SUGGESTED REFERENCES

- *Energy Quest California Energy Commission*
  http://www.energyquest.ca.gov/index.html
- *Molecular Expressions*
  Electricity & Magnetism, Introduction
  http://Micro.magnet.fsu.edu/electromag/java/transformer
- *What is "Electricity"?*
  ©1996 William J. Beaty Electrical Engineer
  http://amasci.com/miscon/whtis.html

NATIONAL SCIENCE EDUCATION STANDARDS

K - 4

Physical Science

Light, Heat, Electricity, and Magnetism

5 - 8

Physical Science

Motions and Forces

Transfer of Energy

**Source: National Science Education Standards, 1996, National Academy Press*

CREDITS

The producers thank Channel 4 Television Corporation/4 Learning for materials used in this program.

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SCIENCE SCREEN REPORT® FOR KIDS

VOLUME 15 ISSUE 6

THE POWER OF ELECTRICITY

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SYNOPSIS

Electricity has existed since the beginning of the universe. It flashes through the sky every time lightning flashes. Throughout time scientists have invented ways to create electricity. Electricity is an important part of our every day lives. We use it in just about everything we do - to light our homes, cook our food, and to entertain us.

This issue of SCIENCE SCREEN REPORT FOR KIDS journeys into the remarkable world of electricity and takes a close look at how it is generated. Students will learn the various ways electricity is created whether it is through burning fossil fuels or through natural resources such as the power of falling water. We will also explore how electricity is transported from the power plants to our homes.

CURRICULUM UNITS

- Chemistry
- Ecology
- Environmental Science
- Physical Science
- Physics

RUNNING TIME

15:10

BACKGROUND

This issue explores the world of electricity and the various ways it is generated. Students will learn about the different kinds of electrical currents and how electricity is an integral part of our everyday lives.

Electricity can be produced using fossil fuels such as coal, oil, and gas. In addition to burning fossil fuels, many power plants generate electricity using nature's resources. The Hoover Dam is a hydroelectric plant that generates electricity by using the energy of falling water. The Hoover Dam was constructed with four intake towers to capture the water. After traveling down pipes in the tower's walls, the water enters a building at the bottom of the dam. This building houses the electric generators which produce electricity. But how do generators produce electricity?

One of the important elements in creating electricity is the turbine. The turbine is a machine which looks like a gigantic fan. The energy from the falling water causes the turbine to spin its blades. As the turbine spins, it causes the metal shaft that is attached to it to spin. The shaft leads us to the generator - and this is where the electricity is created.

On the outside of the generator are wire coils and on the inside is a large magnet. As the turbine spins the shaft, the shaft turns the magnet, and the moving magnet creates a flow of electrons. They create an electrical current when a magnet is placed near a coil wire and rotated. This creates a type of electricity called alternating current - a current that is always changing between positive and negative fields.

The electrical current leaves the power plant by a high-voltage wire. As it travels through the power lines it links to sub-stations called transformers. Transformers adjust the voltage or the speed at which the electricity is traveling. This way it can enter your house at a safe speed.

This video also demonstrates the process of making neon lights. Neon lights are more energy efficient than filament bulbs. With neon lights, a glass tube is bent to a desired shape or design, and the tube is filled with gas. When it is plugged in, the neon atoms are stimulated. As they collide, they give off a glowing light. Neon lights are popular because they come in an array of colors. Different colors are produced by adding different gases. For example, helium gas makes a pale blue while red comes from neon gas.

Because burning fossil fuels creates pollution and is not good for the environment, scientists have invented a car that runs on batteries instead of gasoline and oil. These electrical cars run on DC electricity instead of AC. A DC motor is much more energy efficient than a typical engine that is fueled by gasoline. However, the biggest drawback is that the batteries need to be recharged. Subway trains also run on an electric motor. The electric current is supplied to train motors either through the third rail or through wires passing overhead. As the train passes, the current is converted to drive the motor.

Today's researchers are exploring ways to make natural energy sources economically competitive with fossil fuels and nuclear energy. In the future scientists estimate there will be more renewable energy plants to power our world.

ADVANCED ORGANIZERS

Prior to showing this video students should have some understanding of the following Benchmarks for Science Literacy, Oxford University Press, which are excerpted and, in some cases, abbreviated below. Refer to the Benchmarks for more information.

Benchmark 8: The Designed World

Section C - Energy Sources and Use

Know by the end of Grade 2

- People burn fossil fuels such as wood, oil, coal, or natural gas, or use electricity to cook their food and warm their houses.

Know by the end of Grade 5

- Moving air and water can be used to run machines.
- Some energy sources cause less pollution than others.

Know by the end of Grade 8

- Different ways of obtaining, transforming, and distributing energy have different environmental consequences Electrical energy can be produced from a variety of energy sources and can be transformed into almost any other form of energy. Moreover, electricity is used to distribute energy quickly and conveniently to distant locations.

**Benchmarks can be found at www.project2061.org/tools/benchol/bolintro.htm*

CRITICAL THINKING EXERCISES

1. Build background information about electricity by reading aloud a book to the class. For example, **Where Does Electricity Come From?** A Clever Calvin Book by C. Vance Cast or **Switch On Switch Off**, by Melvin Berger.
2. Have students write a narrative story or an expository essay. They can write a story about what it would be like if there wasn't electricity for a day, or an essay explaining how electricity is created and how it makes it to our homes.
3. Research the effects that burning fossil fuels has on the environment. What will happen once we deplete all of the earth's fossil fuels?
4. Compare and contrast renewable and nonrenewable energy. What are the pros and cons of using these to create electricity?
5. Conduct an experiment to see how much heat a filament bulb produces. Place a thermometer on a desk and shine a gooseneck lamp on it. Experiment with different watt bulbs. Teacher directed for safety precautions.
6. In cooperative groups brainstorm how you can conserve electricity in the classroom and at home. Share your ideas with the class.

VOCABULARY

Alternating current	An electric current that reverses direction in a circuit at regular intervals.
Direct current	An electric current flowing in one direction only.
Electricity	Energy made available by the flow of electric charge through a conductor.
Electron	Negatively charged particle in an atom.
fossil fuel	A hydrocarbon deposit, such as petroleum, coal, or natural gas, derived from living matter of a previous geologic time, and used for fuel.
Generator	One that generates, especially a machine that converts mechanical energy into electrical energy.
Hydroelectric plant	Generating electricity by conversion of the energy of running water.
Renewable energy	Any natural resource that can replenish itself naturally over time, as wood or solar energy.
Transformer	A device used to transfer electric energy from one circuit to another with a change in voltage.
Turbine	Rotary engine in which the kinetic energy of a moving fluid is converted into mechanical energy by causing a bladed rotor to rotate.
Voltage	Electromotive force or potential difference, usually expressed in volts.
Watts	The unit of electrical power equal to 1 ampere (amp) under a pressure of 1 volt.

CAREER POSSIBILITIES

- CIVIL ENGINEER
- ELECTRICAL ENGINEER
- ELECTRICIAN
- PHYSICIST