

Geothermal Energy

Students will learn about the basics of energy and focus on one renewable energy in particular: geothermal energy. Students will have the opportunity to play a game dealing with the different types of renewable and nonrenewable energy.

Grade Level : 3rd grade

Objectives:

- Students will be able to describe geothermal energy.
- Students will be able to define renewable and nonrenewable energy.

Materials:

- Print-offs of pages 4-9
- Small whiteboard and marker

Time Considerations

Preparations: 10 minutes

Activity 1– Energy: 30 min.

Activity 2– Energy Game: 20 min.

Related Activities:

Solar Transportation, Electricity from the Sun

Nevada Department of Education Standards

- **N.5.A Students understand that science involves asking and answering questions and comparing the answers to what scientists know about the world. N.8.A.3 Students know how to draw conclusions from scientific evidence.**
- **N.5.B Students understand that many people from all cultures and levels of ability, contribute to the fields of science and technology. N.5.B.2 Students know technologies impact society, both positively and negatively.**

Excellence in Environmental Education Guidelines

- **Strand 1-Questioning, Analysis and Interpretation Skills (A, G):** Learners are able to develop questions and simple explanations about the environment.
- **Strand 2.1-The Earth as a Physical System (B, C):** Learners are able to identify basic characteristics and changes in matter. While they may have little understanding of formal concepts associated with energy, learners are familiar with the basic behavior of some different forms of energy.
- **Strand 2.1—Environment and Society (C, D):** Learners understand the basic concepts of resource and resource distribution. Learners understand that technology is an integral part of human existence and culture.

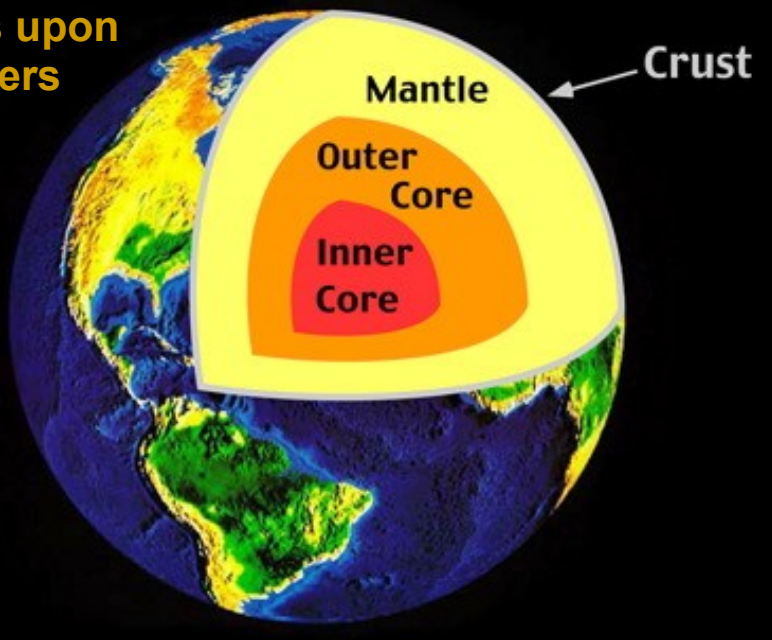
Background

The word geothermal is comprised of greek words geo, meaning earth, and thermal, meaning heat. Geothermal power uses heat that is generated deep within the earth. In some areas on earth, magma may be closer to the surface than in others. Volcanoes and Hot Springs are signs that magma is close to the surface. In those areas, magma can heat the ground to high temperatures. Geothermal plants harness this heat by pumping water into an area of hot rock. The geothermal reservoir within the

rock is pressurized and returns steam to the surface. The steam is used to turn turbines to make electricity. As the steam cools it condenses into water and is pumped back into the reservoir. Most geothermal processes do not consume fuel and contribute very little greenhouse gas to the atmosphere. The energy is also fairly cheap; new power plants can make electricity for approximately the same cost as coal plants. In this lesson, we will discuss energy, and in particular, geothermal energy.



Layers upon Layers



The mixture of rock and magma in the earth is the mantle. The crust is the surface layer. The crust can be a mile thick in places, and very thin in others.

Preparations

Collect the necessary supplies for this lesson and have them easily accessible. Have an open area available (preferably outside) to play the energy game.

Doing the Activity

Activity 1—Energy

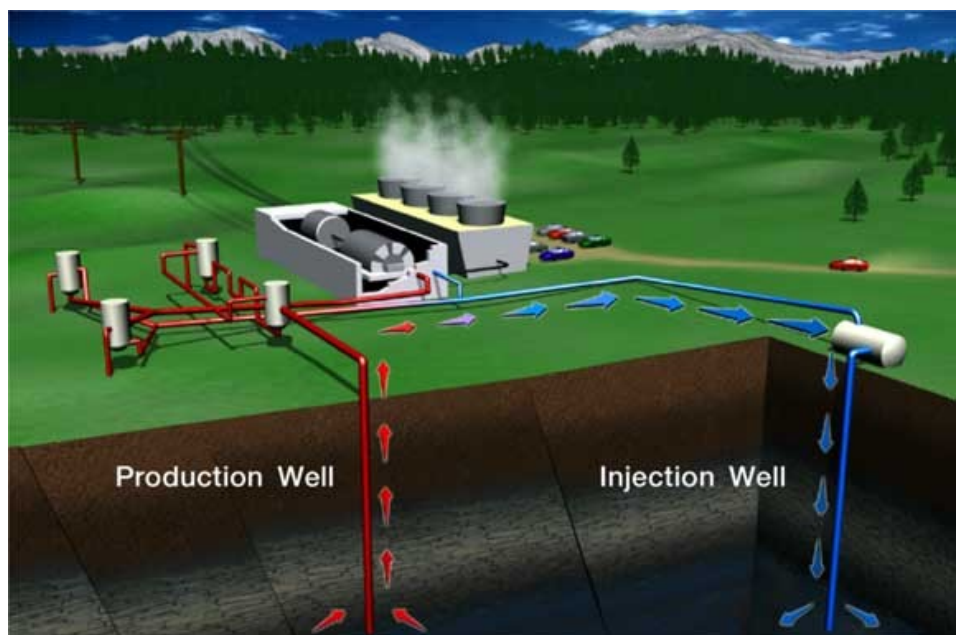
Energy produces a change of some kind; it can do things for us. Energy is the ability to do work. Energy can come in many different forms: light, heat, sound, and motion. Ask the students the following questions: Where does the hair dryer get its energy? (electricity) What kinds of energy does it make? (heat, motion and sound). Where does your teacher get his/her energy? (food). How does s/he use this energy? (to move, hear, see, think, stay cool/warm). Look around the room and see what else uses energy (Computer, clock, plants, lights, etc.). Tell the students that there are many sources of energy. Try to get them to come up with some of the sources that they use in their daily lives (wood for a fire-

place, natural gas/propane to heat their house, gasoline (petroleum product to run their cars). Use page 5 to show examples of the energy sources.

Energy sources can be broken up into two groups: renewable and nonrenewable. Renewable energy can be replenished in a short amount of time, and nonrenewable resources have limited amounts. Solar, wind, geothermal, hydro-power, and biomass are types of renewable energy (show students

page 6). Coal, natural gas, uranium and petroleum are types of nonrenewable energy (show page 7). Most of the energy that we use today comes from nonrenewable sources.

Today we are going to talk a little bit about one type of renewable energy that is becoming common in Nevada: geothermal energy (show page 8). Show the students how you can break up the word geothermal to understand its meaning a little better: “geo” means earth and “thermal” means heat. After you show them the breakdown of the word geothermal, ask the students where the energy comes from. Geothermal energy is heat that comes from inside the earth. Earth’s inside is very hot and sometimes that heat comes close to the surface (show page 9). The crust of the earth is the outermost layer. The next layer in the earth is the mantle. The mantle is made of semi-molten rock. This layer is where the heat that we use for geothermal power plants comes from. We can use this heat to warm our houses and to make electricity. When that heat is close to the surface, the rock becomes very hot and can be used to produce steam. The steam



Example of a Geothermal Plant.

can then be used to produce electricity.

Ask if the students have seen any geothermal power plants before. Many of them will have seen the Nightingale geothermal power plant that is just off of Highway 80 on the way to Reno. As with all energy sources there can also be a downside. Ask students if they can think of a downside to geothermal power. Many geothermal reservoirs are located in wild and scenic areas. Some geothermal waters contain harmful minerals which may be discharged. Some beautiful geysers and hot springs have ceased to flow after geothermal development. This has happened at Beowawe near Carlin, NV.

Activity 2—Energy Game

Tell the students that they are going to play a game dealing with the types of energy that they just learned about. Ask them if they remember the different types of non-renewable and renewable energy. List them on a whiteboard as they name them off.

Evaluations—

Ask the students what geothermal energy is. Where does it come from? (From the earth). What is being heated up? (Water). What form of energy is it? (Renewable). Ask the students for another example of renewable energy (Biomass, hydropower, wind, solar). Ask the students for an example of nonrenewable energy (petroleum, coal, natural gas, uranium, propane).

Extension Activities—

Have the students research the geothermal plants in Nevada. Have them write a short story about their findings.



Aerial view of Steamboat Springs Geothermal Plant in Montana.

Vocabulary

Crust: Outermost layer of the earth.

Energy: The ability to do work. Energy can come in many different forms: light, heat, sound, and motion.

Geothermal Energy: Energy that comes from heat in the earth.

Geo: Earth (Greek).

Inner Core: the solid iron-nickel center of the Earth that is very hot and under great pressure.

Mantle: Layer of the earth com-

posed of magma and rock.

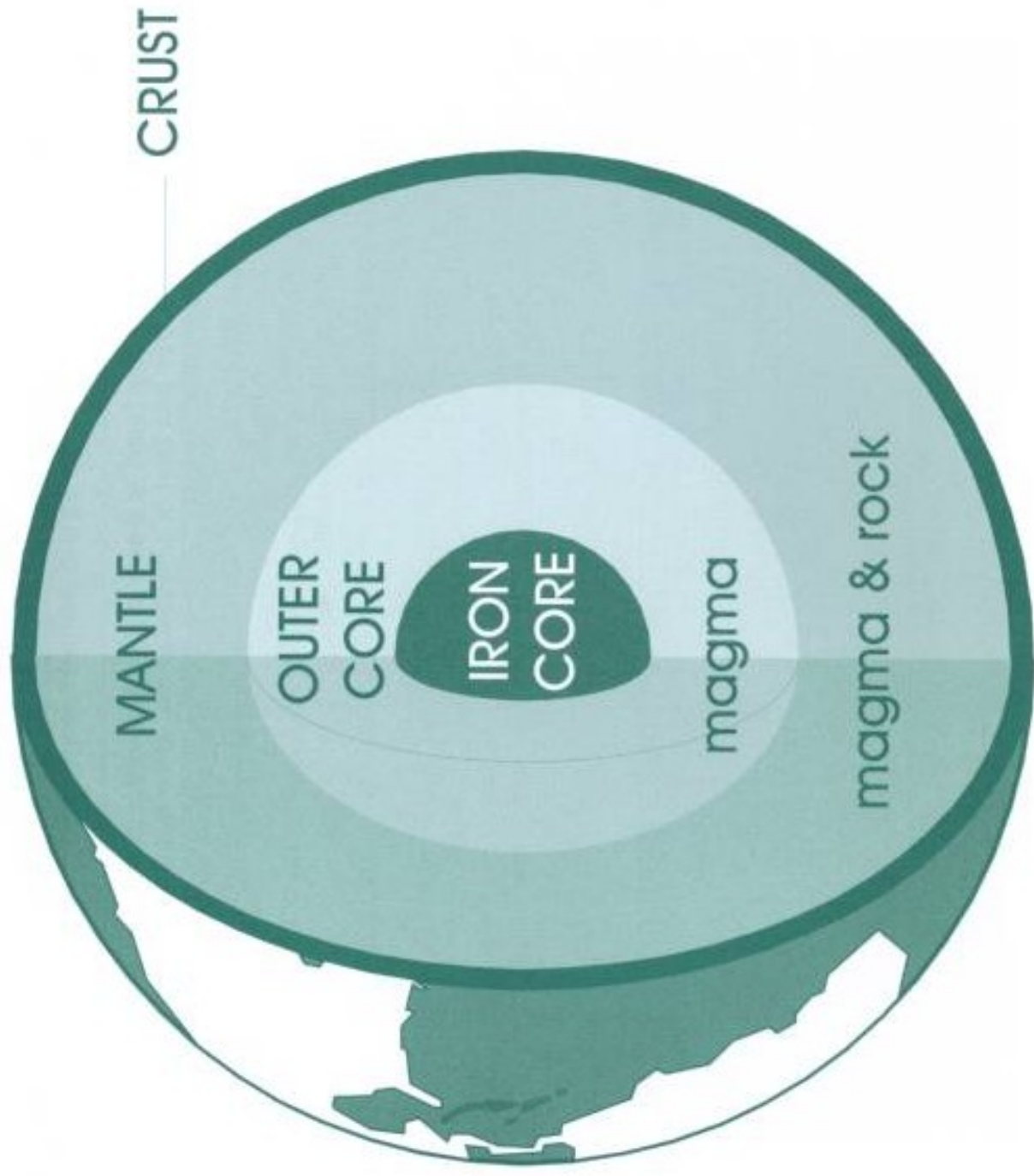
Nonrenewable Energy: Limited amounts of this type of energy, cannot be replenished in a short amount of time. Types of nonrenewable energy are: Petroleum, Coal, Natural Gas, Uranium, and Propane.

Outer Core: the molten iron-nickel layer that surrounds the inner core.

Renewable Energy: Energy that can be replenished in a short amount of time. Types of renewable energy are: Biomass, Hydropower, Geothermal, Wind, and Solar energy.

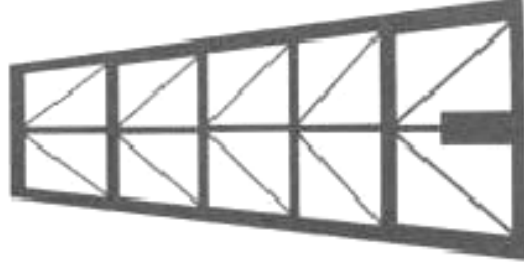
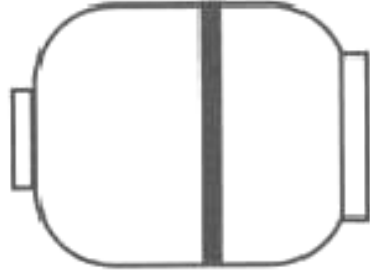
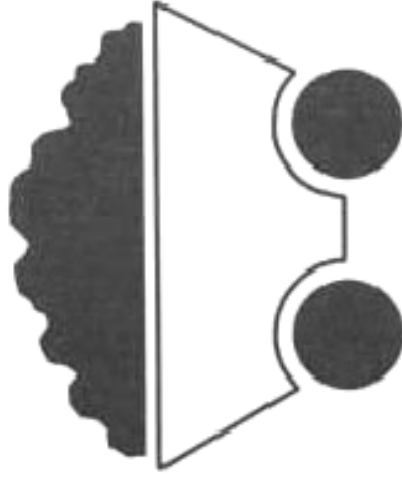
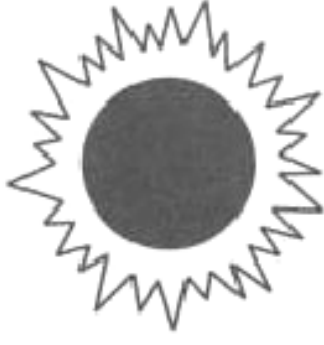
Sources—

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- Layers upon Layers. Accessed on 6 November 2008. <http://www.uvm.edu/~inquiryb/webquest/fa05/lkenney/earth.jpg>.
- Geothermal Plant. Geothermal Education Office. Accessed 6 November 2008. <http://geothermal.marin.org/GEOpresentation/images/img037.jpg>.
- Steamboat Springs Geothermal Plant. Accessed 6 November 2008. <http://montaraventures.com/pix/lbsprings-aerial.jpg>.
- Geothermal Map: <http://windsolarland.com/kb/Graphics/Geothermal/>
- Label the Earth Diagram and Worksheet: <http://www.enchantedlearning.com/subjects/astronomy/activities/label/labelearth.shtml>



The earth is made of layers.

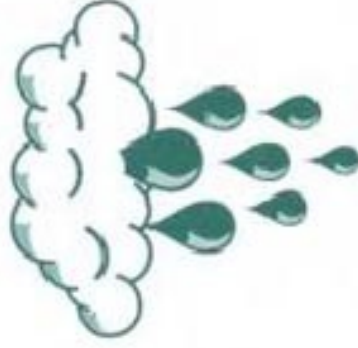
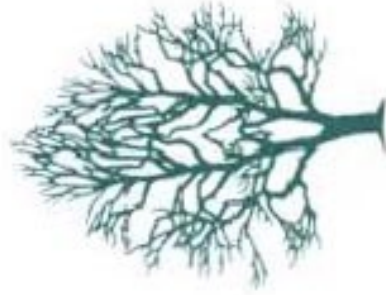
Energy Sources



We use many energy sources to do work.

Renewable

Re - NEW - able
Able to be NEW again

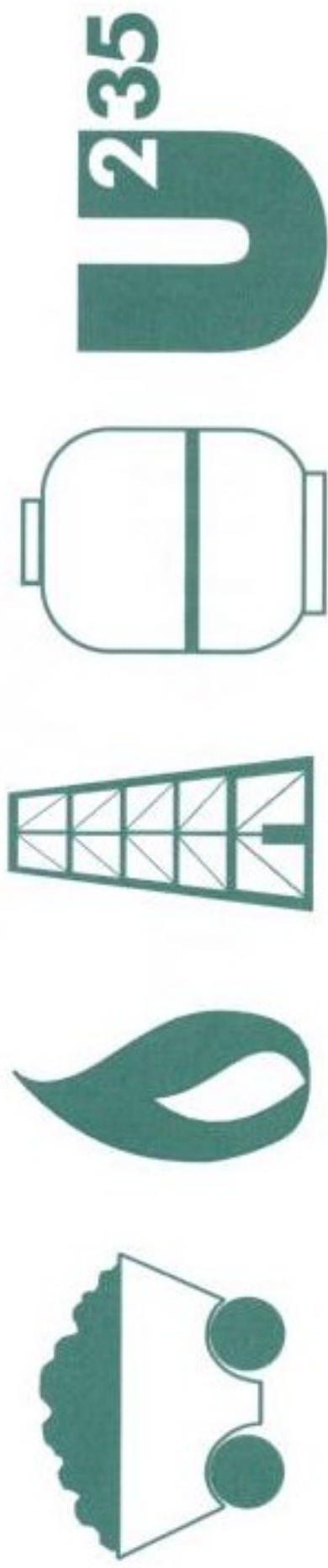


Some energy sources can be used again quickly.

Nonrenewable

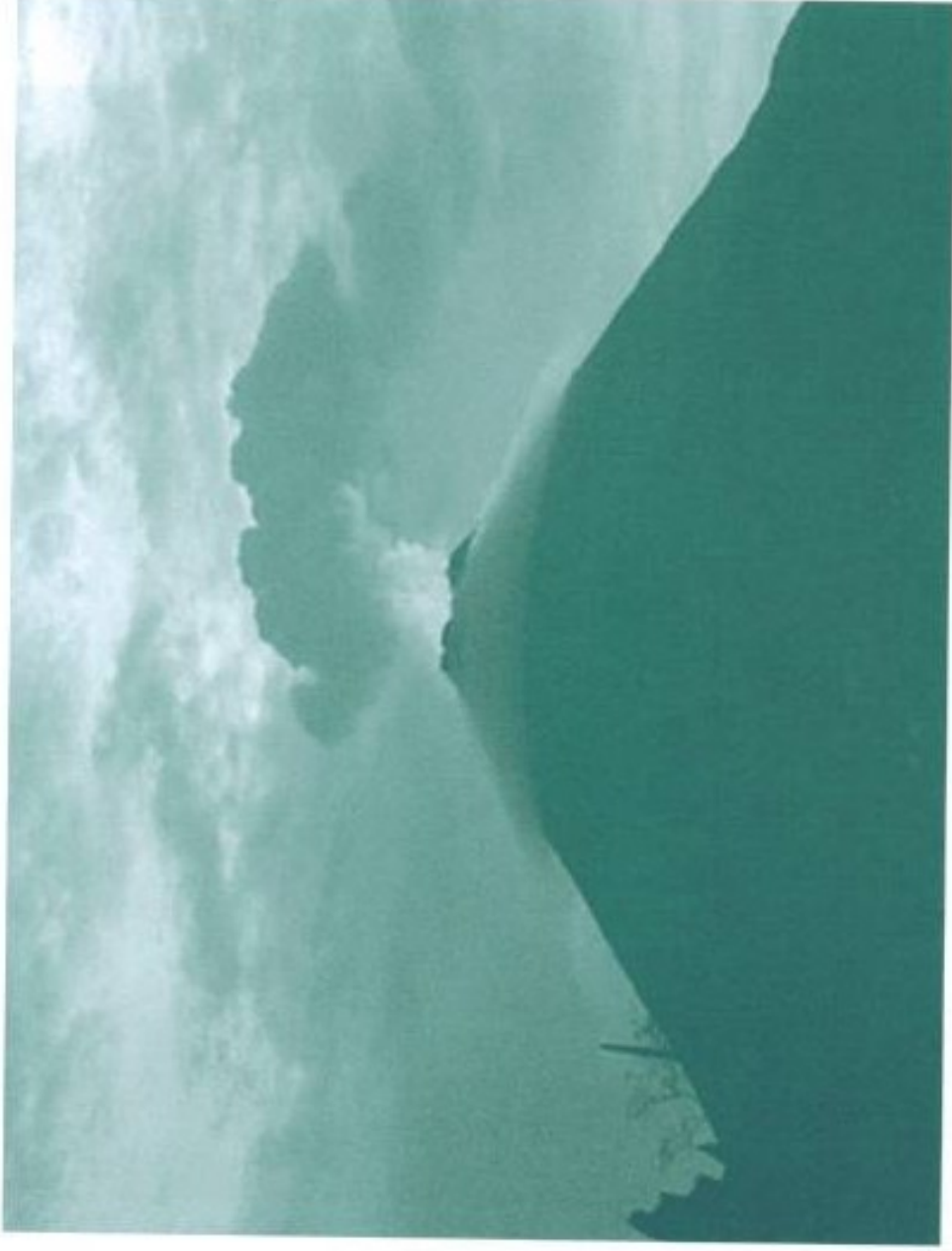
NON-RE-NEW-able

NOT able to be NEW again



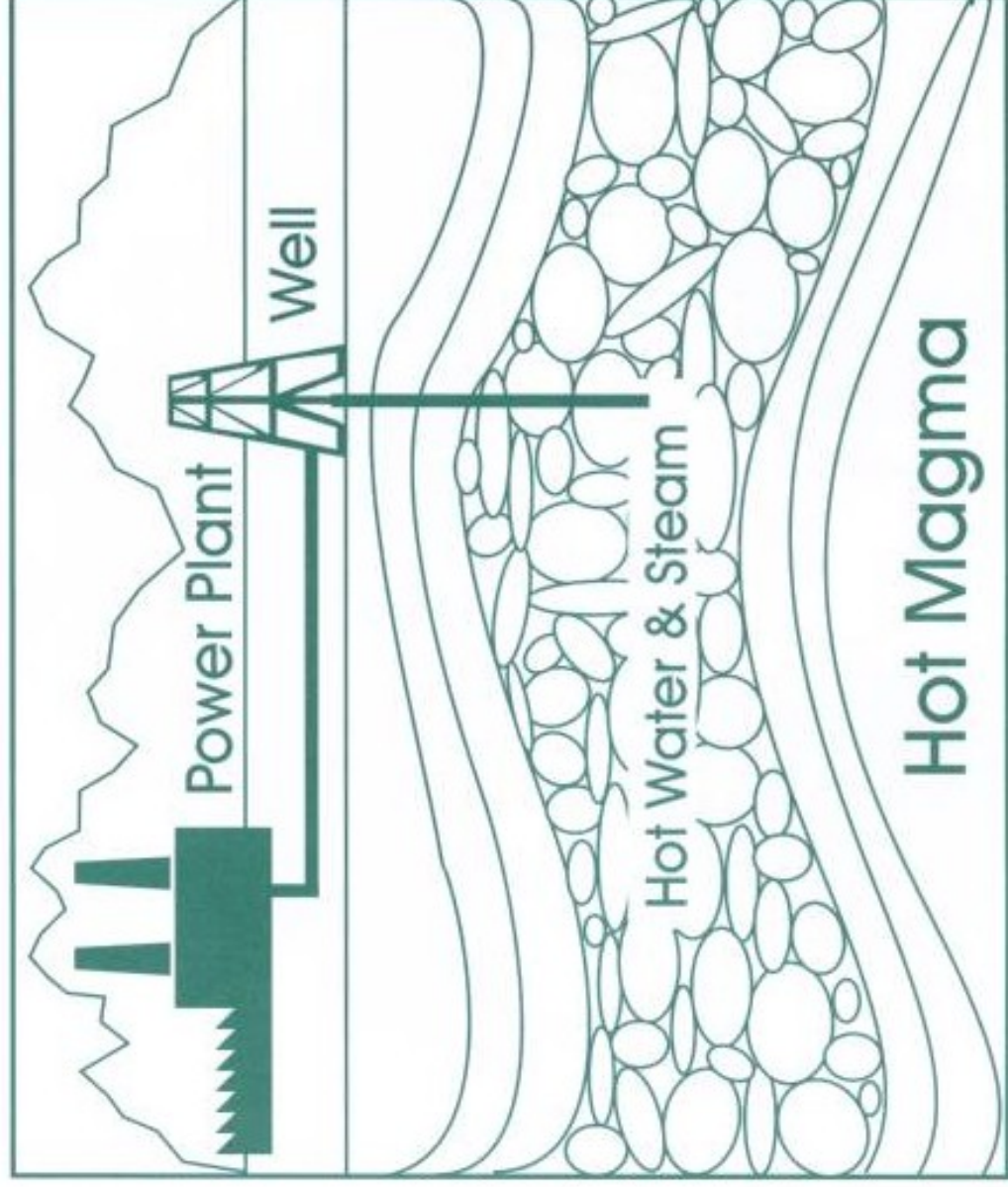
Some sources take millions of years to form.

Geothermal Energy

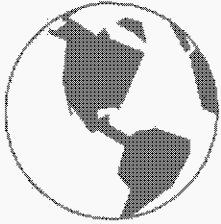


Geothermal energy is heat inside the earth.

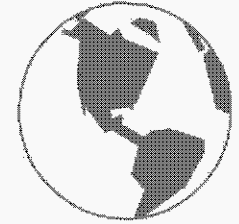
Geothermal Plant



Geothermal power plants make electricity.



GEO THERMAL



Fill in the blanks with the words in the box at the bottom of the page. Use each word only once.

1. The Greek word for earth is _____.
2. The Greek word for heat is _____.
3. The center of the earth has an iron _____.
4. Hot melted rock is called _____.
5. The earth layer with rock and magma is the _____.
6. The shell of the earth is called the _____.
7. The heat inside the earth will always be there. We call geothermal a _____ energy source.
8. When hot water inside the earth comes to the surface, it can form _____.
9. A geothermal mountain called a _____ will sometimes pour out hot _____ with magma in it.
10. Geothermal power plants make _____.

crust	geo	magma	core	therme	electricity
hot springs	renewable	mantle	lava	volcano	