

## OVERVIEW

Children should be aware of the many things electricity can do for us in our everyday lives. It makes living easier, safer, healthier and more fun. Children also should have a basic understanding of the production and distribution of electricity and learn the potential danger involved in the careless use of electricity.

This educational safety kit for third and fourth grades contains interdisciplinary activities providing a basis for an electrical safety unit. Louie the Lightning Bug® is used to enhance teaching and to

make learning more fun for students. Use Activity No. 1 to introduce Louie. Teachers should use discretion in selecting appropriate activities for students in their classes.

A pre-test and post-test are provided to determine students' knowledge of electricity and electrical safety. Please administer the pre-test before teaching this unit and the post-test afterwards. A letter to family members is included to involve them in this learning process.

## OBJECTIVE

*The objective of this kit is to provide students with a basic understanding of the production and distribution of electricity and how to use it safely.*

## TEACHER BACKGROUND

### GENERATING ELECTRICITY

Electricity or electrical energy is produced by converting some other form of energy into electricity. Three things are needed to produce electricity: a magnetic field, a coil of wire and some source of mechanical energy.

In a power plant, a turbine is used to convert the force of steam or water into mechanical (turning) energy. A turbine is made up of many fan-like blades attached to a shaft. As steam or water is applied to the turbine blades, the shaft turns. The shaft is connected directly to the electrical generator.

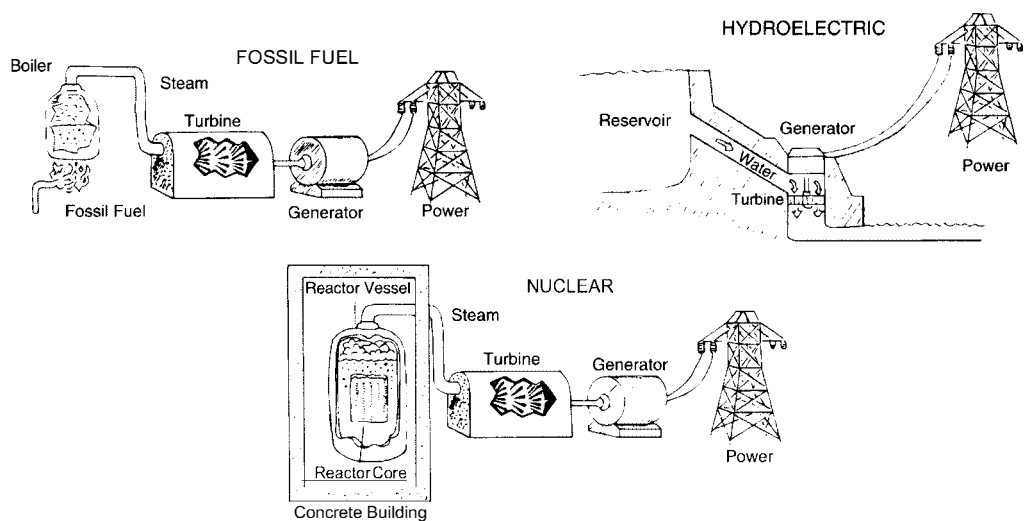
An electrical generator is a machine consisting of a magnet on a shaft surrounded by a coil of wire. As the magnet rotates inside the coil, electrons flow through the wire. This is electricity.

Electricity is produced at three major types of power plants: fossil fuel, hydroelectric and nuclear. In a fossil fuel plant, coal, oil or natural gas is the fuel used to produce steam from water. The steam is used

to power the turbine-generator. Hydroelectric power is produced by harnessing the force of falling water to spin the turbine-generator. Uranium atoms are split in nuclear power plants. The heat created by splitting atoms changes water into steam which is used to power the turbine-generator.

There are many other methods used to generate electricity, including:

- *Tidal power* - Tidal waters in large bodies of water turn turbines located underwater, which turn electric generators.
- *Geothermal* - The earth's natural warmth produces heated water, which produces steam.
- *Biomass* - Burning biomass products, including trees and grass, heats water and produces steam.
- *Coal* - Burning coal heats water and produces steam.
- *Solar Power* - Solar power cells capture sunlight and turn it directly into energy.
- *Wind Turbine* - Wind power turns turbines which contain small generators that produce electricity.



### TRANSPORTING ELECTRICITY

Electricity cannot be sent directly to homes and schools as it leaves the power plant. In order to get electricity through the wires, it must be pushed under pressure.

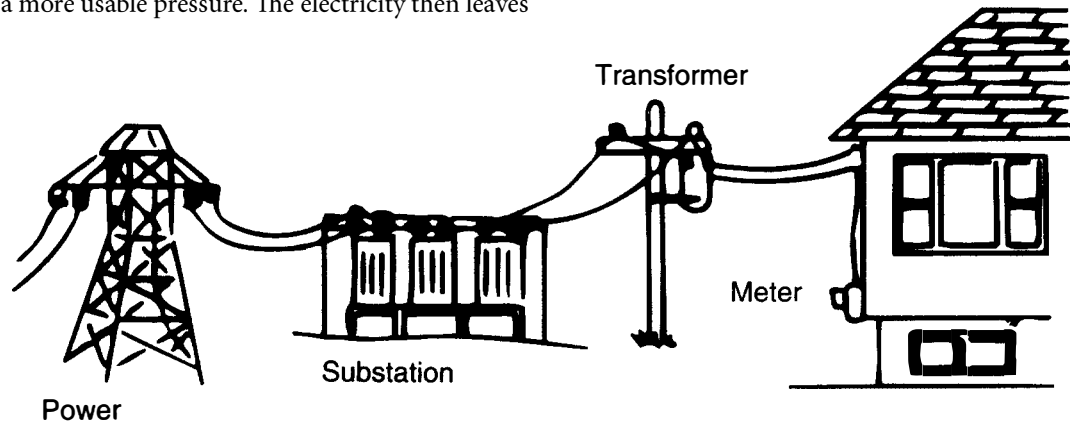
Voltage is the pressure which pushes electricity through a wire. Power plants produce the pressure or voltage. To increase the voltage of electricity, it is sent to a substation located outside the power plant. The substation has devices called transformers which increase the voltage. The transformers help

give electricity an extra push that enables it to travel many miles. The wires which carry this high voltage electricity are called transmission lines.

However, the voltage is too high to use when it arrives in your neighborhood. Another substation is needed to reduce the pressure. This is a distribution substation that contains transformers. These transformers decrease the voltage of electricity to a more usable pressure. The electricity then leaves

the substation along wires called distribution lines. These wires and poles are around your neighborhood. Before electricity comes into your home or school, the voltage is reduced one more time by a distribution transformer.

Meters are found outside homes, schools and other places. These devices measure and record the amount of electricity used.



## SAFETY

Electricity is a very powerful source of energy which can cause injury or death if not handled properly.

In order to be safe around electricity, it is important to know which items are good conductors or good insulators of electric current. Conductors are materials through which electricity flows easily, such as metals, water, people, animals and trees. Insulators are materials that will not allow electricity to flow through easily. Some examples of insulators are rubber, glass and plastic.

The bare, metal wires that bring electricity to us are not insulated. If these wires should touch each other, sparks would fly and might cause an electrical fire. The lines on the poles are kept away from each other by insulators. Touching or even being near a power line can be extremely dangerous.

The only persons who should ever touch a power line are power line workers. They have special training, wear protective clothing and use special equipment and tools to help protect them.

Electricity is our friend; but if handled improperly, it can cause serious injury or damage. Electricity can burn or paralyze our bodies and can even kill.

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## GLOSSARY

*Distribution Lines*-Wires that bring electricity to your house.

*Electricity*-A kind of energy that makes heat and light.

*Fossil Fuel Plant*-An electrical power plant that uses coal, oil or natural gas to produce electricity.

*Hydroelectric Plant*-An electrical plant that uses water to produce electricity.

*Line Worker*-A person who builds and repairs power lines.

*Meter*-A device that measures and records the amount of electricity used.

*Nuclear Plant*-An electrical plant that uses uranium to produce electricity.

*Outlet*-A place to plug in appliances and other devices that operate on electricity.

*Power Plant*-A factory that makes electricity.

*Substations*-A place between the power plant and your house that changes the voltage of electrical energy.

*Transformer*-An electromagnetic device that raises and lowers the voltage of electricity.

*Transmission Lines*-Wires or cables through which high-voltage electric power is moved from point to point.

*Uranium*-The fuel in a nuclear reactor.

*Voltage*-A unit that measures the force of electricity.