FORMS OF ENERGY – LESSON PLAN 2.8

Electrical Energy

This lesson is designed for 3rd – 5th grade students in a variety of school settings (public, private, STEM schools, and home schools) in the seven states served by local power companies and the Tennessee Valley Authority. Community groups (Scouts, 4-H, after school programs, and others) are encouraged to use it as well. This is one lesson from a three-part series designed to give students an age-appropriate, informed view of energy. As their understanding of energy grows, it will enable them to make informed decisions as good citizens or civic leaders.

This lesson plan is suitable for all types of educational settings. Each lesson can be adapted to meet a variety of class sizes, student skill levels, and time requirements.

Setting	Lesson Plan Selections Recommended for Use
Smaller class size, higher student ability, and /or longer class length	• The "Modeling" Section contains teaching content. • While in class, students can do "Guided Practice," complete the "Recommended Item(s)" and any additional guided practice items the teacher might select from "Other Resources." • NOTE: Some lesson plans do and some do not contain "Other Resources." • At home or on their own in class, students can do "Independent Practice," complete the "Recommended Item(s)" and any additional independent practice items the teacher selects from "Other Resources" (if provided in the plan).
Average class size, student ability, and class length	• The "Modeling" Section contains teaching content. • While in class, students complete "Recommended Item(s)" from "Guided Practice" section. • At home or on their own in class, students complete "Recommended Item(s)" from "Independent Practice" section.
Larger class size, lower student ability, and/or shorter class length	• The "Modeling" Section contains teaching content. • At home or on their own in class, students complete "Recommended Item(s)" from "Independent Practice" section.

Electrical Safety Reminder: Teachers should remind students that electricity is dangerous and that an adult should be present when any recommended activities or worksheets are being completed at home. Always obey instructions on warning labels and ensure one has dry hands when touching electronics or appliances.

Public School System Teaching Standards Covered

State Science Standards

- KY SC-4-ET-U-3 4th
- TN SPI 0407.12.2 4th
- TN SPI 0407.12.3 4th

Common Core Language Arts/Reading

- ELA.CCSS.W.4.1 KY 4th
- ELA.CCSS.W.4.3 KY 4th

Performance Objectives

By the end of this lesson, students will be able to:

- **Explain the purpose of electrical energy.**
- **Describe how electricity works.**
- **Identify how electrical energy is measured.**

I. Anticipatory Set (Attention Grabber)

Essential Question

How is electricity created?

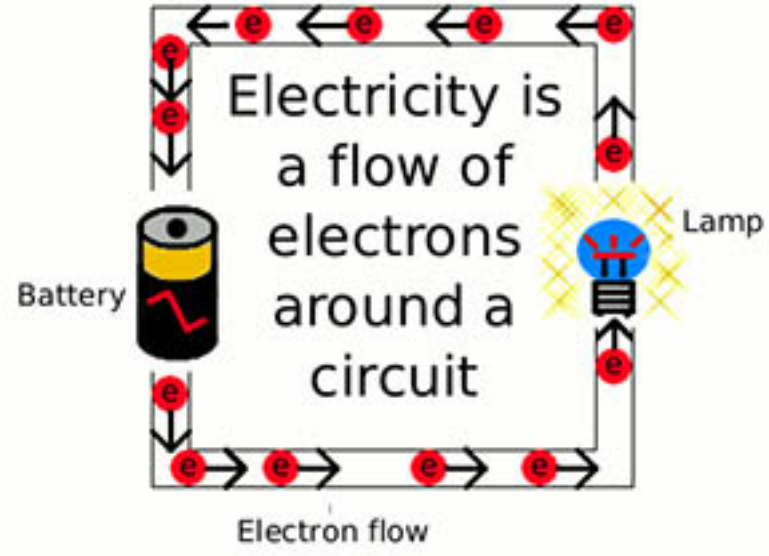
Videos

- **Short video explaining electrical energy and how it works to produce light and heat: http://www.eschooltoday.com/energy/kinds-of-energy/what-is-electrical-energy.html**
- **Bill Nye the Science Guy video on energy/electricity: http://www.billnye.com**

II. Modeling (Concepts to Teach)

When electrons are forced to move along a path in a conducting substance such as a wire, the result is energy called electricity. **Electrical energy is energy carried by moving electrons along this pathway.** Conductors of electricity do a good job of allowing the flow of electrons. Metals are good conductors and that is why most electrical circuits use metal wires. Although electricity cannot be seen, it is one of the most useful forms of energy.

http://www.petervaldivia.com/technology/electricity/moving-charges.php



Power plants do not *create* electrical energy, however. Since energy is neither created nor destroyed, according to **The Law of Conservation of Energy**, electrical energy is a result of energy transformations. For example, power plants can convert chemical energy stored in fuels into thermal energy, which evaporates water into steam, which produces mechanical energy as it moves through turbines. The turbines spin generators, which in turn produce electricity. This electrical energy is used to power lights, heaters, and appliances in homes.

Electrical energy is also seen in the form of **static electricity**. Static electricity is the build-up of charge (electrons) in one location. (Static means to "stay still", or in "one location".) When this build-up of charge is released, the electrons will flow giving off heat, light (lightning), and sound (thunder) in the process.

Read article: http://science.howstuffworks.com/nature/natural-disasters/lightning.htm

Electrical Potential is the potential energy a charge has due to its location in an electrical field. **Electrical potential is measured in volts** (electrical potential energy per charge). The unit "volt" is named after the Italian physicist Alessandro Volta who invented what is considered to be the first chemical battery. Since electrical potential is measured in volts, it is commonly called voltage. Voltage is the amount of potential energy between two points on a circuit.

III. Checking for Understanding

Teachers can ask students these questions to determine understanding of concepts.

REMEMBER	What is electrical energy? How is electrical energy measured? (Class discussion)
UNDERSTAND	Explain static electricity. (Class discussion)
ANALYZE	Investigate how energy is converted into electricity. (Class discussion)
CREATE	Create a small electric circuit. (Teachers and students work together to draw a diagram of a circuit on the board or review the following online circuit exercise: **http://www.sciencekids.co.nz/gamesactivities/electricitycircuits.html**)

IV. Guided Practice Ideas

Recommended Item

Electricity Circuit Experiment (see below)

Experiments

- **Electricity Circuit Experiments**: http://www.sciencekids.co.nz/gamesactivities/electricitycircuits.html
- Experiments (Kids Beginner Electronics, Solar Energy, How To Make a Generator Work): http://sciencewithkids.com/Experiments/Energy-Electricity-Experiments/energy-experiments.html

Games

- Interactive Game – Energy Zone: http://www.kidsenergyzone.com/

V. Independent Practice Ideas

Recommended Items

Scavenger Hunt: Energy in Your home (see below); Electricity Worksheet and Answer Key provided

Other Resources

Personal Practice

- Writing Activity: Teachers write the following questions on the board and ask students to copy and answer the questions on a sheet of paper: What would the world be like if we didn't have electricity? In your opinion, what is the most important form of energy?
- Where Does Your Electricity Come From? Worksheet and Answer Key provided

Practice That May Involve Parents or Guardians

- Scavenger Hunt: Energy in Your Home – Teacher instructs students to find five examples of things that use electrical energy in their home. Do these products use electricity to power light, heat or motion? Write them on a sheet of paper and label if they power light, heat or motion. (Ex. Stove – heat; TV – light; Fan - motion).

VI. Assessment

These items provide a check for understanding so teachers can easily determine whether concepts need to be reinforced. These items can be graded, if desired.

- Where Does Your Energy Come From? Worksheet and Answer Key provided
- Writing Activity (if completed as Independent Practice, as shown above)

VII. Materials Needed

- None for Electricity Circuits Experiments

VIII. Closing the Lesson

In addition to the Essential Question shown below, teachers can reference Performance Objectives at the top of the Lesson Plan.

Essential Question

How is electricity created?

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WORKSHEET FOR ELECTRICAL ENERGY LESSON 2.8 **NAME:** _____

Where Does Your Energy Come From?

Objective: Students will be able to explain the purpose of electrical energy, how electricity is used in homes, and identify how electrical energy is measured.

1. **Explain the purpose of electrical energy.**

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2. **Why are most electrical circuits made of metal?**

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3. **Can we create electrical energy? Why or why not?**

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4. **How do you use electricity at home?**

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5. **Explain how electricity is measured and why we measure it this way?**

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Answer Key

ANSWER KEY FOR WORKSHEET: WHERE DOES YOUR ENERGY COME FROM?

1. **Explain the purpose of electrical energy.**

   Ex. Electrical energy exists when electrons are forced to move along a path in a conducting substance such as a wire. Although electricity cannot be seen, it is one of the most useful forms of energy.

2. **Why are most electrical circuits made of metal?**

   Ex. Metals are conductors of electricity and they do a good job of allowing the flow of electrons.

3. **Can we create electrical energy? Why or why not?**

   Ex. Since energy is neither created nor destroyed according to The Law of Conservation of Energy, electrical energy is a result of energy transformations.

4. **How do you use electricity at home?**

   Ex. Watching television, playing video games, using the microwave, etc.

5. **Explain how electricity is measured and why we measure it this way?**

   Ex. Electrical potential is measured in volts, which is the potential electrical energy per charge.