

Thermal Energy from the Sun and Earth

You might appreciate the sunshine peeking through the clouds on a chilly day. But you might not appreciate how important that sunshine is. The Sun is the source of most of the energy used on Earth. The movement of air and water, the kinetic energy of living things and objects, light, and sound—all of these can be traced back to energy that originated in the Sun. This energy is transferred from the Sun to Earth by electromagnetic waves.

At the end of *Learning Set 1*, you read about chemical energy that is stored in fossil fuels. Remember that fossil fuels are the remains of plants that lived millions of years ago. Plants obtain the energy they need by transforming light energy from the Sun into chemical energy stored in starches. So even the chemical energy stored in fossil fuels can be traced back to the Sun.

While fossil fuels will run out someday, the Sun will fortunately shine in the sky for another five billion years. So not only is the Sun the ultimate source of all of Earth's energy, it is also the best source of renewable energy, energy that is continually resupplied. Many devices today, from calculators to electronic street signs, run on solar energy. Scientists are working on ways to make the transformation of radiation from the Sun into electrical energy more efficient so that more and more devices can rely on energy from the Sun alone.

The Sun is a source of renewable energy that is far from Earth. However, radiation from the Sun can be kept from reaching Earth's surface by clouds. And in the middle of winter, Earth receives less energy from the Sun than in the summer.

However, there is a source of renewable energy that is much closer and is not dependent on the weather or climate. This is **geothermal energy** from Earth. The root word "geo" means Earth, and "thermos" means heat, so geothermal energy is literally "heat from Earth."

geothermal energy: energy that comes from the natural internal heat of Earth.



Hot springs are a source of geothermal energy.

This geothermal power plant in Iceland provides electricity to thousands of people.



Geothermal energy is thermal energy that comes from Earth's interior. This thermal energy is constantly being released at the surface, but it is released in greater amounts in certain locations. Volcanoes and hot springs are two examples of places that receive a large amount of geothermal energy.

In Iceland, where there are numerous cracks in Earth's crust, scientists have found ways to use the large amounts of available geothermal energy that is released through these cracks. Iceland is cold, but almost 90 percent of the energy needed to heat buildings and generate

electricity in Iceland comes from geothermal energy. The geothermal energy is absorbed by water or steam in pipes far underground. The water or steam is then pumped to the locations that need to be heated.

In the United States, California uses the most of this clean, renewable energy source. Even so, geothermal energy today provides less than 1 percent of the world's population's energy needs.

Reflect

1. What are examples of the use of thermal energy in your home? What processes do these examples use to transfer thermal energy from one location to another?
2. What are the advantages of geothermal energy? Why is it not used everywhere to heat homes and generate electricity?
3. Do you think thermal energy is a kind of kinetic energy or a kind of potential energy?