

Waste Watchers

Grades: K-4, 5-8

Topic: Energy Efficiency and Conservation

Owner: Project Learning Tree

Waste Watchers

Activity 73

Energy seems easy to use, but obtaining it is often not easy on the environment. When we reduce the amount of energy we use, we decrease the pollution that results from producing that energy. In this activity, your students conduct an audit of the energy they use in their own homes and create an action plan to reduce energy use.

Levels

Grades 4-8

Subject

Science, Math, Social Studies

Concepts

- Conservation and management technologies, when appropriately applied to the use or preservation of natural resources, can enhance and extend the usefulness of the resource as well as the quality of the environment. (4.5)
- If planned, constructed, and landscaped to be compatible with the environment in which they will be located, human-built environments can conserve resources, enhance environmental quality, and promote the comfort and well-being of those who will live within them. (4.6)

Skills

Observing, Solving Problems, Evaluating



Technology Connections

Word Processing Software, Digital/Video Cameras

Materials

Copies of the "Home Audit" student page, transparency of the "Reading an Electric Meter" chart, thermometers, art supplies, calculators (optional)

Time Considerations

Preparation: 30 minutes
Activity: Several 50-minute periods over a week

Related Activities

Energy Sleuths, Pollution Search, In the Driver's Seat, Every Drop Counts, Global Climate Change

OBJECTIVES

- Students will identify ways to save energy in their daily lives.
- Students will explain how saving energy can reduce air pollution.

ASSESSMENT OPPORTUNITY

-  Have students write a brochure that outlines energy-saving actions people can take and explains why saving energy is important. Students might use word processing software and a digital camera to create their brochure.

BACKGROUND

When you drive to the store, take a shower, or turn on a computer, you're using energy. Electricity is the most common form of energy we use at home and at school. It is a secondary energy source, which means that we get it by converting other sources of energy, such as coal, oil, natural gas, nuclear energy, hydropower, wind power, or solar energy.

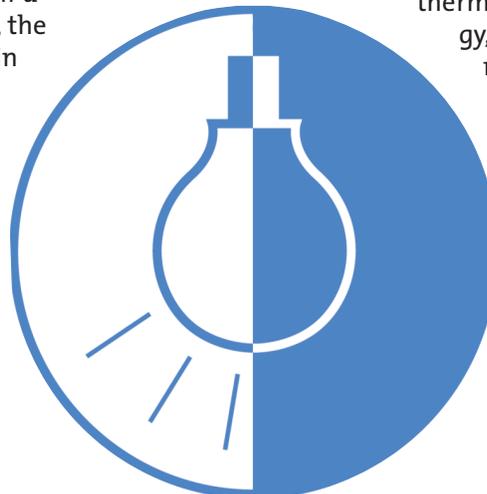
To produce electricity, power plants use one of these secondary energy sources for heating water to produce steam. Then the steam turns a series of blades on a turbine connected to a generator. As the turbine rotates, spinning bundles of copper wire in the generator create a magnetic field that causes electrons to move from atom to atom. This movement of electrons makes an electric current.

While electricity is itself a clean source of energy, the majority of electricity in the United States is generated from power plants that burn fossil fuels (coal, oil, and natural gas). These power plants emit large amounts of carbon dioxide, car-

bon monoxide, nitrogen oxides, sulfur dioxide, and other emissions that affect air quality. For information about carbon dioxide and its relation to global climate change, see background for Activity 84, "The Global Climate."

Electricity is measured in units of power called watts. The amount of electricity we use over a period of time is measured in kilowatt-hours (kWh), or the energy of 1000 watts for one hour. For example, if you use a 40-watt light bulb for 5 hours, you have used 200 watts of power, or 0.2 kilowatt-hours.

Energy conservation means reducing unnecessary energy use and waste. Consuming less energy also reduces the amount of carbon dioxide and other pollutants released into the atmosphere. There are many simple ways that people can conserve energy, including adjusting the heating or air conditioning thermostat to reduce energy, using compact fluorescent bulbs, caulking doors and windows to minimize drafts, lowering the temperature setting of the water heater, and turning off lights and appliances that are not in use.



GETTING READY

Make a copy of the "Home Audit" student page for each student. Find out what types of electric meters are common in your areas—digital or dial meters. If dial meters are common, make a transparency of the "Reading an Electric Meter" chart. For digital meters, students can simply read the number of kilowatt hours shown on the meter. Also, contact your local electric company to find out how the electricity in your area is generated.

DOING THE ACTIVITY

1. Ask the students to brainstorm a list of ways they use energy in a typical week. Discuss: Which uses take the most energy? Which uses involve electricity? Where does electricity come from? Why is it a problem if we waste electricity? Help students understand the relationship between electricity generation (and other energy uses) and air pollution.

2. Pass out copies of the "Home Audit" student page and explain that they will do an energy audit of their homes to help determine how much electricity they use in a week and to look for ways they might save energy.

3. Explain that students will read their electric meter at the beginning and the end of the week to determine the number of kilowatt-hours of electricity their family used during the week (a kilowatt-hour is the amount of energy expended by 1 kilowatt in 1 hour). Use a transparency of the "Reading an Electric Meter" chart to explain how students can read their electric meter. If they have a digital meter, you can explain that they will just need to read the number of kilowatt hours shown on the meter. For students who live in apartment buildings, suggest that they talk to the building superintendent to see if they can have access to the meters.

4. Throughout the week, students should complete the other items on the student page. Depending on the level of your students, you can suggest that they complete their energy audits with help from an adult at home.

5. At the end of the week, remind students to read their meter again and calculate the amount of electricity used. Tally all the results, and post the class total where everyone can see it.

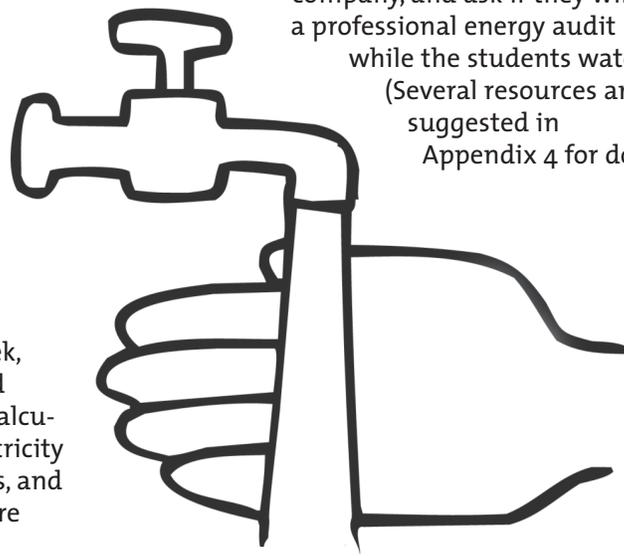
6. Help students analyze the results. What were the total and average electricity uses in a week? Can students think of anything they could do to reduce the energy they use? For example, they could turn off lights when they leave a room, carpool, ride their bike, take public transportation, keep the refrigerator door closed as much as possible, encourage their parents to buy energy-efficient appliances when they need new ones, and so on.

7. Have the students work with their families to develop an action plan for reducing the amount of energy they use.

Enrichment

■ Have students read their electric meter or look at their electric bill so they can keep track of the number of kilowatt-hours of electricity they use over a longer period. (Electric bills specify the number of kilowatt-hours used each month.) Is the monthly usage fairly constant through the year or does it rise and fall? (Students can analyze their usage by making a graph.) What might account for increases or decreases in energy use during the year?

■ Do an energy audit at your school, or contact your local electric utility company, and ask if they will do a professional energy audit while the students watch. (Several resources are suggested in Appendix 4 for doing



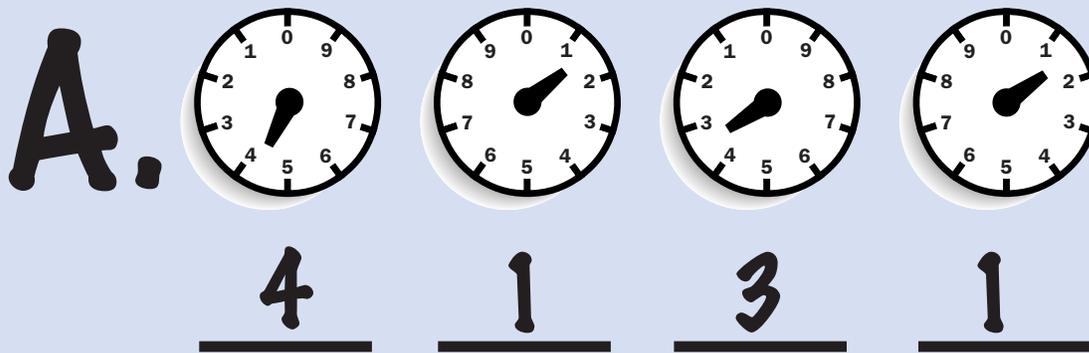
your own school audit.) Then design and carry out a school energy-saving plan. As part of the plan, for example, students could educate citizens in the community or other students at school about turning off lights when they leave a classroom.

■ Ask a landscape architect, urban forester, or horticulture expert to recommend ways to save energy by planting trees, shrubs, and ground cover on the school grounds. For example, the expert might recommend planting trees or shrubs to block winter winds, provide shade, or channel cooling breezes to the building. Then develop and carry out a plan to implement some of the recommendations. This activity could be coordinated with other units such as gardening, ecology, or plant study. (See Activity 31, "Plant a Tree.")

■ Have students research energy-efficient home designs such as active or passive solar and earth-sheltered homes, or examine other energy-saving technologies and report on them to the rest of the group.

Reading an Electric Meter

Many non-digital electric meters consist of four or five round dials. To determine the number of kilowatt-hours used, start by reading the dial on the right. If the dial lies between two numbers, record the smaller number. If the dial is between 9 and 0, you record 9. In the first example the dial is between 1 and 2. You record 1. Moving to the left, the next dial is between 3 and 4. You record the 3. (The dial is 1/10th of the way between the two numbers because the previous dial was on 1). You repeat this process for the remaining dials. The answer for the first meter is 4131. Next, work with the students to determine the second meter reading. Covering the answer, have the students work through each of the four dials to figure out the reading.



Answer to second meter reading: 2049

READING CONNECTIONS

Binns, Tristan. *A Bright Idea: Conserving Energy*. Heinemann Library. 2005. Explore background information on sources of energy. A case study looks at how schools use energy and how they can conserve and save. Grades 2-6. ISBN: 1403468443.

Hawkes, Nigel. *Energy*. Lerner Publishing Group. 1995. This book features short explanations of new energy sources using photographs, diagrams, and drawings. It

focuses on the technology being used to capture usable energy from biomass and atomic power. Grades 4-7. ISBN: 0805034196.

McLeisch, Ewan. *Energy Resources: Our Impact on the Planet*. Steck-Vaughn. 2002. From fossil fuels such as coal, oil, and gas to renewable energy sources such as wind and solar power, this book looks at the issues surrounding energy use and sustaining energy use for future generations. Grades 6-8. ISBN: 073983178X.

Oxlade, Chris. *Dams*. Heinemann. 2000. Explores key types of dams throughout the

world, discussing materials and construction technologies used, functions and locations of major dams, and examples of famous dams in history. Grades 3-5. ISBN: 1575722771.

Smith, Trevor. *Renewable Energy Resources*. Smart Apple Media. 2004. The book examines different energy sources, how they are used currently, and what the projected use will be. It covers renewable energy sources such as wind, water, and solar energy, and biomass. Grades 6-8. ISBN: 1583403612.





Home Audit

Kilowatcher

What is the reading on your electric meter?

What is the reading on your electric meter one week later?

How many kilowatts did you and your family use during the week?

Staying Warm and Keeping Cool

What is the temperature setting of your thermostat?

Is your thermostat on a timer that automatically controls it at night or during the day when no one is home?

Lights

How many light fixtures are in your home?

How many have compact fluorescent bulbs?

How many lights are on even though no one is in the room?

How many radios or televisions are on with no one listening to or watching them?

Out the Window

How many windows are in your home?

How many windows have storm windows?

Check for drafts around the frames of your windows. Move a piece of ribbon all around the frame and check to see if the ribbon flutters. How many windows have drafts?

Check for drafts around door frames by using the same procedure used for your windows. How many doors have drafts?

Down the Drain

What temperature is your hot water heater set on?

NOTE—If your hot water heater doesn't have a temperature setting, measure the temperature of the water. Just run the water until it's hot; then use a thermometer to record its temperature.

Does your hot water heater have an insulated cover?

Does your shower have a low-flow shower head?

Do your sink faucets have low-flow aerators on them?

Do any faucets or pipes in your house leak?

Do you usually wash your clothes in hot, warm, or cold water?

Do you run the drying cycle on your dishwasher or let the dishes air dry?

Do you clean the lint trap on your clothes dryer before drying a load of clothes?
