

ELECTRICITY READER TEACHERS' GUIDE

AG IN THE CLASSROOM - HELPING THE NEXT GENERATION UNDERSTAND THEIR CONNECTION TO AGRICULTURE

RESOURCES

About.com – Understanding Electricity (Inventors)
<http://inventors.about.com/library/inventors/blelectric1.htm>

Discovery Channel School – Electricity
<http://school.discoveryeducation.com/curriculumcenter/electricity/>

Electric Math: The Numbers and Math Behind Our Everyday Appliances
<http://www.partselect.com/JustForFun/Electric-Math-Numbers-Behind-Appliances.aspx/>

How Stuff Works – Electricity
<http://science.howstuffworks.com/electricity.htm>

National Energy Foundation
<http://www.nef1.org/educators.html>

National Renewable Energy Laboratory
http://www.nrel.gov/learning/student_resources.html

Touchstone Energy Kid Zone
<http://www.touchstoneenergykids.com/>

U.S. Department of Energy
<http://www.eere.energy.gov/>
<http://www1.eere.energy.gov/kids/>

U.S. Energy Information Administration
<http://www.eia.gov/>
<http://205.254.135.24/tools/faqs/>

Comments, questions, suggestions and feedback about the Colorado Reader are welcome.

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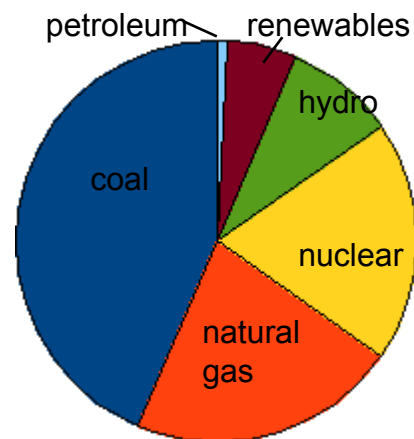
Page One Answers:

Lighting = \$15.30
Water Heating = \$9.30
Space Heating = \$9.00
Refrigeration = \$7.90
Televisions = \$7.20
Clothes Dryers = \$4.00
Computers = \$3.80
Cooking = \$2.30
Dishwashers = \$2.00
Freezers = \$1.70
Clothes Washers = \$.70
Miscellaneous Uses = \$18.90

Page Two Answers:

- 1) 13 – 24 kilovolts
- 2) step-up transformer
- 3) 34.5 – 69 kilovolts
- 4) Business, School, Farms, Home

Pie Chart should look like:



Page Four/Five Answers

(How much does it cost?):

- 1) $500 \times 2 \times 52 / 1000 \times .15 = \7.80
- 2) $3000 \times 3 \times 52 / 1000 \times .15 = \70.20

$$3) 725 \times 10 \times 52 / 1000 \times .15 = \$56.55$$

$$4) 120 \times 1 \times 7 \times 52 / 1000 \times .15 = \$6.55$$

$$5) 50 \times 3 \times 5 \times 36 / 1000 \times .15 = \$4.05$$

$$6) 2400 \times 1 \times 7 \times 52 / 1000 \times .15 = \$131.40$$

Page Five Answers

(Understanding your electric bill):

- 1) 900 kilowatt-hours
- 2) \$.15
- 3) 78 kilowatt-hours less than last year (900 this year vs. 978 last year)
- 4) The average daily temperature for this year is 55 degrees compared to 48 degrees last year. The home owners may have had to use more electricity to heat the home last year because of the cooler temperatures.

Page Six Answers:

- 1) Coal
- 2) Electricity can only be produced from solar sources when the sun is shining. The sun does not shine at night or when it is cloudy outside.
- 3) The wind can potentially blow during the day and/or night, while the sun can only shine during the day.

Page Eight Answers:

- 1) All of the above
- 2) Coal
- 3) Watt
- 4)Kilowatt
- 5) All of the above
- 6) All of the above
- 7) 1 million watts
- 8) Transmission line system
- 9) All of the above
- 10) Coal

ACTIVITES:

After reading page seven, have your students list other jobs in the electric utility field.

Have your students write a paragraph describing what their life would be like if there was no electricity. Have students share their paragraphs. Sharing their ideas should give students more insight in the roles electricity plays in their lives.

Discussion Questions:

Why do birds sit on wires and not get killed?

Electric current always wants to find a way to get to the ground but, because birds aren't touching the ground or anything that's in contact with the ground, the electric current won't flow through them.

What is static electricity?

What we commonly call "static electricity" is a build-up of electric charge that can't go anywhere, as it is not connected to an electric circuit or some other means where it can flow to form an electric current. Static electricity is the build-up of the charge that can cause high voltages to be created.

What's the highest voltage I can touch without being electrocuted?

You can't say how few volts will kill because inside your body is a special sort of electric current that activates your heart and other muscles. It also makes your nerves work. Any

extra electric charge put into one's body can upset that balance and cause a heart attack. There have been incidents of a child dying as a result of touching a battery with their tongue. Don't take risks, treat electricity with respect.

What should I do in a thunderstorm?

"If thunder roars, go indoors" - because no place outside is safe when lightning is in the area.

Why does electric current want to get to the ground?

It's just the nature of electric current to move from an area of higher voltage to an area of lower voltage, if it is given a path to travel there. The ground is the lowest-voltage area, so, if you give electric current a path to the ground, it will take it, no questions asked! When electricity goes into the ground, the Earth absorbs its energy.

Why didn't Benjamin Franklin get electrocuted when he flew a kite in an electrical storm?

Benjamin Franklin's famous key did give off an electric spark. But lucky for Franklin, the kite was just drawing small electrical charges from the air. If the kite had actually been struck by lightning, Franklin would have been killed!

Can you get electrocuted if you touch metal during a lightning storm?

No, unless a lightning bolt strikes the metal you are touching.

How many volts would kill someone?

The nerves and muscles in your body rely on very low levels of electricity to work. Even small amounts of extra electricity can upset the careful balance and could cause a heart attack.

respect.

What's behind the cost of electricity?

Electricity prices generally reflect the costs to build, finance, maintain, manage and operate power plants and the electric grid (the complex system of power transmission and distribution lines) and to operate and administer the utilities that supply electricity to consumers. Some utilities are for-profit and their prices include a return for the owners and shareholders.

Some key factors that affect the price of electricity include:

- Fuels — Coal is relatively inexpensive while natural gas tends to be more costly.
- Power plants — Construction and maintenance costs are greater for some kinds of power plants than others.
- Transmission and distribution lines — Maintaining and using the transmission system to deliver electricity contributes to the cost of electricity.
- Weather conditions — Rain and snow can provide water for hydropower generation. Extreme heat can increase the demand for electricity for cooling.
- Regulations — In some states prices are fully regulated by Public Service Commissions, while in others there is a combination of unregulated prices (for generators) and regulated prices (for transmission and distribution).

Electricity Demand

U.S. electricity use is expected to grow slowly

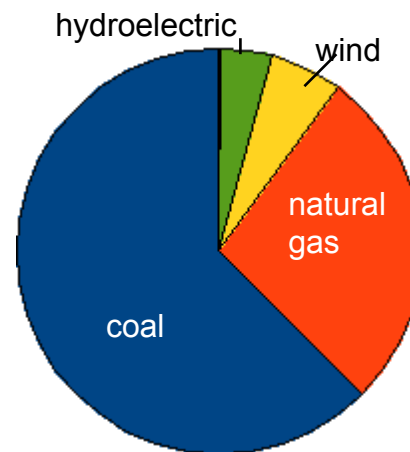
Electricity demand fluctuates in the short term in response to business cycles, weather conditions and prices. Over the long term, electricity consumption increases. However, electricity demand growth has slowed progressively by decade since 1950, from 9% per year in the 1950s to less than 2.5% per year in the 1990s. From 2000 to 2009, increases in electricity demand averaged

0.5% per year. Demand growth is projected to continue at about 1% per year through 2035.

International electricity use will grow faster

Electricity is expected to remain the fastest growing form of end-use energy worldwide through 2030, as it has been over the past several decades. The highest demand growth is expected in China and India, plus smaller developing countries in Asia.

Pie chart on page 8 should look like:



Solar is so small, it is just a line on the chart.

Electricity ~ Please take a few minutes to evaluate your students' knowledge of this topic.

You can also fill out this evaluation online at:

www.growingyourfuture.com

How many students used this reader?

How many of your students understand that they use electricity every day?

How many of your students understand that electrical energy is the movement of charged particles? _____

How many of your students understand that electricity is a secondary energy source generated from other fuels such as coal or natural gas or created using nuclear power or renewable resources?

How many of your students understand that electricity is measured in units of power called watts? _____

How many of your student know that a kilowatt equals 1000 watts? _____

How many of your students can define what "capacity factor" means?

How many of your students can describe one way math is used in electric utility careers? _____

How many of your students can describe one rule for electrical safety?

Return this evaluation for a chance to win a \$100 Visa card.

Please rate:

Student Activities Throughout Reader

Teacher's Guide

Reading Level

I would like to see more activities like: _____

Good

Average

Poor

5 4 3 2 1

5 4 3 2 1

5 4 3 2 1

School: _____

Grade Level: _____

Subject: _____

Name: _____

Phone: _____

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