Raising a thought-provoking question is a good way to assess the overall depth of student understanding. A couple of suggestions are listed below:

- Brainstorm a list of all the ways that you use energy in a day. What types of energy are you using?
- Which two examples have the same form of energy: a falling rock, a tank of gasoline, an exploding atomic bomb and a sandwich? Explain how you know.

## Follow-up Activities

- Using a roll of adding machine paper, have your class create a running list of different examples of energy use. With a one-inch space separating each idea, challenge the class to see how long a roll they can create. Post it.
- Divide a large bulletin board into columns, one for each form of energy. Have students cut out magazine pictures, or draw on 3x5 cards as many examples of energy as they can find, attaching them to the board in the correct column. Make sure that they later review them to verify that they are categorized properly.
- Student-conducted science demonstrations are always the most valuable and memorable. Have students work in small groups to come up with demonstrations of at least two different forms of energy, showing how each example of energy is doing work.

## Suggested Internet Resources

Periodically, Internet Resources are updated on our Web site at www.LibraryVideo.com

- **www.energy.ca.gov/education/projects/projects-html/sunenergy.html**
  This page from the "Energy Quest" Web site developed by the California Energy Commission lists some energy activities that are appropriate for the K–2 classroom.
- **www.eren.doe.gov/buildings/k-12activities/**
  The "Energy Smart" site contains teacher guides, worksheets and other downloadable resources for teaching energy concepts in elementary school classrooms.



TEACHER'S GUIDE

## Suggested Print Resources


- Burton, Jane and Kim Taylor. *The Nature and Science of Energy.* Gareth Stevens Pub., Milwaukee, WI; 1998.
- Fowler, Allan. *Energy From the Sun*. Children's Press, Danbury, CT; 1997.
- Hewitt, Sally. *Full of Energy.* Watts, Danbury, CT; 1998.
- White, Larry. *Energy: Simple Experiments for Young Scientists.* Millbrook Press, Brookfield, CT; 1999.



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**TITLES**

- **ALL ABOUT HEAT**
- **ALL ABOUT THE CONSERVATION OF ENERGY**
- **ALL ABOUT THE TRANSFER OF ENERGY**
- **ALL ABOUT THE USES OF ENERGY**
- **WHAT IS ENERGY?**




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TEACHER'S GUIDE

# Energy for Children™

# What Is Energy?

**Grades K–4**

This guide is a supplement, designed for educators to use when presenting this program in an instructional setting.

**Before Viewing:** Research in learning suggests that it is important for the teacher to discover what the students know — or think they know — about a topic, at the start of a new unit, so that their accurate conceptions can be validated and reinforced, and their misconceptions identified and corrected. Therefore, after reviewing the pre-viewing discussion questions provided for your class, create an "Everything We Know About…" list. Preview key vocabulary words and have students raise additional questions they hope will be answered by this program. Most importantly, students should be told that as "science detectives" they must listen closely, so that after viewing the program, they will be able to tell whether or not the facts/beliefs they put on their list were scientifically accurate.

**After Viewing:** After a brief discussion about the program, challenge your "science detectives" to prove or disprove the accuracy of the facts they put on their "Everything We Know About…" list. Discuss what else they learned and use the follow-up questions and activities to inspire further discussion. Encourage students to research the topic further with the Internet and reading resources provided.

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## Program Summary

Without energy, we would not be alive. Our lives are filled with different forms of energy, but what is energy? Energy is the ability to do move or change things. Any time we do work, we use energy. We use energy to light our lights, heat our homes, cook our meals and run our computers. We use energy to power our cars, fly our planes and operate all of our machines. Our bodies use energy with every motion. The sun is the biggest source of energy on Earth. We can do nothing without energy!

Heat energy can be used to cook our meals, heat our homes and warm our bodies. Heat energy comes from the motion of the tiny atoms and molecules that make up everything around us. The faster these atoms and molecules move, the more heat energy is produced and the hotter the substance gets. Heat always moves from warmer things to cooler things — that's why ice cubes melt in our warm hands.

Chemical energy is the energy that is stored in a substance. For example, the sun's energy is stored in green plants as chemical energy. When animals eat plants, that energy is released and enables them to grow or do work. Burning fuels like wood, oil and gasoline releases their stored chemical energy. Batteries also have chemical energy that is released when we use a battery-operated machine.

Mechanical energy comes from motion. Moving objects require energy to move and to affect other things. Flowing water, blowing wind, falling rocks, cars speeding along a highway, machines turning and working, and even humans moving are all examples of mechanical energy in action. We harness electromagnetic energy whenever we use electricity to do work.

Electromagnetic energy comes in waves through space in a number of related forms: light and color, radio waves, microwaves, lightning, rainbows and X-rays. The sun sends electromagnetic energy through space to Earth.

Nuclear energy is the most powerful form of energy. When an atom is forced to break apart, a tremendous amount of energy is released. The sun and stars are bright and powerful because they are constantly producing nuclear energy. People sometimes use this form of energy to generate electricity in nuclear power plants. Of course, there are dangers associated with nuclear energy, so it is handled very carefully and safely.

## Vocabulary

The following words are included for teacher reference or for use with students. They are listed in the order in which they appear in the video. *(Continued)*



**energy —** The ability to make things happen or to do work.

**work —** To move or change something. Doing work takes energy.

**heat energy —** The energy produced by the movement of the tiny atoms and molecules of an object. The more they move around, the more heat is produced.

**atoms —** Tiny particles that make up everything around us. These particles are constantly moving.

**molecules —** The smallest units of a substance, made of one or more atoms.

**chemical energy —** The energy obtained from releasing energy that is stored in a substance. The sun's energy is released to our bodies when we eat plants. Our bodies use this energy to live. Batteries and burning fuels release chemical energy as well.

**mechanical energy —** The energy of moving objects. Things in motion affect other things they touch. Flowing water, blowing wind, falling rocks, sound, moving machines and animals all can do work using mechanical energy.

**electromagnetic energy —** The energy that comes from electricity, magnetism, light and color, radio waves, microwaves and X-rays. Much of the Earth's electromagnetic energy comes from the sun.

**nuclear energy —** The energy created when atoms are broken apart or forced together. The force that holds atoms together is so strong that breaking atoms apart or forcing them together creates the most powerful form of energy we know.

## Pre-viewing Discussion

Before students generate their list of "Everything We Know About..." this topic, stimulate and focus their thinking by raising these questions so that their list will better reflect the key ideas in this show:

- What gives our machines and bodies the power to move and work?
- What is energy? Where does energy come from?
- What are some different types of energy?

After the class has completed their "Everything We Know About..." list, and before watching the show, ask them what other questions they have that they hope will be answered during this program. Have students listen closely to learn if everything on their class list is accurate and to hear if any of their own questions are answered.



## Focus Questions

You may wish to ask your class the following questions to assess their comprehension of key points presented in the program:

1. What is energy? What is work? Give examples of each.
2. How are energy and work connected?
3. What is the Earth's greatest source of energy?
4. What causes heat energy?
5. What do atoms and molecules have to do with heat energy?
6. What is different about the movement of the atoms and molecules in a bowl of hot soup than in a glass of cold milk? Explain.
7. Name some ways that we use heat energy.
8. When you place a scoop of ice cream in a warm dish, what happens to the ice cream? To the dish? Explain.
9. What does eating lunch have to do with chemical energy?
10. What do the following things have in common: leaves from a tree, an old dried log, a hamburger and a charged battery? Explain.
11. Why are green plants especially important to us?
12. What kind of energy does a bowling ball have as it rolls toward the pins? Explain.
13. Name things that have mechanical energy.
14. What is electromagnetic energy?
15. What is so special about the way in which most electromagnetic energy travels?
16. What is the most powerful and dangerous form of energy?
17. Where does nuclear energy come from?
18. What do we see every day that produces a tremendous amount of nuclear energy?

## Follow-up Discussion

The most important part of this segment is to examine both the facts and beliefs generated by the class in their "Everything We Know About..." list. Research indicates that students will retain their previous misconceptions — in preference to the new information — until they actively recognize and correct their own errors. Because of this, it is important to lead students to the correct ideas while identifying and correcting any misconceptions from the class list. After reviewing the list, encourage students to share the answers they got to the questions raised, before viewing the program. *(Continued)*