

Energy
Education World

nationalgrid

Energy Efficiency World



Smell Gas. Act Fast.



Your energetic world

Plants get their energy from the sun. People get their energy from food. What about cars, computers, TVs, lights and ovens? They get their energy from sources like gasoline, electricity and natural gas.

Imagine life without energy. You would not be able to play computer games, ride a bicycle or use a phone. Cars and trucks wouldn't move. Lights wouldn't shine. Plants wouldn't grow.

Without energy, life would not exist!

This booklet helps you learn about energy and how you and your family can use it more efficiently.



ENERGY IN YOUR LIFE

List some items at your home or school that use each energy source shown below.

| ENERGY SOURCES | ENERGY-USING ITEMS | |
|----------------|--------------------|--|
| Electricity | | |
| Natural Gas | | |
| Sunshine | | |
| Gasoline | | |

ENERGY HAS MANY FORMS

Make a match.

Draw a line to match each form of energy to its definition.

Bonus: Two of these pictures each represent more than one form of energy. Which two are they?

Mechanical Energy moves objects from place to place.

You use mechanical energy when you kick a ball. Other examples of mechanical energy include water flowing in a stream or bicycle tires rolling down a road.

Electrical Energy comes from the movement of electrons within atoms. It can be created at a power plant or inside a battery. Lightning is a form of electrical energy.

Radiant Energy can move through space. Heat and light are forms of radiant energy.

Nuclear Energy is energy contained in the nucleus at the center of an atom. Nuclear energy is released when nuclei are split apart into several pieces, or when they are combined to form a single, larger nucleus.

Chemical Energy is released by chemical reactions. Food contains chemical energy that is released when you digest your meal. Fuels like wood, natural gas and coal contain chemical energy that is released as heat when they are burned.



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Energy *moves!*

Energy can **MOVE** from one object to another.

When you ride a bike, mechanical energy moves from your legs to the pedals. The pedals send the energy to the gears, which transfer the energy to the wheels to move the bike along.

Here's another example: When a cat sits on a sunny window sill, radiant energy from the sun moves through the window and heats up the cat's fur.

Energy can also **CHANGE** from one form to another.

A toaster changes electrical energy to heat. Inside the toaster, electricity heats wires. These wires toast the slice of bread. Suppose you eat the toast for breakfast. Your digestive process changes the chemical energy of the toast to mechanical energy that makes your body move.



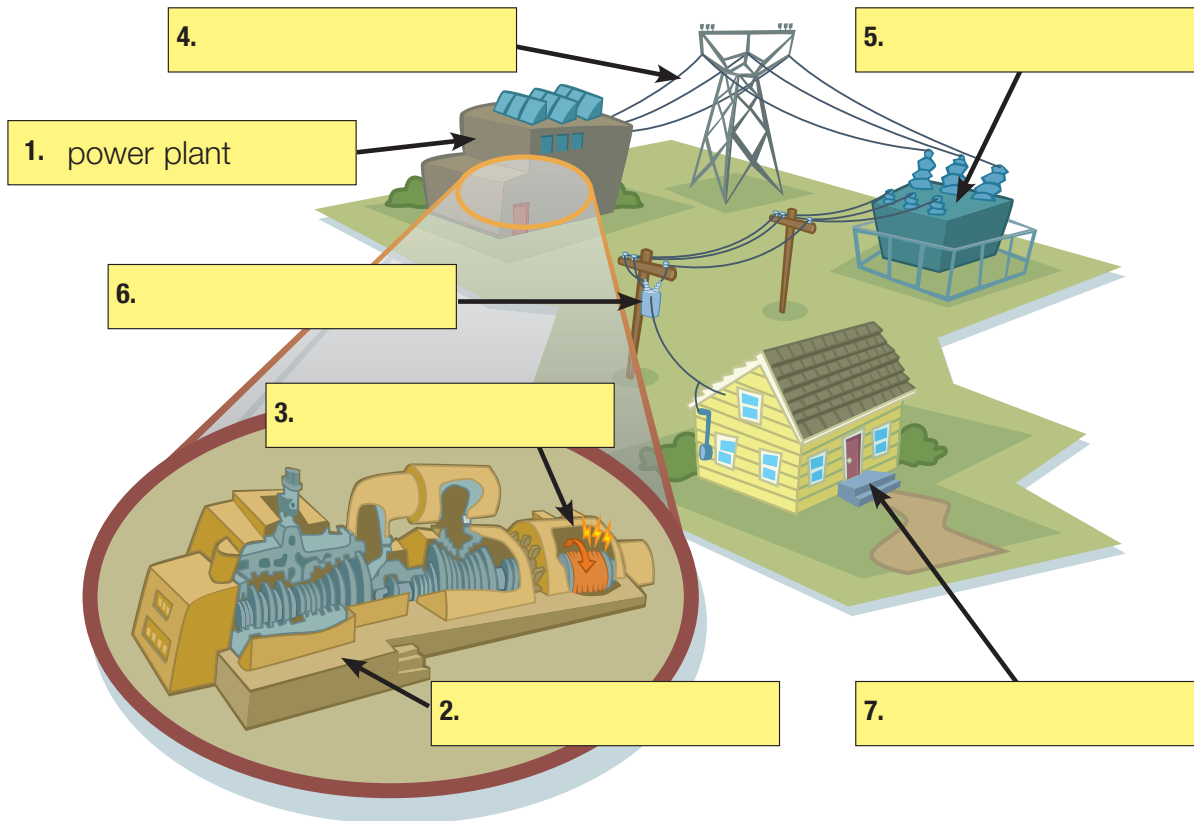
USE YOUR CREATIVE ENERGY!

Pick one of the examples described on this page or come up with a similar one of your own.

Make a drawing or a collage to show how energy moves or changes in your example.



WHERE DOES ELECTRICITY COME FROM?



Use the **blue** words to label the illustration.

Most of the electricity people use comes from **POWER PLANTS**. Inside a power plant is a device called a **GENERATOR**. An energy source turns the blades of a turbine inside the generator, which spins a magnet. The spinning magnet creates a flow of **ELECTRICITY**.

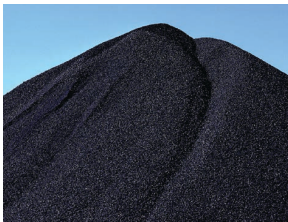
POWER LINES on tall towers carry the electricity from the power plant to a **SUBSTATION** where transformers reduce the voltage (strength). Then **DISTRIBUTION LINES** carry the electricity to **HOMES** and buildings, where we use it for lights, appliances and equipment. (Distribution lines can be located overhead as shown here, or under the ground.)



The many sources of electricity!

Many sources of energy can be used to produce electricity. **Nonrenewable** resources will someday be used up. **Renewable** energy sources can be replenished in a fairly short period of time, so they can be used over and over again.

Nonrenewable



Fossil Fuels

Coal, oil and natural gas – fuels made from the fossilized remains of plants that lived on Earth millions of years ago.



Nuclear Power

Energy released when uranium atoms are split apart or combined.

Research energy sources.

How are these energy sources used to produce electricity? Find out in the library or on the Internet.

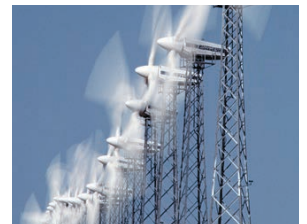
Bonus: Pick one renewable energy source and one nonrenewable source, and investigate the advantages and disadvantages of using each of them to produce electricity. Present your findings in writing or as an oral report.

Or: Write or tell a story about how the world would be different if we didn't have this energy source.

Renewable

Wind Power

The force of wind.



Geothermal Energy

Steam from deep inside the earth.



Biomass

Fuel made from food, garbage and other waste materials.



Hydropower

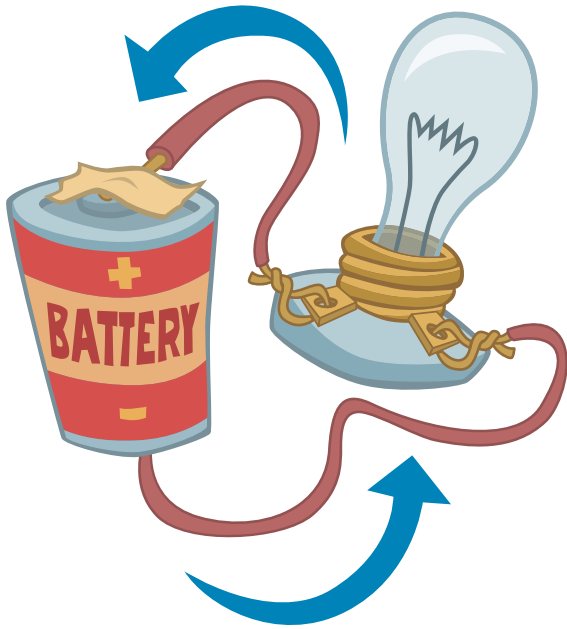
Energy of falling water.



Solar Energy

Energy from the sun.





GO WITH THE FLOW!

In order for electricity to travel to where we need it, there must be a complete circuit of electricity. A complete circuit is like a circle. Electricity is produced at one place, travels around the circuit, and returns to the starting place.

Build a circuit.

You can build an electrical circuit of your own, using a battery as the electricity source instead of a power plant generator.

1 Get a D-cell battery, a 1.2-volt light bulb with a matching E-10 light bulb base, electrical or masking tape, and two pieces of insulated wire with 1 inch stripped on each end. (An adult should strip the wire for you.)

2 Predict what will happen if you attach only one wire from the battery to the bulb. Now, predict what will happen if you add another wire from the bulb to the battery.

3 Look at the picture of the battery and bulb on this page. Use your materials to build a circuit like the one in the picture. Were your predictions correct? If not, explain why.

4 Suppose you wanted to build a circuit with 10 light bulbs. What would you have to do to be sure all the bulbs would light up?

5 When you use a lamp, you use a switch to turn it on and off. What does the switch do to the circuit that brings electricity to the lamp?



What is energy efficiency?

You have learned that energy is the ability to change or move matter. Energy efficiency means changing or moving the **MOST** matter using the **LEAST** amount of energy.

Your body is efficient.

Your body moves in ways that don't use more energy than necessary. For example, when you are wearing a heavy backpack, you don't usually swing it in circles around your head, you just carry it on your back.

Good athletes make very efficient use of energy when they move. For example, basketball players make their shots as efficiently as possible – their bodies and the ball travel smoothly in the same direction, without unnecessary motion. And swimmers practice to make sure their strokes are smooth, so that they don't waste any energy as they move through the water.

Reach for examples.

List some other ways that people, animals or machines move or work efficiently.

Bonus: How could they become even more efficient?



WHY SAVE ENERGY?

When we save energy, we **reduce the need for fossil fuels like coal, oil and natural gas**. Earth's supply of fossil fuels is limited, so once we use them up, they will be gone forever.

When we save energy, we **reduce pollution**. We burn fossil fuels to heat our homes and to power our cars. This releases pollutants into the air. We can help control pollution by saving energy.

When we save energy, we **save money**. Electricity, natural gas and gasoline can be expensive. Why spend money when you don't have to?



Find the energy sources.

Here are some energy sources your family might already use:

WOOD
NATURAL GAS
PROPANE
ELECTRICITY
COAL
GASOLINE
DIESEL FUEL
SOLAR

See if you can find them in the puzzle. Words may go diagonally, across, backward, up or down.

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Y | S | L | R | C | L | P | L | L |
| T | A | E | W | O | O | L | H | I |
| I | G | U | D | O | J | A | B | A |
| C | L | F | A | L | O | Y | L | G |
| I | A | L | R | I | Y | D | M | P |
| R | R | E | B | E | S | A | A | R |
| T | U | S | R | N | A | R | D | O |
| C | T | E | A | Z | M | I | I | P |
| E | A | I | L | I | U | H | S | A |
| L | N | D | O | L | E | S | O | N |
| E | G | A | S | O | L | I | N | E |



Energy efficiency helps the environment



Most of the world's electricity is created at power plants that run on fossil fuels. Burning these fuels releases **carbon dioxide** and other gases into the earth's atmosphere. These gases are called "**greenhouse gases**" because they trap heat energy from the sun in what is known as "**the greenhouse effect.**" Because they warm our world, the effect of these gases on the earth is known as "**global warming**" or "**climate change.**" Using electricity efficiently can help reduce the amount of greenhouse gases that enter our atmosphere.

The production, transportation and/or use of any energy source can contribute pollutants to our environment. So no matter which energy sources you use, **using energy efficiently helps the environment.**

Marvelous trees!

Trees help balance the effects of energy use. Over 40 years, one tree will remove more than 600 pounds of carbon dioxide from the air! Trees also give back the oxygen that we need to breathe.

Word Game

Unscramble the words and then use them to complete the paragraph.

NEREYG

OLOC

RIA NOCTIDNOIRE

SNIDW

THREAE

Trees can help people save _____.

In summer, tree shade can keep your home and car _____

so you don't have to run your _____

as much. And in winter, trees can block cold _____

so your _____ doesn't have to work as hard.

YOU'RE GETTING WARMER!

Many scientists believe that by the time you are your grandparents' age, the greenhouse effect will make the earth warmer than it has been at any time in the last 100,000 years. Temperature changes are already affecting glaciers, weather patterns, ocean levels, plant growth and animal habitats.

Make a mini greenhouse.

Try this experiment to see how the greenhouse effect works.

- 1 Get two large glass bottles or jars the same size, one piece of plastic wrap (or you can reuse a plastic bag!), one rubber band, and four ice cubes all the same size.
- 2 Place two ice cubes in each jar, then cover the mouth of one jar with the plastic and fasten it in place with the rubber band. Leave the other jar open.
- 3 Predict which ice cubes will melt faster in a sunny spot, and why:



- 4 Place the two jars side-by-side in a warm, sunny place. Time how long it takes for the ice to melt in each jar. Record the times here:

- 5 Was your prediction correct? Why/why not?

- 6 Summarize your conclusions on a separate piece of paper. Include the following:

- Did one jar of ice melt faster than the other? Why?
- How are your observations related to the greenhouse effect?



Save energy at home

This pie chart shows you a breakdown by percentages of the different ways energy is used in a typical home. What uses the most energy? What uses the least? Draw an arrow to match each energy use with its slice of the pie. We have done the first one for you.

Water Heating Uses 15%

- Take shorter showers.
- Ask an adult to install energy-saving low-flow showerheads.
- Wash full loads of clothing and dishes.
- Tell an adult about any water leaks.

Large Appliances Use 10%

- Open refrigerator doors only when necessary and close firmly. Keep coils clean.
- Use a clothesline or drying rack instead of a dryer.
- Wash full loads of clothing and dishes.

Lighting Uses 4%

- Turn off lights when you are not using them.
- Ask an adult to install energy-efficient light-emitting diodes (LEDs). These last longer and use far less energy than standard light bulbs.

Heating and Cooling Uses 53%

- Keep doors and windows closed when heat or air conditioning is on.
- Ask an adult to keep heat at 68°F by day and much lower at night.
- Ask an adult to keep air conditioning at 76°F to 78°F.
- Use a ceiling fan to cool with less energy. Be sure to turn it off when you leave the room.

Home Electronics Use 4%

- Turn off the radio, TV, CD or DVD player when done.
- Turn off or sleep computers when not in use.
- Unplug chargers when not in use.

Other Devices and Appliances Use 14%

- Ask an adult to cook with the microwave oven instead of the regular oven.
- Unplug appliances you rarely use. (Many use energy when plugged in, even if they are not on.)

Source: www.eia.gov

Save energy at school

Most schools spend more money on energy than on computers and textbooks combined. Here's how you can help your school reduce energy waste.

Lights and Computers

- Ask your teacher if students can take turns being the energy monitor to make sure lights and computer monitors are turned off when not in use (especially at recess and lunch).

Heating and Cooling

- Make sure books or furniture do not block the vents in your classroom.
- Encourage everyone to keep doors and windows closed when heating or air conditioning is running.

Water

- Turn off the water in the bathroom when you are finished using it.
- If you find a water fountain that won't turn off, a leaky faucet or a toilet that's running, report it to your teacher or school custodian.



GET CREATIVE!

Make a poster to illustrate any energy-saving tip that you have learned in this booklet, and hang it where it can help change people's behavior.

For example, next to a light switch put a poster about turning lights off, and near the sink display a poster about reporting leaks.



Make a commitment.

Put a check by all the energy-saving actions on these two pages that you already do.
Put a star by at least three that you can commit to doing this week.



Buy energy-efficient products



Appliances that have earned the ENERGY STAR® are very efficient. They use a fraction of the energy that standard appliances need to do the same job. For example, you could power two new ENERGY STAR certified electric heat pump water heaters (HPWHs) with the electricity it takes to run one standard electric storage water heater.



Compare energy costs.

Use this imaginary example to learn how energy-efficient appliances can save your family money in the long run.

APPLIANCE A is very efficient.
It costs \$460 to buy.
It uses about \$10 of energy per month.

APPLIANCE B is less efficient.
It costs \$400 to buy.
It uses about \$20 of energy per month.

- 1 How much more does Appliance A cost to buy than Appliance B? _____
How much less does Appliance A cost in energy per month? _____
- 2 Appliance A can make up for its higher purchase price through dollars saved on energy bills. How many months will this take? _____
- 3 Why is A the smarter choice in the long run? _____

Learn more at www.energystar.gov.

YOU HOLD THE KEY TO ENERGY EFFICIENCY

Whether your appliances are old or new, how you use them can make a big difference in their energy efficiency.

- 1** If you keep doors and windows closed on hot days, the air conditioner can do its job more efficiently because warm outside air isn't let into the room.
- 2** If you use lids on pots and pans while cooking, more heat from the burner stays inside the pot. This lets your food cook faster or at a lower burner setting.
- 3** If you keep your refrigerator closed as much as possible, it doesn't have to work as hard to keep food cool.



THINK EFFICIENCY!

Now that you've read this booklet, list some ways you've learned to use energy efficiently at home and at school:

Test for drafts.

Wet your finger and feel around doors, windows and air conditioners for air flowing through. Put a sticky note by any leaks you find and ask an adult to fix them so your heating system and air conditioner can do their jobs with less energy.



Home energy efficiency inspection

With an adult, use this checklist to examine your home energy use. Then check your score.

Yes **Not Yet**

- | | | |
|-----------------------|-----------------------|---|
| <input type="radio"/> | <input type="radio"/> | Do you turn off lights and computers when you're not using them? |
| <input type="radio"/> | <input type="radio"/> | Are LED bulbs used in your home? |
| <input type="radio"/> | <input type="radio"/> | Is most of your laundry washed in cold water? |
| <input type="radio"/> | <input type="radio"/> | Are water-saving showerheads used in your bathrooms? |
| <input type="radio"/> | <input type="radio"/> | Do the dishwasher, clothes washer and dryer have full loads when used? |
| <input type="radio"/> | <input type="radio"/> | Are the "Air Dry" or "No-Heat Dry" settings used on your dishwasher? |
| <input type="radio"/> | <input type="radio"/> | Do you close the blinds and draperies to keep out summer sun or winter cold? |
| <input type="radio"/> | <input type="radio"/> | Are doors and windows equipped with weather stripping and caulk to block drafts? |
| <input type="radio"/> | <input type="radio"/> | Has your family unplugged appliances you rarely use? |
| <input type="radio"/> | <input type="radio"/> | Is regular maintenance done on your heating and cooling system – cleaning or replacing filters monthly and yearly tune-ups? |

YOUR SCORE: *Score 5 points for every "Yes,"; 0 points for every "Not Yet."*

0–15 FAIR There's a lot more you can do to save energy.

20–35 GOOD You have some good savings, with room for improvement.

40–50 EXCELLENT Congratulations on your super energy savings! Share your energy smarts with family and friends.