottom).

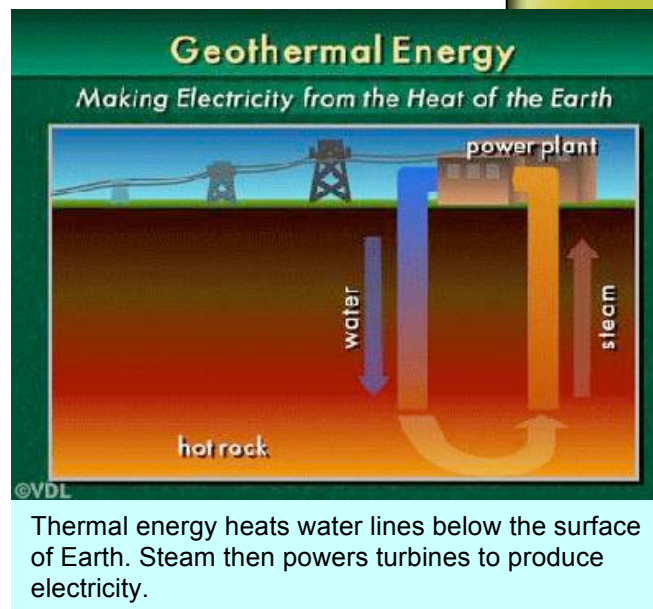
The Advantages of Geothermal Energy

Geothermal energy is the use of thermal energy from deep down in the Earth. It can be used on a small scale, such as heating homes, or a large scale, such as powering whole cities. Many regions have been taking advantage of this energy source. The advantages of geothermal energy is that it is long-lasting, low-maintenance, and inexpensive.

According to the Geothermal Energy Association, there is enough installed geothermal energy capacity to power more than 12 million typical households. The United States has more installed geothermal energy plants than all other countries. There is well over 3,000 megawatts of energy spread across eight states. Most are in California, with 40 plants producing about 2,400 megawatts, or enough to meet 5% of the state's electricity needs. Geothermal plants in Iceland, the Philippines, and El Salvador produce enough energy to supply more than 25% of each respective country's needs.

The Source of Geothermal Energy

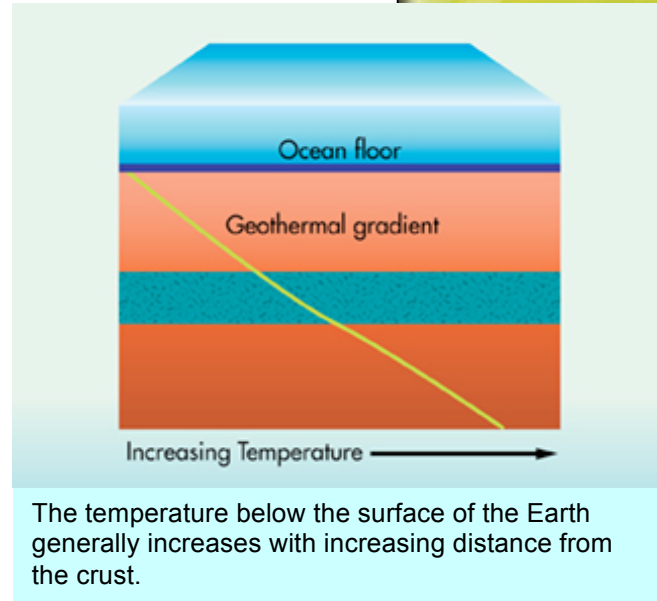
Earth is made up of crust, mantle, and core. Magma is a layer about 10 kilometers below the surface of Earth. This layer consists of molten rock, which constantly produces thermal energy. The source of the thermal energy is the decay of naturally-occurring radioactive materials and thermal energy left over from the formation of Earth. About 50,000 times more thermal energy exists in this layer than from all of the fossil fuel resources known to be available.



Geothermal systems vary in their use of naturally-occurring convection. They collect heated water from deep below Earth's surface or capture steam from below Earth's surface. Some systems use heat exchangers and sealed lines of chemicals that can transfer and hold thermal energy. Heated water or steam can be collected and used to drive electrical turbines, which then generate electricity. The system then returns the water to the ground.

The areas with the most thermal energy, and the highest temperatures, are near volcanoes. These areas typically occur where plate boundaries meet or at areas of thin crust, which allows thermal energy to pass through. The Ring of Fire in the Pacific Rim is known for having many volcanoes. Unfortunately, these areas are also prone to seismic activity, which results in earthquakes. The movement of magma also causes hot springs and geysers, where the water temperature at the surface can reach more than 200° C. The presence of seismic activity can make these places unsuitable for the construction of power facilities.

Fortunately, suitable thermal energy can be drawn from as few as three meters below the surface almost anywhere in the world. The U.S. Geological Survey estimates that there is a capacity of 8,000 to 73,000 megawatts of geothermal energy available across land in 13 states. They also determined that there could be more than 700,000 megawatts available from underground dry rock. The total estimated capacity is high enough that geothermal energy could one day supply all electricity needs in the United States.



QUESTIONS

1. What is geothermal energy?

2. What are some of the advantages of using geothermal energy?

RESEARCH PROJECT

Research the advantages of using geothermal resources in your community to meet an energy need, such as home heating or electricity. Record some of your findings in the space below. Then organize your findings into a written or oral report. Present the report to the class.