



Follow the rules

**Stay safe around electricity and
natural gas.**

**National Electric Safety Month
May 2005**

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Dear Educator,

May is National Electrical Safety Month, and We Energies is pleased to offer you safety education materials for your science and health units. Energy experts and educators developed this book for you to:

- Provide safety information about energy.
- Help meet academic standards for science.

For more safety materials, visit our We Energies Educators Web site at www.we-energies.com. Click on *Other Visitors*, then *Educators*, to get energy education resources such as classroom workbooks and an online safety quiz for students.

Safety is important to We Energies, and I thank you for taking the time to help teach children about electrical and natural gas safety. You truly make a difference in the lives of youth.

Sincerely,



Jacquelyn Peck
Education Outreach Program

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Follow the rules



Take safety seriously

Unintentional injury is the number one killer of children ages 14 and under.
Source: National SAFE KIDS campaign.

Every year in the U.S., tens of thousands of people are killed or injured from contact with electricity. Some are children.

Electricity and natural gas are useful tools when handled correctly. Following simple safety rules will help children remain safe while using electricity and natural gas.

Four safety rules

1. Stay away from power lines.

Overhead wires are *not insulated*, and can carry up to 345,000 volts of electricity. So before you climb a tree or fly a kite, look up and stay away from power lines.

2. Mr. Ouch means danger.

Mr. Ouch is a cautionary character found on stickers attached to dangerous electrical equipment — such as green transformer boxes. He appears on this dangerous equipment to warn children and adults of hazardous voltage. So when you see Mr. Ouch, don't touch. He means danger.

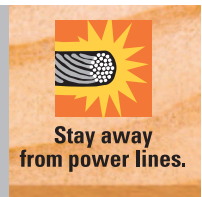
3. Natural gas smells like rotten eggs.

For your safety, a strong odorant called Mercaptan is added to natural gas to make it smell like rotten eggs or sulfur. So if you smell this stinky smell, do not turn off the lights or use a telephone. These actions could cause a spark or even an explosion. If you smell natural gas, tell an adult immediately. If no adult is present, get everyone out of the house and tell a trusted adult to call We Energies for help at (800) 261-LEAK.

4. Outlets are for plugs.

Outlets are wired directly to the circuits that carry electricity to appliances such as computers, video games or microwaves. Outlets can carry 120 volts of electricity. So never stick your finger, metal or anything other than a plug into an outlet.

Rule No. 1 - Stay away from power lines.



Lesson Plan: Building Electricity

Concept

- Illustrate how electricity works to reinforce safety fundamentals.

Instructional Information

- Target Grade Level: 3-5
- Time: 30 minutes (15-minute discussion; 15-minute activity)
- Curriculum Focus: science, health, safety
- Key Vocabulary: electricity, power lines, power plant, energy sources

Learning Objectives

- Know how to be safe around electricity
- Determine uses of electricity
- Understand how electricity is generated

Material Needed

- Building Electricity overhead, provided
- Generating electricity overhead, provided
- Distributing electricity overhead, provided

Background

Electricity is a form of energy – kinetic energy – that is produced from the use of energy sources like coal, natural gas, oil, nuclear, wind, water, solar and biomass.

Most electricity is generated at a power plant from nonrenewable energy sources – coal, natural gas, oil, and uranium for nuclear energy.

A power plant consists of two main parts: 1) the generator, which makes electricity and is made up of a magnet surrounded with copper wire and 2) the turbine, a metal fan that drives the generator. When wind blows, water falls, coal is burned or nuclear fission started, the turbine begins to turn. This turning causes the generator to pass by the positive and negative ends of the magnet. The differences between these charges (voltage) cause the electrons in the copper wire to become energized and begin to flow (current). When the current reaches the distribution site (e.g. light bulb), the electrons cause the tungsten wire in the light bulb to get hot and emit light. The electrons then return to the generator in the power plant (A complete or closed circuit is needed to make things like a light bulb work, which is why there is a circuit from the plant to your home and back to the plant.), where the electrons are reenergized by the generator. Electrons move at the speed of light, which is one of the reasons why electricity travels so fast.

Electrons are one of three particles that make up an atom. Atoms are tiny particles that are too small to see, but make up everything around us – matter. The center of the atom has at least one proton and one neutron. At least one electron travels around the center of the atom at very great speed. An outside force, called voltage, can push electrons from atom to atom. This movement of electrons produces electricity.

We Energies owns and operates a total of 25 power plants: 14 hydroelectric, 6 coal, 3 natural gas, 1 nuclear and 1 wind. These generating facilities in Wisconsin and Michigan produce about 5,600 megawatts, which serve one million electric customers.

Need more information? Go to www.we-energies.com/educators/.

(next page)



Rule No. 1: Stay away from power lines.

How to Do the Lesson

Introduction

May is National Electrical Safety Month, and there are four safety rules that are important to follow: 1) stay away from power lines, 2) Mr. Ouch means danger, 3) natural gas smells like rotten eggs and 4) outlets are for plugs. And today, we are going to discuss electricity and the importance of staying away from power lines. But why is it important to discuss electricity?

What would our world be like without electricity? (Students list examples like no television, no video games, no refrigerator, etc.) So electricity is important in our everyday life, and that's why we are going to spend some time talking about energy and safety.

Energy Fundamentals

What is electricity? Is it the lights we see with our eyes? (No, those are called photons.) Electricity is a form of energy (kinetic, moving energy). But where does electricity come from? Use *Building Electricity* overhead to illustrate. To produce electricity, power plants – where electricity is produced – need energy sources.

There are several types of energy sources: renewable (can use over and over) and nonrenewable (once used are depleted). What are different types of energy sources? Point to answers on overhead. (We Energies gets its uranium for nuclear energy from Australia, and its low-sulfur coal from western states such as Wyoming. We Energies brings energy sources to its power plants by barge or train car.)

These energy sources are used in the power plant to produce electricity. An energy source, coal for example, is burned in a boiler to heat water to make steam. Show process with overhead. Under high pressure, this steam turns fans that are connected to the generator. The generator has two main components: a rotating magnet and copper wire. When the magnet rotates, electrons start to move and create a flow of current through the copper wires. This movement in the magnetic field generates electricity, which is carried over power lines.

Electricity travels from the power plant to homes, businesses and schools through over 40,000 miles of overhead and underground wires – that's almost twice the circumference of the earth! These wires contain powerful amounts of electricity.

The power of electricity is useful in your house for things such as air conditioners and water heaters, but to stay safe around electricity, we need to follow a few simple rules. For example, rule number one: stay away from power lines. Why is that a rule?

The Safety Aspect

When electricity travels, it takes the shortest path to the ground – even if that means through you! People make an excellent path to ground for electricity. Your body is made up of 70 percent water. Like aluminum and copper, water is an excellent conductor. If you become a part of electricity's path to ground, you're in danger of being shocked or burned or worse.

Overhead wires are not insulated and can carry up to 345,000 volts of electricity. So before you climb a tree or fly a kite, look up and stay away from power lines.

Ask students: so what is rule number one? (Answer: stay away from power lines.)

Recommended Activity

I Speak Up for Safety

Rule No. 2 - Mr. Ouch means danger.



Mr. Ouch
means danger.

Lesson Plan: Is that dangerous?

Concept

- Show how to recognize electrical hazards to emphasize the importance of safety.

Instructional Information

- Target Grade Level: 1-2
- Time: 25 minutes (10-minute discussion; 15-minute activity)
- Curriculum Focus: science, health, safety
- Key Vocabulary: electricity, transformer

Learning Objectives

- Identify dangerous electrical situations
- Know how to be safe around electricity
- Identify uses of electricity

Material Needed

- Transformer with Mr. Ouch overhead, provided
- Mr. Ouch sign, provided

Background

Overhead and underground electrical wires transmit electricity to homes or schools from the power plant. During electrical distribution, electrical voltage may be stepped up or down, either increasing or decreasing voltage. Electrical equipment such as transformers can be shaped like a green metal box. These transformers house electrical wires and either step up or step down voltage, depending on what the location needs. This means that there is electricity being conducted through these transformers! An important thing to notice about these transformers and other electrical equipment is their Mr. Ouch sticker. Mr. Ouch means danger and serves as a hazardous voltage warning.

How to Do the Lesson

Introduction

Does anyone know who Mr. Ouch is? He is very famous. Mr. Ouch is on thousands of signs and pieces of equipment across Wisconsin. In fact, he probably is right in your neighborhood.

Energy Fundamentals

Have you ever seen this sign? This is Mr. Ouch. *Point out lightning bolt character.* You can find him on electric utility equipment such as green transformer boxes like this. *Show transformer with sticker on it.* How many of you have seen a transformer like this? What do you think happens inside a transformer? Let's find out. *(next page)*



Mr. Ouch
means danger.

Rule No. 2 - Mr. Ouch means danger.

Electricity travels from the power plant to our homes and schools through over 40,000 miles of overhead and underground wires – that's almost twice the circumference of the earth! In order to get electricity to your homes, these wires contain powerful amounts of electricity, or a push of electricity. What makes this push so powerful? (Transformers.)

Inside a transformer, electricity is either decreased or increased. Transformers closer to your homes decrease the push of electricity to 120 volts, which is what you have in your home.

This means that there is electricity going through these transformers! Again, an important thing to notice about these transformers and other electrical equipment is their Mr. Ouch sticker. Why do you think Mr. Ouch is on this electrical equipment? (To warn children and adults of danger and hazardous voltage.) Mr. Ouch means danger and serves as a hazardous voltage warning. So when you see Mr. Ouch, don't touch.

The power of electricity is a useful tool in your house for things like an oven to make your birthday cake in, or a microwave to pop popcorn in or even lights to light up your classroom. And having the right push of electricity, helps makes the use of these electrical appliances safe and possible. But to stay safe around electricity, we need to follow a few simple rules.

Safety Aspect

May is National Electrical Safety Month, and because being safe is important, we discussed one of the four rules of safety: Mr. Ouch means danger. The other rules are: stay away from power lines, natural gas smells like rotten eggs and outlets are for plugs.

So what do we do when we see Mr. Ouch? (Stay away. And tell others to do the same.) Mr. Ouch means danger. Don't touch.

Recommended Activity

I Spy Safety

Rule No. 3 - Natural gas smells like rotten eggs.



Natural gas smells like rotten eggs.

Lesson Plan: Blue-flamed energy

Concept

- Use sense of smell to emphasize natural gas safety fundamentals.

Instructional Information

- Grade Level: 3-5
- Time: 30 minutes (15-minute discussion; 15-minute computer lab activity)
- Curriculum Focus: science, health, safety
- Key Vocabulary: natural gas, mercapton

Learning Objectives

- Understand what natural gas is in relation to states of matter
- Know how to be safe around natural gas and electricity
- Identify uses of natural gas

Material Needed

- Natural gas distribution overhead, provided
- Mercapton sticker, provided in safety brochure

Background

Natural gas is a combustible gas found in deep underground reservoirs formed by porous rock. This fossil fuel is composed almost entirely of methane, but does contain small amounts of other gases. Methane is a molecule that has one carbon atom and four hydrogen atoms.

Three segments of the natural gas industry are involved in delivering natural gas from the wellhead to users. Production companies explore, drill and extract natural gas from the ground. Pipeline companies operate the pipelines that link the gas fields to major consuming areas. Distribution companies, like We Energies, are the local utilities that deliver natural gas to the customer or use it to produce electricity. Natural gas is delivered to about 175 million American consumers through a 1.3-million-mile network of underground pipe. A total of 288,000 producing natural gas wells, 125 natural gas pipeline companies and more than 1,200 gas distribution companies provide gas service to all 50 states. About 46 percent of natural gas delivered to U.S. consumers is used in the industrial sector, providing energy for everything from mining minerals to processing food. Generating electricity only consumes about 15 percent of natural gas. Another 15 percent is used in the commercial market – for heating and cooling office buildings, hospitals and schools, and for cooking in restaurants. Most of the remaining amount – about 22 percent – is used in the residential market, providing energy for home heating, hot water, cooking, clothes drying and air conditioning.

We Energies has nine combustion turbines, which are fueled by natural gas or oil, and can be started up by remote control from the company's system control offices.

(next page)



Natural gas smells like rotten eggs.

Rule No. 3 - Natural gas smells like rotten eggs.

How to Do the Lesson

Introduction

Do you have a gas stove in your home? Did you know that we can produce electricity using that same gas - natural gas? Natural gas is a very useful energy source. It is used to cook food, heat homes and even dry our clothes, but it requires careful use to avoid fires and other hazardous situations. Does anyone know why we have to be extra careful with natural gas? Natural gas is a colorless, odorless and nonpoisonous gas. So if we can't smell it or see it, how can we tell if there is a gas leak? Let's go back to the beginning. What is natural gas and where does it come from?

Energy Fundamentals

Natural gas is a fuel that occurs in nature. In fact, it is a fossil fuel that is extracted from rocks in the ground, using deep wells and drilling rigs. These gas wells remove natural gas from the ground, using a metal drill to dig into the Earth's crust. When natural gas is found, it is easy to bring it to the Earth's surface through pipes, because natural gas is lighter than air, so it just rises up. Once natural gas comes out of the ground, it needs to be transported through pipes to something called a processing plant, where sand, water and other impurities are removed to help natural gas burn cleanly and be more pure. From here, natural gas is sent all over the United States through miles of pipeline. *Show Natural Gas Distribution overhead.* (We Energies gets some of its natural gas from Louisiana.)

When natural gas is traveling through these 1.3 million miles of pipes, does it look like the gasoline you put in your car? (No.) Natural gas is a gas. Does anyone know the other two states of matter? (Solids and liquids.) The gas that you put in your car is gasoline and is a liquid. Natural gas is a mixture of hydrogen, which can be found in the air, and carbon. And like the air, we can't see a gas.

Because natural gas is odorless and colorless, a strong odorant, Mercaptan, is added to natural gas for your safety before it gets to your home. Mercaptan has a foul odor similar to hydrogen sulfide, or rotten eggs.

Safety Aspect

Why is Mercaptan important? Natural gas is flammable. If a gas leak occurred, we couldn't smell it without Mercaptan, and a dangerous explosion or fire may result.

Have you ever smelled a rotten egg? If you have, you know the stinky smell of rotten eggs – and natural gas. If you smell natural gas, do not use a light switch, candle, flashlight or even a telephone. Tell an adult immediately. If no adult is present, get everyone out of the house and tell a trusted adult to call the utility company for help.

This is one of the four rules of safety: natural gas smells like rotten eggs. Here is an example of what natural gas smells like. Pass around Mercaptan scratch and sniff found in the Safety Guide. The other rules that are important to follow when using electricity or natural gas are stay away from power lines, Mr. Ouch means danger and outlets are for plugs.

So what should you do if you smell natural gas? (Tell an adult immediately.) Don't use the telephone or even turn off the lights.

Recommended Activity

Safety Quiz at www.we-energies.com/educators/

Rule No. 4 - Outlets are for plugs.



Lesson Plan: Safety unplugged

Concept

- Demonstrate how to use a cord, plug and outlet to share key safety messages.

Instructional Information

- Grade Level: K
- Time: 25 minutes (10-minute discussion; 15-minute activity)
- Curriculum Focus: science, health, safety
- Key Vocabulary: electricity, outlet

Learning Objectives

- Understand what makes a dangerous electrical situation
- Know how to be safe around electricity
- Identify uses of electricity

Material Needed

- Outlet picture, provided
- Outlet and cord with plug picture, provided
- Cord with plug picture, provided
- Metal fork picture, provided

Background

Each outlet in your home and school is connected into a circuit through wires that carry electricity. The circuits in your homes are wired to supply electricity for different types of appliances such as computers, televisions and even Gameboy players. Outlets carry 120 volts of electricity, but when too many appliances are plugged into an outlet, a breaker will trip or fuse will blow in your circuit breaker box, which protects you from using too much electricity at one time.

How to Do the Lesson

Introduction

Who can show me an outlet in the classroom? What do we use an outlet for? (Encourage students to respond with different types of electrical appliances.) So outlets make things work – and they do this by using electricity. Would you say that word with me – electricity? Electricity is what makes our television, refrigerator and computers work when we plug them into an outlet. Electricity is very powerful and could be dangerous if you don't follow the rules.

Who thinks they know the rules for how to be safe around electricity and outlets? Let's find out. I'm going to tell you some things I want to do when using outlets and electricity. If it's not safe, I want you to say, "Stop. Outlets are for plugs." Okay?

Electricity Basics

Use pictures of objects. I want to stick my finger in the outlet and see what is in there to make things work. (Start to move your *(next page)*)



Rule No. 4 - Outlets are for plugs.

finger toward the outlet. Prompt students to tell you stop, if there is not participation. Students should reply, "Stop. Outlets are for plugs.") That's right. You should never stick your finger or anything other than a plug into an outlet. There is a lot of electricity wired to this outlet to make things work. Do you know how much? 120 volts!

Well, if I can't stick my finger in the outlet, I want to stick a metal fork in the outlet and see what happens. (Start to move the fork toward the outlet. Prompt the students, if no reply. Students should reply, "Stop. Outlets are for plugs.") That's right; metal can touch the wires that are in the outlet and shock, or even worse, the person holding the fork. So never stick anything into or play with outlets. You could get hurt.

Well if I can't play with the outlet, I want to chew on the cord. It looks yummy. (Start to lean toward the cord. Prompt students, if no reply. Students should reply, "Stop. Outlets are for plugs.") That's right. These plugs on the end of the cord are for the outlet, not your mouth.

Safety Aspect

So remember, outlets are useful, but carry dangerous amounts of electricity. So never stick your finger, metal or anything other than a plug into an outlet. Outlets are for what? Help students answer with: plugs.

That's a very important rule when using electricity.

Recommended Activity

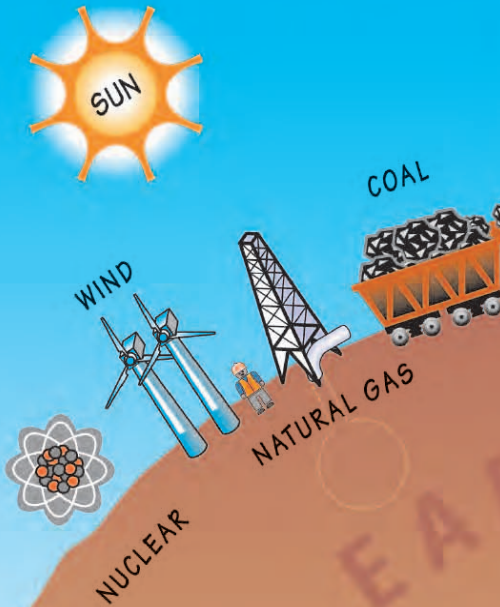
Mr. Ouch means danger coloring sheet



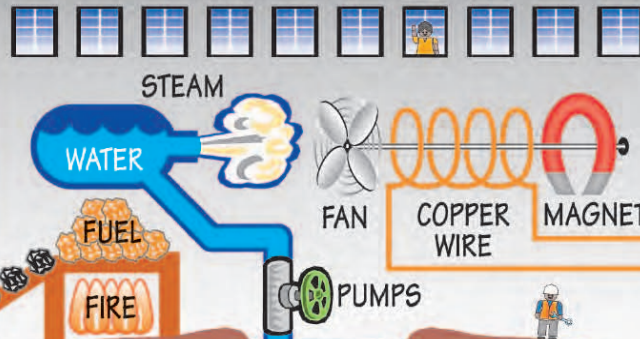
Building Electricity



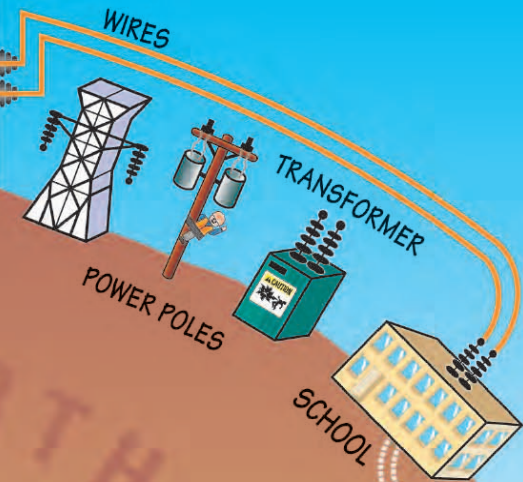
DIFFERENT ENERGY SOURCES



POWER PLANT



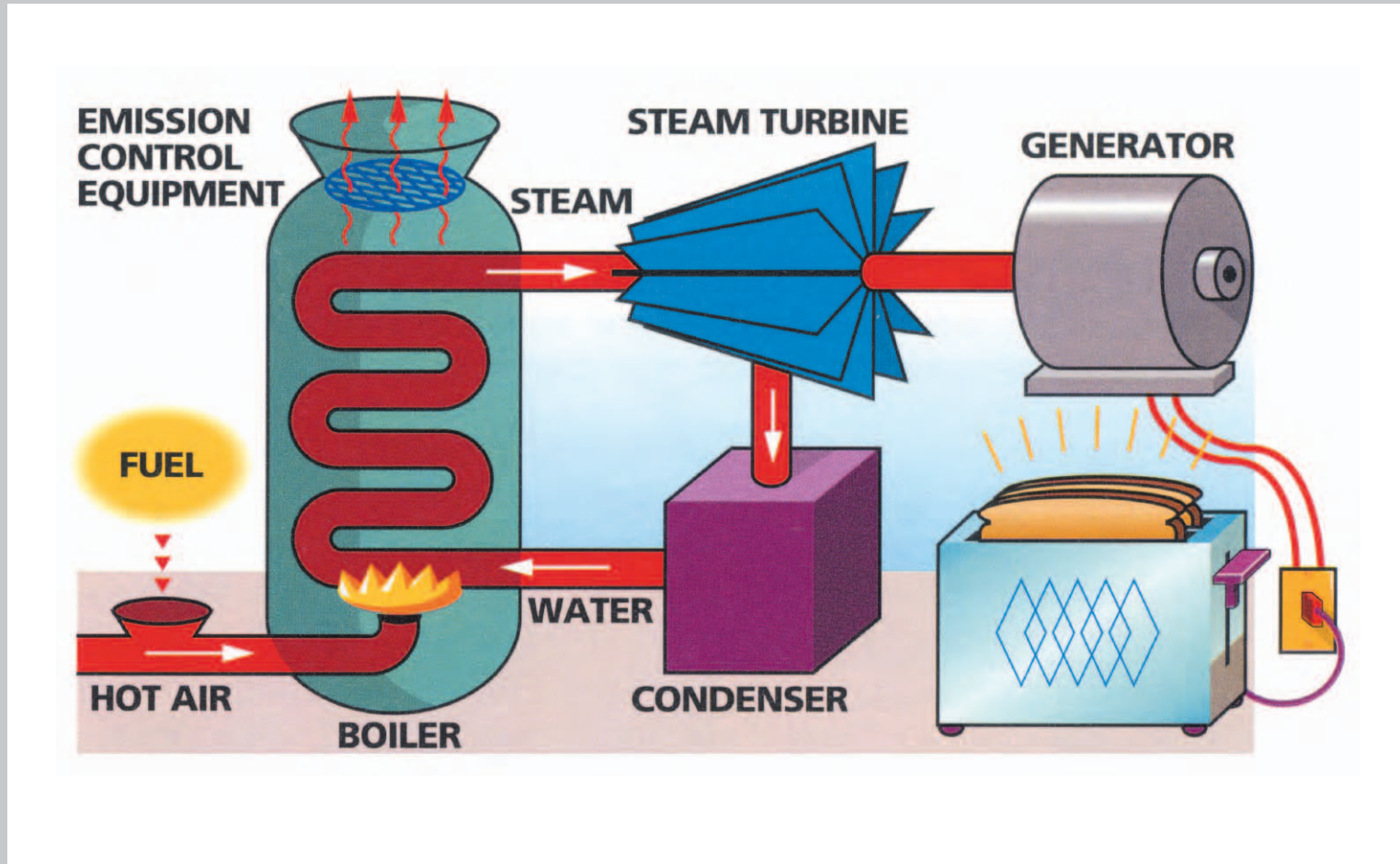
HOW ELECTRICITY GETS TO YOUR HOME



When using electricity and natural gas, follow the rules to stay safe.

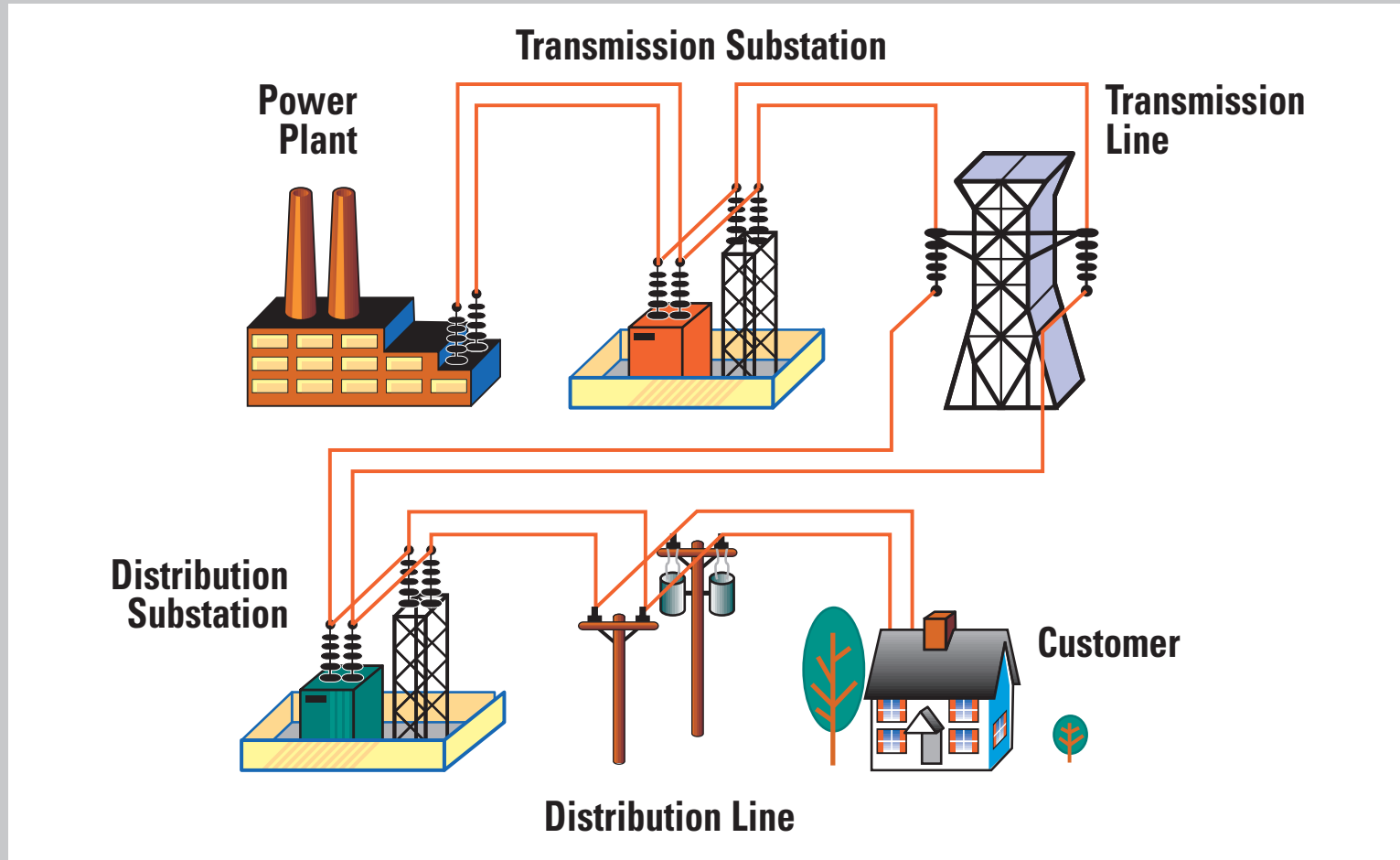


Generating Electricity





Distributing Electricity

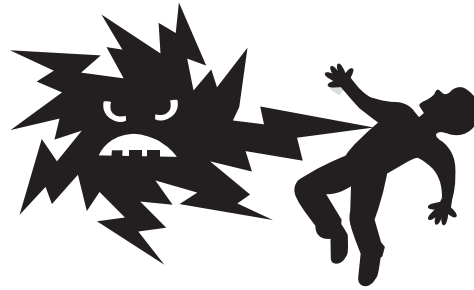




Mr. Ouch Sign



 **CAUTION**



Hazardous voltage inside.

Keep out!

**Can shock, burn, or
cause death.**

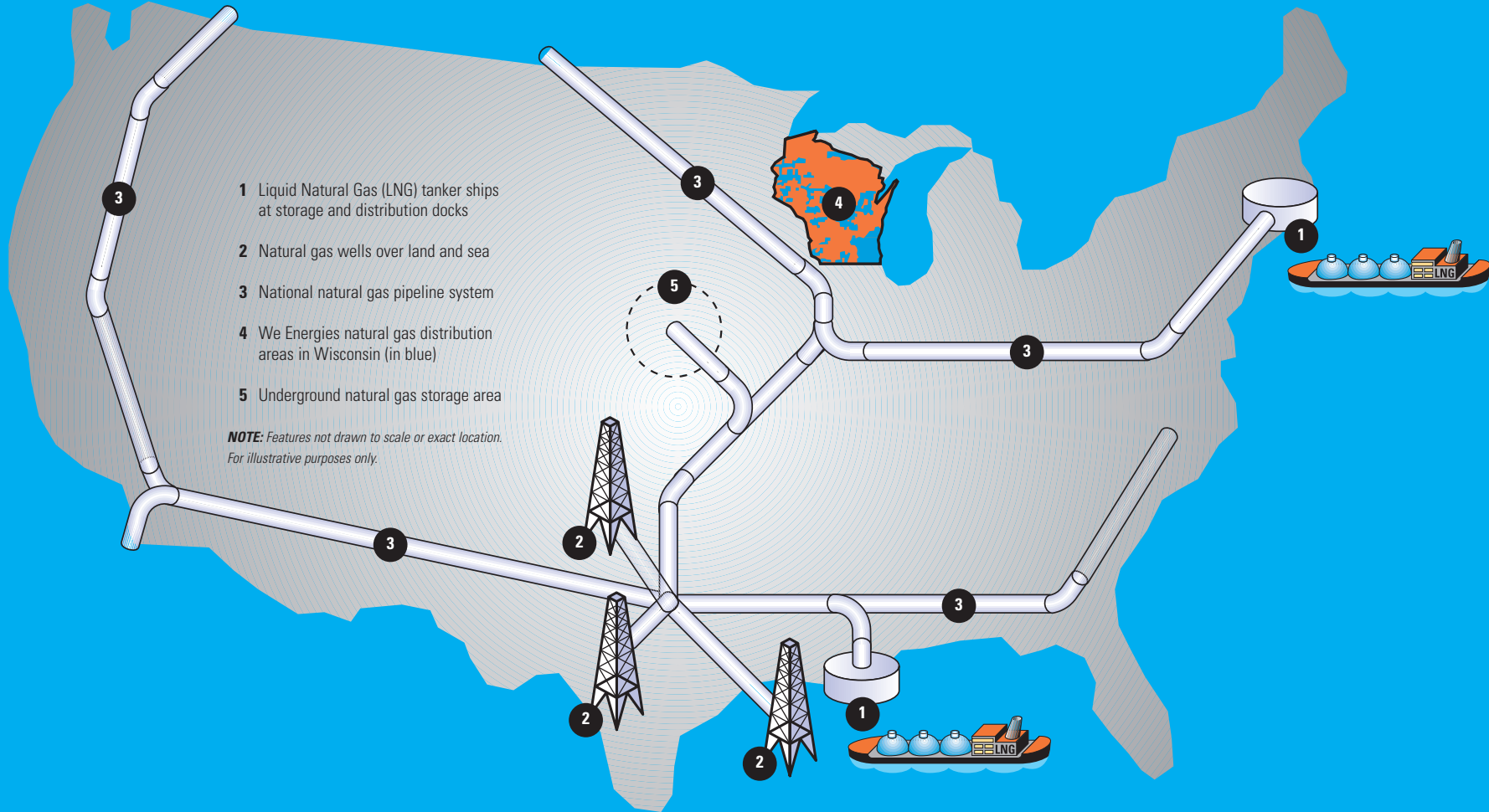


Transformer with Mr. Ouch



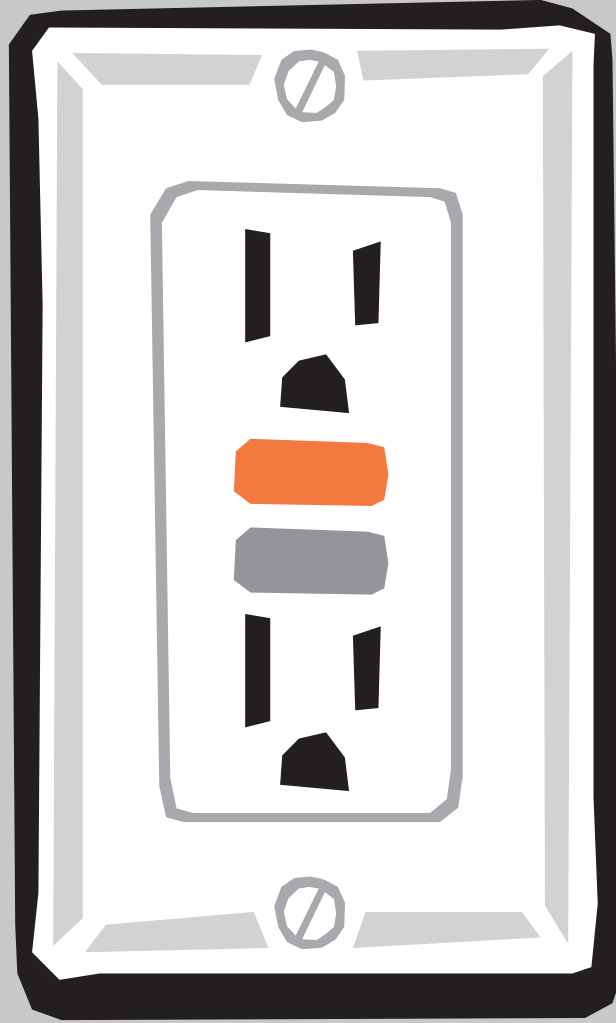


Natural Gas Distribution





Outlet



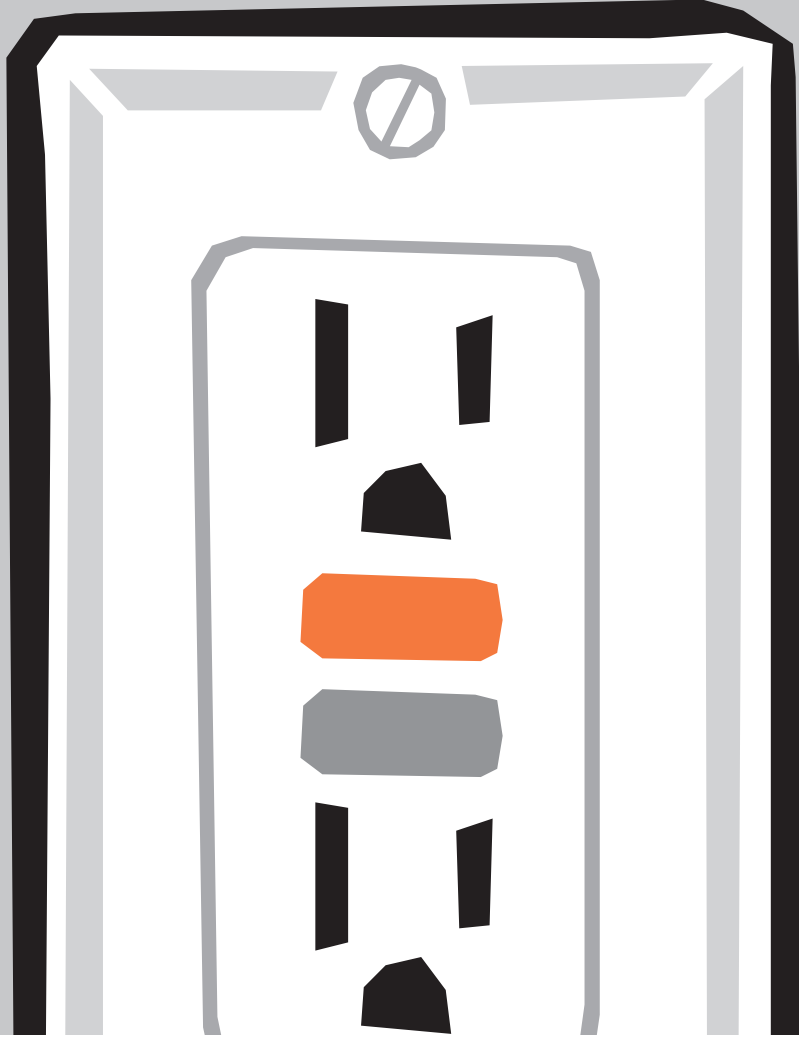


Cord with plug



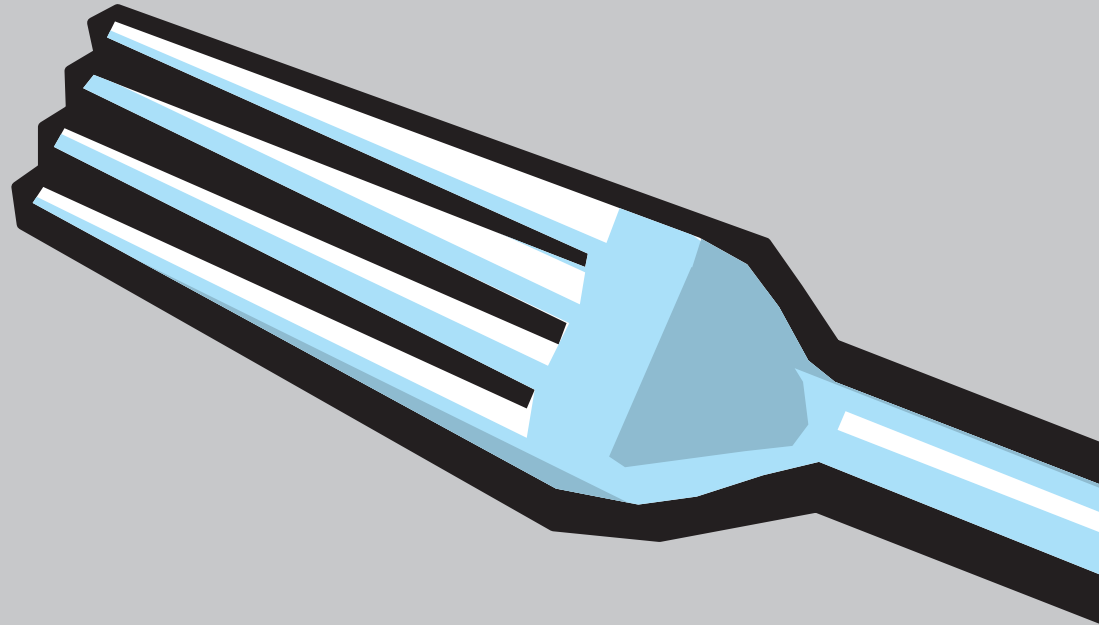
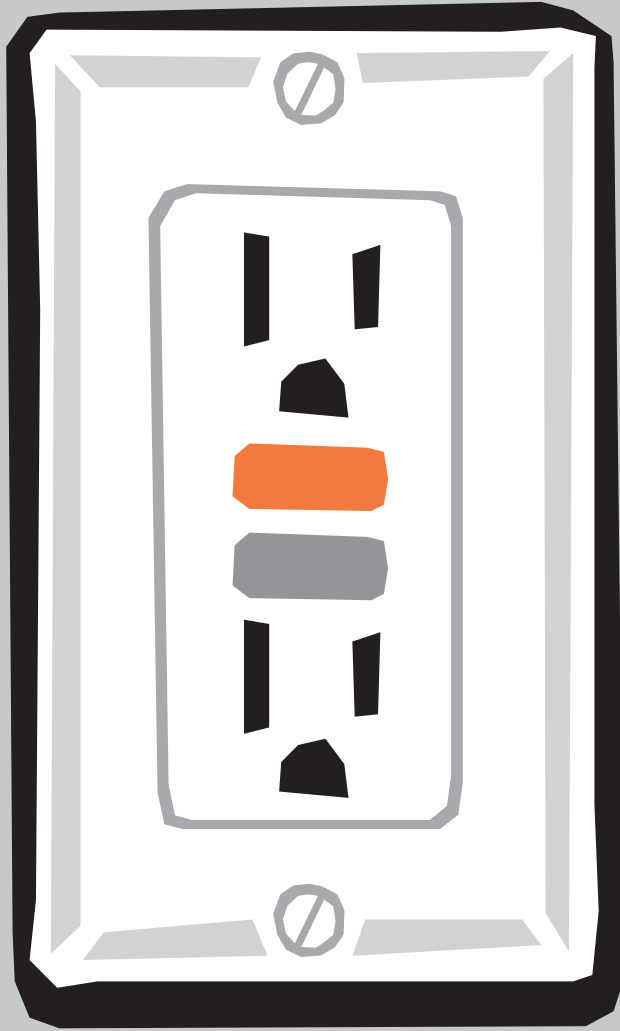


Outlet with plug and cord





Metal fork





Mr. Ouch means danger

Coloring sheet

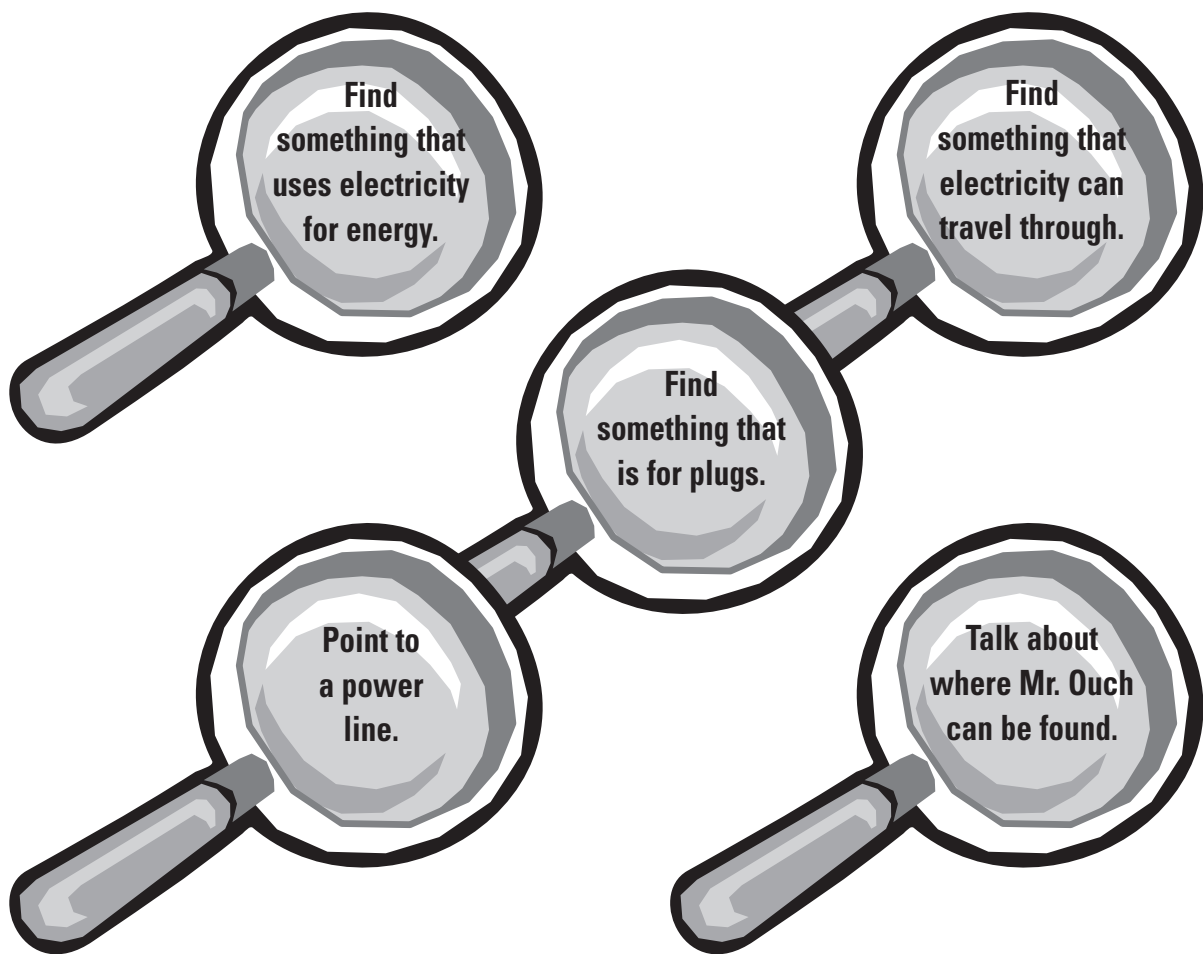


Follow the rules and stay away.

Safety Star: _____



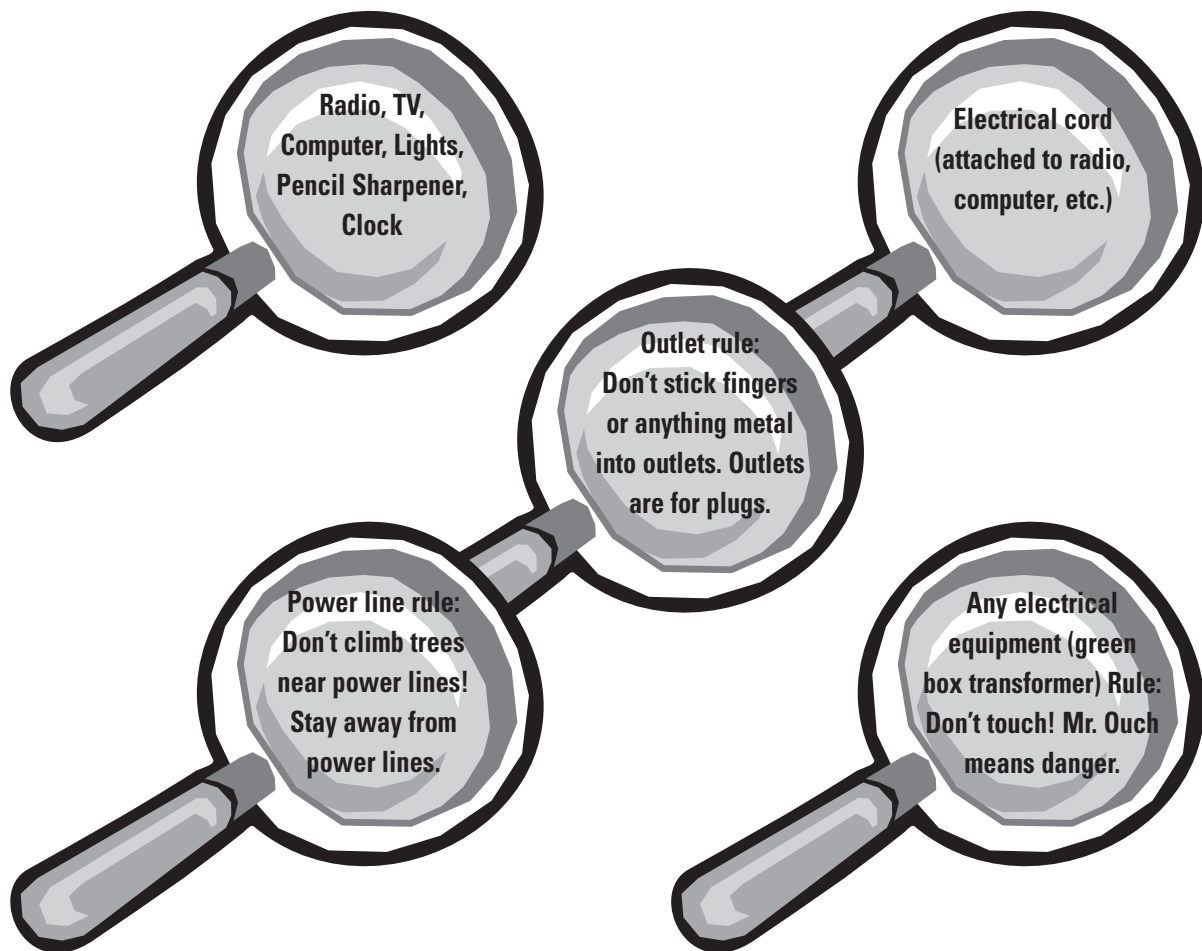
Find or talk about objects related to electricity.



Safety Detective: _____



Pair students with a classmate. Help students locate or talk about objects from inside the classroom. Once objects are identified, discuss correct electrical terms and safety rules. For the Mr. Ouch rule, don't go near real transformer. Use green box transformer photo provided in the materials section of this book.





I Speak Up for Safety

Broadcast game



You have been chosen as the Safety Spokesperson of the year. Your job is to create original safety rules and broadcast them during the morning announcements. Remember: May is National Safety Month.

Safety Rule Announcement: _____

Safety Rule Announcement: _____

Safety Rule Announcement: _____

Safety Spokesperson: _____



Online Safety Quiz

Safety Skills Test



Go online to test your safety skills.

Visit www.we-energies.com/educators/ and click on *Kids Safety Game* located in the Energy Fundamentals chalkboard.



Final Score: _____

Safety Whiz: _____

Measure Your Safety Success

Are your students acting safely around electricity and natural gas? Check their progress once a week during May, National Electrical Safety Month. Ask students a safety question relating to one of the four safety rules. If the question is answered correctly, note progress on the "Follow the rules" poster. At the end of the month, award students with a Safety Excellence certificate for their work and achievement.

Week one question: Stay away from power lines.

Do the power lines outside your home have insulation on them?

No. Power lines on the poles outside only have weather proofing on them, not insulation. Power lines are very dangerous and could seriously hurt and even kill you if you touch them. So rule number one, stay away from power lines. And never climb trees or fly kites near them.

Week two question: Mr. Ouch means danger.

Transformers, such as the green metal boxes you may see around your neighborhood, have dangerous amounts of electricity inside. True or false?

True. Never play on or around any electrical equipment. If you ever see Mr. Ouch or a Danger High Voltage Sign, it means danger. And if you don't follow the rules, you could get severely injured or worse. So don't touch electrical equipment.

Week three question: Natural gas smells like rotten eggs.

The first thing you should do if you smell natural gas in the home is use the telephone to call for help. Then, run out of the house and shut off the lights before you leave to save energy. True or false?

False. If you smell natural gas, do not use the phone or turn light switches on or off. Tell an adult immediately. And natural gas smells like what? Rotten eggs.

Week four question: Outlets are for plugs.

Do you think letting your younger brother or sister chew on an electrical cord is a good idea?

No. Even though the electrical cords we use in our homes (like the one connected to your video game or lamp) are covered with a special insulation made of non-conducting material, this insulation can wear. Damaged cords could give you a painful shock or start a fire. Do not play with cords and only put plugs into outlets.





Education Outreach
Program

Star Safety Student



CERTIFICATE OF SAFETY EXCELLENCE

is hereby granted to

for Following the Rules of electric and natural gas safety

In Congratulations:

jacquelyn

We Energies Education Outreach Program

1) Stay away from power lines. 2) Mr. Ouch means danger. 3) Natural gas smells like rotten eggs. 4) Outlets are for plugs.

1



Stay away
from power lines.

2



Mr. Ouch
means danger.

3



Natural gas smells
like rotten eggs.

4



Outlets are
for plugs.

5

Follow the Rules!

we energies.



6

Energy Terms

Conductor	A material that electricity can pass through easily, such as metal or water.
Electrical Distribution System	The network of wires that carry electricity to end users.
Gas Distribution System	The network of pipelines, ships and trucks that carry natural gas to end users.
Electrical Current	A flow of electrons.
Electricity	A form of kinetic energy. Electricity: volts x current = watts.
Energy	The ability to do work.
Energy Sources	Fossil fuels, such as coal and nuclear, and natural resources, such as water and wind, that are used to produce electricity.
Insulator	A material that electricity does not flow through easily, such as rubber or plastic.
Magnet	An object that attracts certain materials, such as iron or steel.
Magnetic Field	The space all around a magnet where the force of a magnet can act.
Mercapton	Odorant added to natural gas to provide a rotten egg or sulfur smell to warn of a gas leak.
Natural Gas	A gas, mostly methane, found in deposits in the earth. Gas is a form of matter. Other forms of matter are solids or liquids.
Nonrenewable	Fossil fuels and uranium are nonrenewable resources, meaning they exist in finite amounts and are depleted when used to produce electricity.
Outlet	A receptacle in a wall for inserting an electrical plug.
Photon	A particle that is visible light we see with our eyes.
Power Lines	The wires that electricity travels through.
Power Plants	A place where fuels, such as coal and natural gas are converted into electricity.
Renewable	The sun, wind, water and biomass are all renewable sources of energy. Renewable energy comes from natural resources that do not diminish with use – they replace themselves naturally.
Step-down Transformer	Equipment at substations that decreases the voltage for customer use.
Step-up Transformer	Equipment that increases the voltage so electricity can be delivered long distances on transmission lines.
Voltage	Pressure or force that pushes electrons over electrical wires.
Watts	A unit of electrical power.

Safety is a priority for We Energies. Thank you for sharing our four rules of electrical and natural gas safety with your students.

