

Lesson 2: Electricity (2 Days)

☐ Getting Started

We use electricity to make light and to run motors. Every day we use electricity without thinking about where it comes from or how it works. Electricity can come from a battery or an electrical outlet. Think of all the ways you use electricity during a single day!

Stuff You Need

- *Let's Explore Energy* by Moving Beyond the Page
- coal (kit)
- hammer
- markers
- matches
- paper clips (kit)
- poster board
- small metal pot
- tea candle (kit)

Ideas to Think About

- What is your relationship with energy?
- How are energy and the environment interrelated?

Things to Know

- Batteries store energy that can be used for motion and light.
- Fossil fuels are nonrenewable sources of energy, such as coal, oil, and natural gas. They are formed from the remains of plants and animals that have been buried beneath the surface of the earth and changed by heat and pressure.

☐ Reading and Questions

Read pages 9-12 in *Let's Explore Energy* and then answer these questions.

1. Name three *renewable* resources that can be used to make electricity.

2. Name three *nonrenewable* resources that can be used to make electricity.

3. What is a turbine? How does it work?

Activities

☐ Activity 1: Electricity to Your Home

Research the source of electricity for your home. You can do a search online for "electricity in [your town]" or ask a parent to help you find the website for your local utility company. Questions to consider:

- Does your house have solar panels? If not, is it able to have solar panels?
- How far away is the power plant that provides your electricity? Is there more than one power plant in your area?
- How do the power plants in your area generate electricity? With windmills? Is it hydroelectric power? Is it generated in a nuclear plant? Or a combination of different ways?
- Challenge: Does your family own a small generator that can make electricity when the power goes out? If so, what type of fuel does it use?

Next, find information that will help you learn more about your local power plant. You may be able to locate this information on your utility company's website or by doing a search on the name of the power plant near you. This will prepare you for your field trip.

Day 2☐ **Activity 2: Power Plants and Fossil Fuels**

In the United States, about 60% of the electricity in the United States is made using fossil fuels. About 40% of that comes from burning natural gas, and the remaining 20% is from burning coal. Today you will experiment with coal, an extremely common fossil fuel that humans have burned to provide light and heat for thousands of years.

Follow the steps on the "Fossil Fuels" activity page.

NOTE: Ask a parent for assistance with this activity.

☐ **Activity 3: Power Plant Field Trip**

Work with your parent to find a way to schedule a visit to your local power plant. Take notes about how the energy is generated and how it gets to your home from the plant. When you return from your field trip, design a poster that illustrates how the energy is generated and how it moves from the plant to your home. Explain the process to your family.

Wrapping Up

What did you learn about electricity in your community? Review the different types of power plants and how they harness energy. Is your community doing anything to offer alternative sources of electricity?

Fossil Fuels

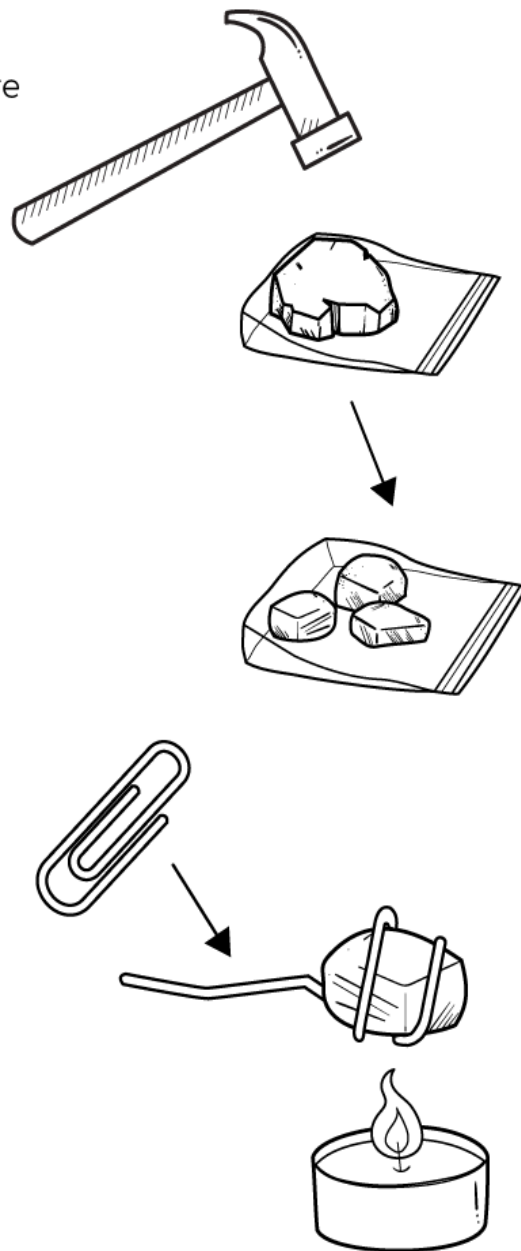
Directions: Be sure to have a parent do this activity with you. Follow the steps to burn coal. Discuss the questions with your parent.

Materials:

- coal (kit)
- tea candle (kit)
- matches
- paper clip (kit)
- hammer
- small metal pot

Procedure:

1. Fill a small pot with some water and have it near where you will burn the coal.
2. Leave the coal in its plastic bag (or put it in a small plastic bag). Put the bag on a hard surface such as a cutting board or a sidewalk. Use the hammer to break the coal into smaller pieces. Find a piece that is around 1/2 to 1 inch wide.
3. Straighten out the paper clip.
4. Wrap and twist one end of the paper clip around the piece of coal until you feel it is secure. Leave enough of the paper clip for you to use as a handle.
5. Have a parent help you light the candle. Blow out the match and put it in the pot of water.
6. Hold the coal over the flame and watch it burn.
7. When you are finished experimenting with it, put the coal into the pot of water.



Discuss these questions with a parent:

1. What was it like to burn the coal? Was there an odor? Did it make smoke? Was the coal messy?
2. How is coal made? Refer to the *Let's Explore Energy* booklet if you need help.
3. Why do people worry about the United States' dependence on fossil fuels?

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Things to Know

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⦿ Skills

- Identify sources of stored energy, such as food, fuel, and batteries. (S)
- Explain how machines and living things convert stored energy to motion and heat. (S)
- Know how energy for your home is produced.
- Differentiate between renewable and nonrenewable energy sources. (S)

Introducing the Lesson

Explain to your child that today she will explore ways that energy is generated and used for electricity. Ask your child what she knows about power plants.

Reading and Questions

1. Name three *renewable* resources that can be used to make electricity.

Geothermal energy (steam from underground), solar power (radiant energy from the Sun), and hydroelectric power (from the force of rushing water).

2. Name three *nonrenewable* resources that can be used to make electricity.

Uranium, natural gas, and coal.

3. What is a turbine? How does it work?

It is a large object that looks like a wheel or fan. It has blades that spin from steam, water, or wind. Inside a generator the mechanical (kinetic) energy of the spinning turbines is converted into electricity.

Activities

Activity 1: Electricity to Your Home

Help your child locate information about electricity production in your area as well as the local power plant.

Day 2**Activity 2: Power Plants and Fossil Fuels**

You or your child (with your assistance) should use a hammer to break the piece of coal from the kit into smaller pieces. Keep (or put) the coal into a plastic bag first since it can be messy. One of the smaller pieces can then be taken out and used for the experiment.

As needed, help or supervise your child with lighting the candle and burning the coal.

Answers to discussion questions:

1. What was it like to burn the coal? Was there an odor? Did it make smoke? Was the coal messy? (Discuss your child's observations.)
2. How is coal made? Refer to the *Let's Explore Energy* booklet if you need help. (Coal is naturally formed over millions of years from dead swamp plants. The remains of these plants become buried deep underground. The heat and pressure created from being buried changes the remains into coal.)
3. Why do people worry about the United States' dependence on fossil fuels? (Fossil fuels are nonrenewable, pollute the environment, and contribute to climate change.)

Activity 3: Power Plant Field Trip

Take your child to visit your local power plant. When she returns from her tour, she will create a poster that describes how the power plant produces energy and how the energy reaches your home.

If a field trip to a power plant is not feasible, your child can instead take a virtual field trip. Your local power plant may have a virtual tour available. She can also search for "virtual power plant tour" or watch one of the tours in the following web link.

**Virtual Plant Tours**

www.beyondthepage.com/link/11388/

This channel has virtual tours for geothermal and hydroelectric power plants. You can also take a virtual tour of a wind farm or a solar farm.

Wrapping Up**Questions to Discuss**

- What are the ways energy is generated for use in homes and businesses? Explain how each one works. (Fossil fuels are heated and burned to produce steam that turns the blades of the turbine. Hydropower uses flowing water to spin the blades of the turbine. Nuclear power boils water, and the steam turns the turbine. Wind power uses the wind to turn the turbine blades. Solar panels convert the energy of the Sun directly into electricity without the use of turbines.)
- How are fossil fuels formed? (Heat and pressure beneath the Earth's surface turn the buried remains of plants and animals into fossil fuels.)

- What is the difference between renewable and nonrenewable energy? (Nonrenewable energy cannot be replaced, so they may run out one day; renewable energy resources are continually being produced.)

Things to Review

Review the different ways that electricity can be produced. Find time for your child to share what she learned on her field trip with the rest of the family.