EmPOWERed Kids
Teacher Guide
(ELECTRICITY 3-6)

Consumers Energy Count on Us

PROVIDING ENERGY EDUCATION TO STUDENTS IN THE COMMUNITIES WE SERVE.
THAT'S OUR PROMISE TO MICHIGAN.

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Dear Educator,

Throughout our 127-year history, Consumers Energy has been dedicated to supporting education in the communities we serve.

This commitment is more than just a belief, it's how we do business. During the last 5 years, our Foundation has donated more than $3.8 million to educational organizations and initiatives because we know that education is the key to creating successful communities and a successful state. Our educational outreach programs have reached more than 330,000 students over 22 years, and we aren't done.

EmPOWERed Kids is an interactive educational app that was created to teach children about electricity and natural gas in a fun and informative way. It is intended to be taught through a live presenter or teacher who relays the information to students as they follow along.

We continue to believe that having a live presenter from Consumers Energy provides your students with the best experience and will continue to offer our free in-class presentations, where available. We also know that due to scheduling, location, and popularity, a live presentation is not always possible. This teacher's guide will give teachers and educators the information they need to successfully navigate their students through the EmPOWERed Kids app.

We appreciate your interest in our EmPOWERed Kids app and programs and hope you will find them useful and effective for your students. Please reach out to us or provide us feedback by contacting education@cmsenergy.com.

Thank you,

Tara Ragauss
Education Programs Manager
EmPOWERed Kids

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ANTICIPATORY SET

The EmPOWERed Kids app presents high-interest content that encourages users to raise questions and become familiar with current resources used for energy. The use of this guide with our app is meant to supplement your curriculum and not to replace it. Begin the lesson by reviewing classroom procedures involving the use of technology in the classroom as well as energy vocabulary appropriate to class content. (See vocabulary list at the end of the Teacher's Guide. **All words included in the vocabulary list are underlined the first time they are encountered in this presentation.)

NOTE: For more information about Consumers Energy:

- Visit – www.ConsumersEnergy.com
- Join us on Facebook – www.facebook.com/ConsumersEnergyMichigan
- Follow us on Twitter – www.twitter.com/ConsumersEnergy

PROCEDURES

PRESENTATION

Students gain knowledge most effectively by exploring and doing. When teaching the content found in our app, we suggest alternating between a presenter or teacher-led discussion, and breakout sessions for exploration among smaller groups of students. Suggestions for group configurations can be found on the next page. When it is necessary to teach new terms, give definitions and use them in a sentence. Also, use the following tips:

1. Keep it short and sweet – avoid rambling and overly detailed explanations
2. Plan ahead – set clear goals for what you want the students to know
3. Use diagrams, pictures, and other visual aids when available for students to better understand information
4. Check for understanding by asking questions during and after the presentation
5. Write key words on the board
6. Break up the presentation with time for discussion with a desk mate, small groups or as a whole class

GROUP CONFIGURATIONS

While going through the app, there are several different presentation options. How you decide to present will depend on the characteristics of your group and the availability of the technology in your classroom.

1. Teacher presents the app overhead while class watches

a. This is the best option for younger students and classrooms with limited technology. Students are still able to receive the information, but are limited in their ability to explore and interact.

2. Individual with his/her own tablet:

   a. If your classroom is equipped with individual technology, this arrangement allows for the greatest amount of personal exploration and interactivity, but students may lose out on having a robust scientific discussion.

3. Two students paired together sharing a tablet:

   a. This arrangement allows students to work and explore collaboratively.

How you break up groups for discussion will likely depend on how you decided to configure your students for the presentation and your personal preference for group work. Some arrangements you might find helpful are:

a. Elbow partner – discuss with the person that sits closest to you

b. Small groups – discuss with a few others that sit at your table/group of desks

c. Whole class – discuss as a class with the teacher

Regardless of the configuration you decide, each of the breakout sessions offers your students the opportunity to have a scientific discussion. These discussions are a key component in helping your students think more scientifically. Throughout the presentation, ask and answer scientific questions with your students by making observations, using open ended questions and making predictions. For each breakout session, ask students to point out observations, explain why they think it happened, if there are other possibilities, and what additional questions they might still have. Here are some additional tips:

1. You will be investigating new topics with your students, so remember that to help them acquire the new knowledge, repetition is key. This can be accomplished by having students repeat after you or have students summarize the observations of other classmates into their own words.
2. Whenever possible, encourage open ended questions and answers, as opposed to close ended questions. Ex. Closed = Is electricity made from coal? Answers: Yes; Open = How is electricity made? Answers: Coal, Oil, Natural Gas, Wind, Water, Sun, etc.
3. Allow students time to predict what may happen next and then discuss with one other person next to them before discussing aloud as a class to arrive at the final answer. Explain that scientists don't just try to find an answer that fits; they look for evidence to support their answer. What evidence do the students see to support their predictions?
4. Throughout the presentation and breakout sessions, have students:

   a. Write questions that occur to them while they are exploring and go back to find the answers

   b. Make a list of questions to ask others that they can't find the answer for in the materials provided

   c. At the end of each section have students list:

      i. What is one new thing I learned?

      ii. What is one question I still have?

HOME VERSUS SCHOOL MODE

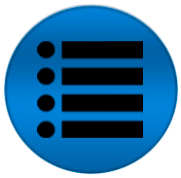
The EmPOWERed Kids app has been designed for K-6th grade. The app is split into two grade bands, K-2nd grade and 3rd-6th grade. Pick which level is appropriate for your student. After you select a grade level, you will be prompted to select "School Presentation Mode" or "Home Activity Center."

Selecting the "School Presentation Mode" will allow you to learn about electricity or natural gas lessons. The Electricity Safety Presentation covers vital information about electric generation, distribution and safety (downed power lines, outlet safety, etc.). The Natural Gas Safety Presentation teaches important messages about underground utility safety, calling 811 to have a locator mark your yard with flags, and how to properly respond to a natural gas leak.

Selecting the "Home Activity Center" allows you to explore a dozen games! There are six games related to electricity and six for natural gas. The games vary slightly depending on the grade level category you selected at the beginning. The "Home Activity Center" is designed for students to play after being taught the safety lessons to help reinforce key safety messages. It is also a great way for students to bring the safety messages home to play with their families.

TECHNOLOGY BUTTONS

At the bottom of the screen, you will notice some technology buttons. They can be used to enhance your presentation experience.



The first icon looks like a bulleted list. This button will bring you to the table of contents page or 'slide menu.' You can choose a slide from this page and it will automatically take you there.

The second icon looks like a home. Using this button will bring you back to the slide where you choose either Electric Safety Presentation or Natural Gas Safety Presentation. If a student mistakenly clicks this button, you can re-enter the safety presentation and use the "bulleted list" button to quickly advance them to the proper page he/she needs to be on. When in the "Home Activity Center" you can use the home button to pause or exit the game you are playing.

The third icon looks like a speaker with music notes. This button will only turn off the background music of the app. The slides themselves have sound that can be turned off with the volume buttons on the physical device (tablet, phone, iPad, etc.) that the app is being viewed on.

The other buttons you will see are "Back" and "Next." These buttons do exactly what they say. "Back" will take you to the previous slide. "Next" will advance you to the following slide in the presentation. If you have not completed the activities on the slide, you may see a "Skip" button instead of "Next." You can either complete the activities on the page to garner a "Next" button, or you can click "Skip" and a box will prompt you to confirm if you indeed want to skip or if you would like to remain on the page.

ANTICIPATION GUIDE

Before we go through the EmPOWERed Kids app from Consumers Energy, respond to the following questions under "Before." If you agree with the statement, check yes. If you do not agree with the statement, check no. After completing the activities in the EmPOWERed Kids app, we will come back to this guide and compare our thinking.

Before		**… completing the EmPOWERed Kids App …**	**After**	
Yes	No		Yes	No
		1. Electricity that comes to my house is made from coal.		
		2. Materials like metal and copper are excellent insulators.		
		3. Renewable resources can be used over and over again.		
		4. An insulator is something that electricity cannot flow through easily.		
		5. Electricity can travel in power lines both above the ground and below the ground.		
		6. Power lines located above the ground and under the ground can hurt me.		
		7. Only an adult should touch the fuse box located in my home.		
		8. Plugging too many things into an outlet could cause a fire in my home.		
		9. Unsafe areas will have signs warning me of a danger zone.		

INTRODUCTION

Consumers Energy, Michigan's largest utility, provides electricity and natural gas to 6.6 million of the state's 10 million residents in all 68 Lower Peninsula counties. Today we are going to learn about electricity safety using their EmPOWERed Kids app.

What kinds of things in your house use electricity?

Answer: TV, lights, telephone, computer, fridge, microwave, dishwasher, stove, washer, etc.

Does anyone know how we get our electricity to make these things work?

Answer: Coal, Oil, Natural Gas, Wind, Water, Sun/Solar, etc.

So now, let's talk sources. There are two types of sources where our energy can come from; one is renewable and the other is non-renewable.

What do you think a renewable source is?

Answer: Something you can use over and over again [visual of hands rotating around each other to show motion]. It can be replenished in a short amount of time and it is usually good for the environment. Some examples are wind, water, sun and biogas.

What do you think a non-renewable source is?

Answer: Once you use it you lose it [visual of x with hands towards the floor to show motion]. Often these sources come from fossil fuels – which are coal, oil, and natural gas. They were formed over millions of years. Another non-renewable source is nuclear energy, which involves splitting uranium atoms in a process called nuclear fission.

Consumers Energy balances the two to make our energy environment better.

So now, let's start learning more about Consumers Energy and electricity safety!

First, tap on the 3rd-6th grade button, then choose school presentation mode, and tap on the electricity safety presentation.

Now let's click (NEXT) to start learning more about electricity safety with Consumers Energy using their EmPOWERed Kids app.

HOW ELECTRICITY IS MADE

First Slide Opens

[Click icon]

Wind – By a show of hands, how many of you have ever seen a wind turbine?

A turbine is built to be over 300 feet tall, which is taller than the Statue of Liberty. The tower is built in three sections and then the top is added – the rotor on the front, the nacelle on the back and the 3 blades in between.

The 3 blades spin around when the wind blows. Each blade on an average wind turbine is about 150 feet long. A typical football field is 100 yards or about 300 feet. So it would take two blades, touching end to end, to make up the length of a whole football field.

If it isn't windy, do you think the blades will spin?

Answer: No

(NEXT)

The blades will spin at optimal speed if the wind is blowing 14 miles per hour or faster. In the nacelle (which is the size of a school bus), the gear shaft spins around, turning the generator, which creates electricity. The generator is what makes the electricity.

(NEXT)

The electricity then moves down the tower, through the foundation, and into the wires underground to your house.

(NEXT)

[Click icon]

Water – By a show of hands, have any of you ever visited a dam in Michigan?

In Michigan, we are surrounded by the Great Lakes and the many rivers that flow into them. For over 100 years Consumers Energy has used that water to make electricity. There are over 100 dams in the state of Michigan owned by Consumers Energy and others.

How do we use that water to make electricity?

Answer: Rain collects in rivers and lakes and naturally flows downhill. The water upstream flows through the dam and heads downstream.

(NEXT)

The water flows down the penstock (the tunnel the water travels through), gaining kinetic energy.

(NEXT)

The water spins the red turbine, which is like a boat propeller, turning the generator. The generator spins, creating electricity.

(NEXT)

[Click icon]

Coal – Does anyone know what coal is?

Answer: Coal is a non-renewable source that came from fossils, like dinosaur remains and plants that lived millions of years ago.

Coal is found deep down inside the earth.

(NEXT)

Consumers Energy gets coal from mines within the United States, although there are no coal mines in Michigan. Workers dig the coal out of the ground and then put it in trucks, trains and boats to get it to the power plants.

(NEXT)

Next, the coal is smashed/pulverized into little pieces so it burns evenly.

(NEXT)

Then the coal is sent to a burner and lit on fire. The fire heats a big tank of water.

When water gets hot, what does it turn into?

Answer: Steam

(NEXT)

The steam goes through the tube and turns the turbine and generator. The generator makes the electricity.

(NEXT)

Then the electricity leaves the power plant and travels through the wires above ground to your house.

(NEXT)

[Click icon]

Biogas – Does anyone know what this renewable energy source comes from?

Answer: Plants & Animals

Biogas fuel makes up about 5% of the energy the United States used in 2014.

Plants get their energy from the sun. Animals eat the plants and absorb their energy.

(NEXT)

Once the plants are digested, the waste is placed into the tanks and the manure from the animals decomposes and creates methane gas.

(NEXT)

Biogas digesters, or tanks, collect the methane gas. Then the gas travels through the tubes and is burned. Large combustion engines turn the generator instead of a turbine, and the generator creates electricity.

(NEXT)

The electricity then travels through the wires, above ground or underground to your home. Yes, we can get energy from poop!

(NEXT)

[Click icon]

Solar – By a show of hands, have you ever seen solar panels outside?

Where have you seen them?

Answer: On the roof of a house or business or on the ground.

What state do you think might be the best to produce energy from the sun?

Answer: California (Note: this is because the southern area of California has a large amount of solar energy per square meter per day)

Fun Fact: According to a study recently done by the Energy Information Administration (EIA), if we covered 4% of the world's desert areas with solar panels, we could supply energy for the entire world! The Gobi Desert alone could supply almost all of the world's total electricity demand.

Sun is an important source of energy. The sun has produced energy for billions of years. Solar energy comes from the sun's rays that reach the earth. This energy can then be converted into other forms of energy, such as heat and electricity.

(NEXT)

How is electricity made from the sun?

Solar panels capture the sun's rays and absorb photons. The photons cause the movement of electrons and the electron's movement creates electricity.

(NEXT)

The electricity then travels from the solar panels, which produce direct current (DC) electricity, which is the same form of electricity produced by batteries, through a wire. The electricity used in your home comes in the form of alternating current (AC). Before the electricity that is produced from the panels gets to your home, a device called an inverter is wired between the solar panels and your home to change the form of electricity from DC to AC.

(NEXT)

The wire then connects to the meter on your house and provides electricity for your appliances, like your microwave, stove, and dishwasher.

(NEXT)

[Click icon]

Nuclear – About what percent of the electricity in the United States comes from nuclear power?

Answer: About 20%, or 1/5 of the U.S. electricity supply.

There are 65 nuclear power plants in the U.S. and most of them are east of the Mississippi River. Consumers Energy does not own any nuclear plants, but they do purchase some electricity made at nuclear plants.

Uranium fuel is formed into pellets, which are about the size of your fingertips. The pellets are stacked end to end into rods. These rods can be up to 12 feet long, which you can see flashing in orange on the screen.

(NEXT)

The heat given off during fission, which is the process of breaking apart the uranium atoms, heats a big tank of water and causes the water to boil and turn into steam. The steam then gets cooled down and is turned back to its liquid state and is reused again in the process!

(NEXT)

The steam turns the turbine, which turns the generator, creating electricity.

The electricity then travels through the wires to your home.

(NEXT) (NEXT)

HOW ELECTRICITY GETS TO YOUR HOME

We are going to talk about the vocabulary words and read through them together.

[Click on the power plant]

Read these slides with me if you would like.

Electricity is made at the power plant

(NEXT)

Power travels to a substation where the voltage is increased

(NEXT)

Electricity travels a long distance through high voltage wires

(NEXT)

When close to your house, another substation lowers the voltage back down

(NEXT)

Low voltage poles carry the electricity to your neighborhood

(NEXT)

Now you have power!

The electricity can travel to your home either above ground through a gray transformer on the pole or underground through the green transformer. (Point out the green transformer box by the house. Ask if they have ever seen one of these in their neighborhood.)

(NEXT) (NEXT)

FLOW OF ELECTRICITY

[Read the text box below the pictures with students]:

The path electricity chooses to follow is determined by each path's size, material and distance from the electricity! Before we start we will need to review some vocabulary words.

What is a conductor?

Answer: Something that electricity can easily flow through.

Here is an easy way to remember what conductors do: conductor starts with the letter "C" and so does the word carry.

What is an insulator?

Answer: Something that electricity cannot flow through easily and stops it from getting to the ground.

Electricity will find the quickest path to the ground and it will use any conductor it can find. Consumers Energy workers need to protect themselves with insulators when working on power lines. Consumers Energy employees wear plastic hats and safety glasses, along with rubber gloves and boots, when working with high voltage equipment.

Brainstorm a list of conductors and insulators you can find in your home. (Have students add to the list through whole group discussion.)

Note: Wood can sometimes be a conductor if it is wet (like a tree when it soaks up water to grow) and an insulator if it is dry (wood bookshelf).

Work with students on the 3 boxes on this slide. Give students a few minutes to work through each box on this slide, one at a time, introducing each icon with the information below on: what they are looking at, what they are looking for, and what they should report back on.

[First icon]

Students will be looking at the flow of electricity based on the size and resistance of the path. They will be looking at what size pipe will allow for a better path for the electricity to flow. Have them report back on what size path has the least amount of resistance.

[Second icon]

Students will test items to see if they are conductors or insulators. The students will be looking for what items are conductors and what items are insulators. They should report back to the class with one item that was a conductor and one that was an insulator.

[Third icon]

Students will be looking at lightning and how it travels the path of least resistance. They will be looking for how lightning follows the path of least resistance to the ground. They should report back to the class on what object lightning found to follow that path of least resistance.

Have students put their tablet down when they are done and have them report out on their findings, one icon at a time, as a class.

Note: If you don't click through each icon, you will need to click (SKIP) (NEXT) to get to the next slide.

ELECTRICITY CAN SHOCK, BURN OR ELECTROCUTE

Electricity can travel through the water inside our bodies and hurt us. Here are some vocabulary words that describe what might happen to our bodies if we interact unsafely with electricity.

Shock – a tingly feeling or sharp stabbing [show with hand visual of wiggling fingers].

Burn – electricity burns the things on the inside of the body, like the muscles in your hands, so you wouldn't be able to wiggle your fingers anymore.

Electrocute – if you look up the word in the dictionary it means 'to be killed by electricity' and is the most dangerous thing that can happen to you. The electricity flows through the body.

What happens when it gets to the heart? [make a heart with hands]

Answer: You could die.

Have students tap on the icon with the volt meter on it to see what the electricity can do to their body. The volt meter measures the milliamps or how much electricity an object is producing. Students can work on the 4 boxes on this slide, one at a time, from left to right.

After a few minutes, go through each icon to reinforce the correct safety message.

[First icon]

Can Just Feel It: What are we looking at?

Answer: Someone touching a metal doorknob, creating static electricity and getting a shock.

[Second icon]

Can't Let Go: What are we looking at?

Answer: Someone putting a metal fork into a toaster and getting shocked or burned.

What should we do if our toast gets stuck?

Answer: Don't put any object into the toaster, especially a conductor like a metal fork. First unplug the toaster, let it cool off, and then remove the toast safely.

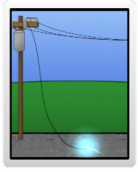
[Third icon]

Possibly Fatal: What are we looking at?

Answer: Someone sticking metal keys into an outlet.

Is this safe?

Answer: No, you shouldn't put any metal objects, like keys, into outlets. It can shock, burn or hurt you. Have adults cover the outlets with child protective covers if you have babies in your house for safety.



[Fourth icon]

Probably Fatal: What are we looking at?

Answer: A downed power line.

What should we do if we see a downed wire?

Answer: Don't go near a downed power line. Tell an adult and call Consumers Energy or 911. Stay away and stay alive.

(NEXT) (NEXT) (NEXT)

THE DANGER SIGNS

Have the students tap on each sign and read them together discussing what each sign means. Start from the top left, working your way down from left to right. This is a quick look at the various types of warning signs that exist for electricity hazards.

Danger of Shock – What does this mean?

Answer: Stay away from this area and stay alive.

Buried Cables Nearby – What does this mean?

Answer: Call MISS Dig at 811 before digging to have flags marked for free to tell you where the underground wires are buried.

Dangerous Restricted Area – What does this mean?

Answer: Stay away; this is not an area to play near.

Do Not Open High Voltage Inside – What does this mean?

Answer: Keep out or stay away from this area because you can get hurt by electricity.

Do Not Open! – What does this mean?

Answer: Don't go near this area and if it is open or unlocked tell an adult and call Consumers Energy.

Dangerous Restricted Area – What does this mean?

Answer: Don't go near this area because there is electricity inside that can hurt you.

(NEXT)

STAYING AWAY FROM DANGER ZONES

Click on the first icon [substation]

Show of hands, how many of you have seen a substation before?

The electricity comes from the power plant to the substation in your neighborhood. The substation lowers the amount of electricity in the power lines before it sends it out to all the homes in your neighborhood.

Tell students this real-life example:

There was a 10 year old boy named Earl who was outside playing soccer with his friends one day. He was kicking the ball around, and it accidentally landed in a nearby substation. He went over to the substation to check it out. All of our substations have large danger signs warning people about the high voltage electricity. We don't know why Earl decided to ignore or not read the sign. He decided to climb over the fence anyway to get the ball out. When he climbed inside, he touched some of electrical equipment inside and he was electrocuted. He lost his life trying to get the ball out of the substation.

Is that worth it?

Answer: No! People are always more important than things. Leave it alone! If you lose something near a substation, you can tell an adult or go play somewhere else.

(NEXT)

Reinforce with safety message: Substations are very dangerous! Never climb the fence!

(NEXT)

Click on second icon [transformer]

Earlier we talked about what this was called; does anyone remember what it is?

Answer: Transformer. Transformers are the last stop electricity makes before it enters the meter on your house. They can be on utility poles (overhead power lines) or in someone's yard (underground power lines).

After reading this real-life example, discuss with students:

There was a girl who lived in a neighborhood with underground power lines and green transformer boxes on the ground throughout the neighborhood. She was playing hide-and-seek with her friends. She saw that the lock had been broken off one of the boxes, so she decided to try and hide in there. When she opened it up and touched some of the high voltage wires inside, she was severely burned. Remember, when you get burned by

electricity, it hurts the inside of your body. Remember to stay away from things that have a danger sign on them, like transformers.

These green transformers mean that there are underground power lines in the neighborhood.

Why would we want to know if there are underground lines in our yard?

Answer: So you can dig safely.

To learn where underground lines are buried, you can call Miss Dig at 811. Miss Dig will send a locator to your house for free, who will put little plastic flags above where the underground lines are buried. There are two colored flags that mark energy lines. A red flag means there is an electric line (power line) and yellow flags mean natural gas pipes. Other colors are used to mark utilities like water, sewer and telephone. Natural gas is used to heat homes, cook food and dry clothes. If you hit a natural gas line while digging, it could cause a fire or an explosion. If you hit an underground power line, you could get shocked, burned or electrocuted.

(NEXT)

Reinforce with safety message: Transformers are locked so you can't get inside, but you should never play around them! If you see a transformer that has been tampered with or damaged, contact Consumers Energy to come fix it.

(NEXT)

Click on third icon [fuse box]

Show of hands, who knows where their <u>fuse box</u> is in their house?

Sometimes this box is called the fuse box, circuit breaker box or electric panel. The fuse box is the 'control center' for electricity in your house. Only adults should touch this box to fix it. A "blown circuit" means the electric circuit is overloaded and the power will shut off, which helps keep you safe.

Show of hands, how many of you have lost power in your house because of a blown circuit or fuse?

When this happens, your house is giving a warning that too much power is being used, and you need to unplug some devices or there could be a fire! All of the electricity in your house passes through a fuse box before it goes to the rooms in your house (bathroom, kitchen, bedroom, etc.). You should never play near a fuse box because there is a lot of electricity flowing through it.

(NEXT)

Reinforce with safety message: There is a fuse box in your house, but never play near it!

(NEXT)

Click on the "Place the Sign" activity (green box, bottom of screen)

Read: Now I will give you a few minutes to check out this activity, but make sure to remember to read the directions first to know how to complete the activity. When you're done placing the danger signs on the objects that you should never touch, put your tablet down on your desk and wait quietly for others to finish. Once everyone is done, we will talk about what 3 objects you should never touch or go near.

(NEXT)

After ample time, drag the danger signs over the fuse box, transformer, and substation on projected device. Reinforce the message: Never touch these objects!

(NEXT) (NEXT)

ELECTRICITY CAN HURT YOU

Students can explore the "Electricity Can Hurt You" slide on their own as well. This is a recap of the two stories just discussed in a self-guided activity. Let them know what they are looking at, what they are looking for and what they should report back on by reading each icon description below before they explore it on their own.

[First icon]

Students are looking at what happens when Josh's ball goes inside of the substation. They should be looking for what they should do if this happens to them to stay safe and report back on what they can do to keep this from happening to them.

[Second icon]

Students are looking at Josh playing with his toy airplane outside. They should be looking for what he should do to be a safety hero and report back on what option they chose to be safe so no one gets hurt in this story.

Have students place the tablet on their desk when they are finished.

Note: If you don't click through each icon, you will need to click (SKIP) (NEXT) to get to the next slide.

DANGERS OF WATER AND ELECTRICITY

Direct students to take a few minutes to look at these two icons and then have them discuss what they think are the key safety messages (keep tapping "NEXT" to move through slides). Let them know what they are looking at, what they are looking for and what they should report back on by reading each icon description below before they explore it on their own.

[First icon]

Students are looking at a girl blow-drying her hair in the bathroom near the sink. They should be looking for what is wrong with this picture and report back on what they should do to stay safe.

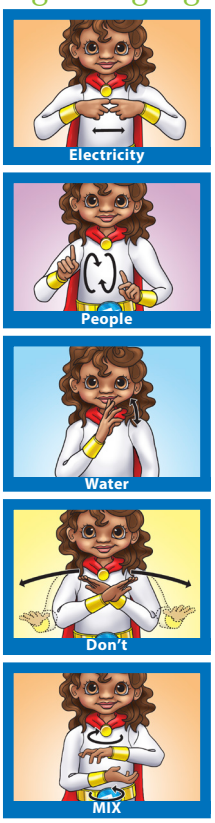
[Second icon]

Students are looking at someone in the bathtub listening to the radio. They should be looking for what is wrong with this picture and report back on what they should do to stay safe.

Have the students share the messages they learned from looking at the slides by having them turn to their neighbor and share the safety message and then discuss them as a whole class.

Can you think of another water and electricity situation that would be dangerous?

Examples: kitchen, laundry room, outside near pool, etc.



Reinforce with safety messages:

1. Never keep anything that uses electricity near water!
2. Remind the students that electricity, people, and water don't mix! (Use the Safety Sign Language activity to reinforce this message.)

Note: If you do not click through each icon, you'll need to click (SKIP) (NEXT) to move onto the next slide.

BE AWARE OF YOUR SURROUNDINGS

Read: Playing outside is fun, but it is important to play safe!

What are some activities you like to do outside?

Answer: Fly kites, climb trees, air planes, etc.

Here are some reasons why we need to be careful when flying toys in the air or climbing things outside.

[Tap the first icon - kite]

(NEXT)

Read: Always LOOK UP and around for power lines when playing outside.

(NEXT)

Reinforce with safety message: Never play near anything dangerous: power lines, substation, transformer, fuse box

(NEXT)

[Tap the second icon - winter scene]

Remind your parents that anytime they are carrying anything taller than their head, like a ladder, they need to do what?

Answer: LOOK UP!

Point finger up and look up at the ceiling to reinforce message

(NEXT) (NEXT)

Reinforce with safety message: Never get close to something that could hurt you, even if you think you'll be safe!

(NEXT) (NEXT)

STAY AWAY FROM DOWNED POWER LINES

What would happen if you touched a downed power line?

Answer: You would likely get hurt, shocked, burned or electrocuted. The power line will hurt your body and will most likely kill you.

Let's go through this slide to figure out what to do if we ever see a downed power line. Tap on the icon of the downed wire to start.

When a power line falls down, sometimes it lies nice and still and doesn't make a sound. Does that mean it is safe?

Answer: NO!

You can never tell if there is electricity in a power line. Just because you can't see the electricity doesn't mean that it won't hurt your body.

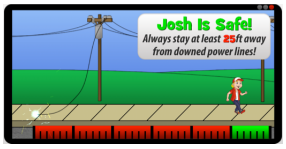
(NEXT)

Sometimes the lines spark and look like there are fireworks shooting out of the end. It is easier to tell that this power line is dangerous and you need to stay away.

(NEXT)

Remember to Stay Away and Stay Alive! Call Consumers Energy or 911 when you see a downed wire.

(NEXT)



[Tap the sidewalk to move Josh around]

How far does Josh need to stay from the power line?

Answer: 25 feet or more! (Point out that an average classroom length is about 25 ft.)

Read: Josh is Safe! Always stay at least 25 ft away from downed power lines!

(NEXT)

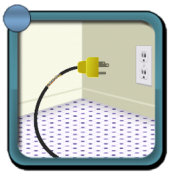
Reinforce with safety message: STAY AWAY & STAY ALIVE! When you see downed power lines, call Consumers Energy at 1-800-477-5050 or call 911

(NEXT)

TELL AN ADULT

Read: When you see something that looks dangerous, tell an adult!

Discuss with the students the 3 scenarios that could occur in their home by clicking on the icons. (Keep tapping "next" to move through the slides and then discuss what they were looking at and the safety message below).



[First icon]

Always remind adults to fix cords that are ripped or fraying. Adults can do this with inexpensive electrical tape. Wrapping cords around appliances can cause the cord to rip, tear and fray. Be sure to check cords before use.

[Second icon]

Never use silverware to get bread out of the toaster. Always unplug the toaster to stop the electricity before trying to the get toast out. Modern toasters have safety precautions in place to help keep people safe, but putting metal in a toaster is never a good idea.

[Third icon]

Never stick anything in outlets that don't belong there (no keys, hair pins, silverware, etc.). Do any of you have the outlet covers in your house, used to protect young children from sticking materials into the outlets? Great. I'm glad your family is thinking about safety. Only electric cords belong in electric outlets.

Reinforce with safety message: When you see something that looks dangerous, tell an adult.

(NEXT)

DON'T YANK OR OVERLOAD POWER CORDS

Read: When unplugging something from the wall, never pull on the cord and make sure to never use more than one splitter per power outlet!

Discuss with the students the 3 scenarios that could occur in their home by clicking on the icons. (Keep tapping "next" to move through the slides and then discuss what they were looking at and the safety message below.)

[First icon]

Pulling on cords could cause them to rip. If the metal wires in the cord touch your body, you could get shocked! Always pull from the plug without touching the metal part.

[Second icon]

Plugging too many things into one outlet could cause an electrical fire. Use a surge protector or power strip when you need to plug in several things at once. They are designed to handle the electricity safely.

[Third icon]

What would happen if you threw water on an electrical fire?

Answer: The electricity could spread and make the fire worse!

Why would water make it worse?

Answer: Because water is a conductor and would spread the fire. Adults need to use fire extinguishers to put out electrical fires.

(NEXT)

STORM SAFETY

The following slides can be completed individually or as a whole group.

Read and discuss how to be prepared for a storm. Go through the list (1–4) on this slide.

[Tap on the first icon]:

What would you put in the storm safety box? Why?

(NEXT)

Read: Flashlight & Batteries—Remember: Candles are a fire hazard and don't last long!

(NEXT)

What does a First Aid Kit contain?

Read the list.

(NEXT)

What are non-perishable foods?

Read the list and discuss other non-perishable foods.

(NEXT)

Read: Cell Phone & Emergency Numbers—Have the phone numbers for local police, fire departments, hospitals and Consumers Energy: 1-800-477-5050

(NEXT)

Read: NOAA Radio—A NOAA radio is a special radio which only broadcasts information on weather hazards and other emergencies 24 hours per day!

(NEXT)

Read: The Storm Kit is Finished!—Make sure to keep your kit somewhere easy to reach and check it once a year!

(NEXT)

[Tap on the second icon] Breaking News!!

(NEXT)

Read: Stay Inside During Storms!

(NEXT) (NEXT)

CLOSURE

CONGRATULATIONS! You are now safety heroes!

Encourage students to click on the 'play games' icon at the bottom of the screen if time permits or allow them to come back to them at a later time to help reinforce the important safety messages they've learned. A brief description of how to play each game and some helpful hints are listedon the next page.

ELECTRICITY GAMES

Design a Power Path

How to Play: Connect the power plant to the substation to lower the voltage, and then connect the power to the house! Touch and drag to lay down power lines. The red outlines show where you can touch. You have a budget to build the power lines with. Make sure you try to use the most cost efficient path!

Hints: You must use the squares to go to the substation and then to the house to make the power flow properly. Blue boxes can clear forest squares. Hit the "test the grid" button to see if you were successful.

Word Search

How to Play: Search for the hidden words. To highlight a word, drag your finger from the first letter of the word to the last letter of the word. When you highlight a word, it will be crossed out. Highlight all the safety electricity words to win!

Hints: Words can go forward, backward, and diagonal.

Path of Least Resistance

How to Play: Electricity always tries to find the path of least resistance. Pick the conductor out of the 3 household objects at the bottom of the screen to complete the circuit! The electricity won't flow if you choose an insulator.

Hint: There are 5 levels of play.

Electric Snake

How to Play: Use your arrow keys to change direction. Collect lightning bolts to gather energy and fill up the battery! Plug into the outlet when the battery fills to win! Avoid water, the walls, and yourself. That can be dangerous!

Hint: This game moves very quickly and might be difficult for some students. For a slower version of this game, students may wish to play on the K-2 level.

Spot the Hazards

How to Play: Is your home safe? See if you can spot the hazards in each room of the 3D house. If you see something that looks dangerous, tap it with your finger to spot it. This is an augmented reality game and must be played on a Consumers Energy activity book or a dollar bill.

Hints: This game can be tricky and requires a fair amount of patience. There is one hazard per scene and once you find it, you are advanced to the next room in the house. When you've found all the hazards, a Safety Hero will pop up to congratulate you.

Build a Storm Kit

How to Play: What items go in a storm safety kit? Drag and drop the items that are essential for a storm kit. Bonus points are earned for only dragging the important items and for building it quickly!

Hints: Every item will not go into the kit. Some items are more critical to have during a storm, and those critical items will earn you points! Ex: comics are fun, but not critical in an emergency. Therefore they will not earn you points.

ADDITIONAL RESOURCES

BOOKS

(Recommended grades, Title, Author)

(K-2) Oscar and the Bird: A Book About Electricity by Geoff Waring

(K-3) A Picture Book of Benjamin Franklin by David Adlee

(K-3) Magic School Bus Rides the Wind by Anne Capeci

(K-4) Energy: Heat, Light, and Fuel by Darlene Stille

La energia: Calor, luz y combustible (Spanish Edition) by Darlene Stille

(K-3) Switch On/Switch Off by Melvin Berger

(K & Up) Flick a Switch: How Electricity Gets to Your Home by Barbara Seuling

(1–2) A Nasty Shock by Hedley Griffin

(1-3) The Boy Who Harnessed the Wind by William Kamkwamba

(1-3) What's the Big Idea Ben Franklin? by Jean Fritz

(1 & Up) What is Electricity? (Rookie Read Aloud about Science) by Lisa Trumbauer

(1 & Up) Where Does Electricity Come From? by Susan Mayes

(2-5) The Magic School Bus Science Chapter Book #14: Electric Storm by Anne Capeci

(2-5) The Magic School Bus and the Electric Field Trip by Joanna Cole

(2-6) Charged Up: The Story of Electricity by Jacqui Bailey & Matthew Lilly

(2 & Up) Wind Energy; Blown Away! by Amy Hanser

(3-4) The Shocking World of Electricity with Max Axiom, Super Scientist! by Liam O'Donnell & Charles Barnett III

(4-6) Why Does Electricity Flow? by Rob Moore

(4 & Up) Discovering Electricity by Rae Bains

(6) Wind Power by Josepha Sherman

(5-6) How Electricity is Made by C.L. Boltz

(6) Manga Guide to Electricity by Kazuhiro Fiyitaki

(6) Wind Power by Christine Petersen

MEDIA

(Grade, Title, Link)

(K-2) P.I. Plug's Home Safety Video (3:31 minutes) www.youtube.com/watch?v=Veyv2lFc_Fk

(K-3) Kids Safety Video (4:19 minutes) www.ogepet.com/videos/kids-safety-video.aspx

(2-4) Dexter Duck—Electrical Safety Video (7:05 minutes) www.youtube.com/watch?v=igK-DRB5faU

EXTENSIONS

ENERGY SOURCES RESEARCH PROJECT

Your project is to select and investigate one of the energy sources listed below. You must build a model, create a poster board or design a power point presentation which demonstrates your chosen energy source. You will also write a summary of your project which includes a description of the energy source, the advantages and disadvantages of the energy source, and the percentage of energy usage for that energy source in the United States and Michigan. The summary must include a list of sources used in addition to the EmPOWERed Kids app, including books and websites. Finally, you will present your model, poster board or power point to the class.

ENERGY SOURCES:

Hydroelectric Fossil Fuels Wind Solar

Nuclear Power Geothermal Biomass

Project Requirements:

1) The model, poster board or power point must be scientifically correct.

2) Written summary includes:

a) Description of energy source

b) Advantages and disadvantages of energy source

c) List of all sources used to obtain your information

3) Present model, poster board or power point to the class. (Rubric follows)

Presentation Rubric Energy Sources	Unsatisfactory 0-2	Poor 3	Good 4	Excellent 5	Total
Organization	Audience cannot understand presentation because facts presented do not seem to be in order.	Presentation is very short. Audience has difficulty following presentation because student jumps around.	Presentation is appropriate length. Student presents information in logical order which audience can follow.	Student presents information in logical, interesting sequence which audience can follow.	
Subject Knowledge	Student does not seem to know information and cannot answer questions about subject.	Student is uncomfortable with information and is able to answer only simple questions.	Student is at ease with expected answers to all questions, but fails to give more details.	Student demonstrates full knowledge (more than required) by answering all class questions with explanations and details.	
Speech	Student mumbles, incorrectly pronounces words, and speaks too quietly for students in the back of class to hear.	Student's voice is low. Student incorrectly pronounces words. Audience members have difficulty hearing presentation.	Student pronounces most words correctly. Most audience members can hear.	Student uses a clear voice and correct pronunciation of terms so that all audience members can hear presentation. Student is happy.	
Eye Contact	Student reads all of report with no eye contact.	Student occasionally uses eye contact, but still reads most of report.	Student maintains eye contact most of the time but often returns to notes or maintains eye contact only with teacher.	Student maintains eye contact with entire audience, seldom returning to notes.	

Possible websites to use for energy source research project:

Types of Energy: Mixture
www.eia.gov/kids/
www.kathimitchell.com/energy.htm

Fossil Fuels
www.energyquest.ca.gov/story/chapter08.html
www.discoveringfossils.co.uk/fossilfuels.htm
www.eia.doe.gov/kids/energyfacts/sources/non-renewable/coal.html

Wind
www.energyquest.ca.gov/story/chapter16.html
www.eia.doe.gov/kids/energyfacts/sources/renewable/wind.html

Hydroelectric
www.energyquest.ca.gov/story/chapter12.html
www.eia.doe.gov/kids/energyfacts/sources/renewable/water.html

Biomass
www.energyquest.ca.gov/story/chapter10.html
www.eia.doe.gov/kids/energyfacts/sources/renewable/biomass.html

Solar
www.solarenergy.org/younger-kids
www.eia.doe.gov/kids/energyfacts/sources/renewable/solar.html
www.energyquest.ca.gov/story/chapter15.html

Geothermal
www.energyquest.ca.gov/story/chapter11.html
www1.eere.energy.gov/geothermal/geothermal_basics.html
www.eia.doe.gov/kids/energyfacts/sources/renewable/geothermal.html

Nuclear
www.eia.doe.gov/kids/energyfacts/sources/non-renewab le/nuclear.html
www.kids.esdb.bg/uranium.html

Other Energy Kids Research Ideas:
http://www.eia.gov/kids/resources/teachers/pdfs/EIAScavengerHunt.pdf

ELECTRIC SAFETY AWARENESS PROJECT

OPTION 1

Sharing knowledge with others is a great way to help your school community. Now that you know more about how to be safe around electricity, you can share that information with others, so they can be safe too. Your project is to create a poster that teaches others about electric safety. The poster must contain a major safety message about electricity along with at least 3 facts that support the message. For example, you could say, "Electricity is Dangerous" but now you will need to list 3 facts that explain why electricity is dangerous. Artwork must be appropriate and support the major safety message. Think about billboards or signs that you see around town. Too many words will make the message confusing, but too few words might not give enough information.

Project Requirements:

1) Create a poster with an important electric safety message.

2) Include 3 supporting facts about your safety message.

3) Pictures and artwork should be appropriate and support the major safety message.

4) Present your poster to the class and explain your message and why it's important. (Rubric follows)

Presentation Rubric Safety Awareness Poster	Unsatisfactory 0-2	Poor 3	Good 4	Excellent 5	Total
Organization	Poster does not contain an important safety message or 3 supporting facts. Artwork is unrelated to the topic.	Poster contains a safety message and supporting facts, but the message is not clear or the facts don't support the message. Artwork is only slightly related to the topic.	Poster contains an important safety message and 3 supporting facts. Artwork is related to the safety message.	Poster contains an important safety message with 3 supporting facts. Artwork is related to the safety message. A good balance of words and visuals are represented.	
Subject Knowledge	Poster contains an incorrect or confusing safety message. No supporting facts are included.	Poster contains an incorrect or confusing safety message. Supporting facts don't support the safety message.	Poster contains an important safety message and 3 facts related to the safety message.	Poster contains an important safety message and 3 facts that clearly support the safety message.	
Speech	Student mumbles, incorrectly pronounces words, and speaks too quietly for students in the back of class to hear.	Student's voice is low. Student incorrectly pronounces words. Audience members have difficulty hearing presentation.	Student's voice is clear. Student pronounces most words correctly. Most audience members can hear presentation.	Student uses a clear voice and correct pronunciation of terms so that all audience members can hear presentation. Student is happy!	
Eye Contact	Student reads directly off the poster with no eye contact.	Student occasionally uses eye contact, but still reads mostly from the poster.	Student maintains eye contact most of the time but often returns to notes or maintains eye contact only with teacher.	Student maintains eye contact with entire audience, seldom returning to notes.	

OPTION 2

Sharing knowledge with others is a great way to help your school community. Now that you know more about how to be safe around electricity, you can share that information with others, so they can be safe too. In groups of 4, your project is to create a commercial that teaches others about electric safety. You will present your commercial to the class. Your commercial must contain a major safety message about electricity along with at least 3 facts that support the message. For example, you could say, "Electricity is Dangerous" but now your commercial will need to include 3 facts that explain why electricity is dangerous. The content of your commercial must be appropriate and support the major safety message. Think about commercials that you see on TV. Are some commercials more interesting or exciting than others? What are some interesting elements you can add to your commercial to make it something that people would want to watch?

Project Requirements:

1) Create a commercial of 1 minute or less with an important electric safety message. (record using iPad or other device when possible)

2) Include 3 supporting facts about your safety message in the commercial.

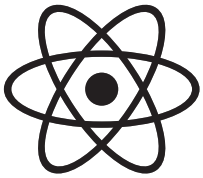
3) Perform the commercial in front of the class. (Rubric follows)

Presentation Rubric Safety Awareness Commercial	Unsatisfactory 0-2	Poor 3	Good 4	Excellent 5	Total
Organization	Commercial does not contain an important safety message or 3 supporting facts. Commercial does not make sense.	Commercial contains a safety message and supporting facts, but the message is not clear or the facts don't support the message.	Commercial contains an important safety message and 3 supporting facts.	Commercial contains an important safety message with 3 supporting facts. Interesting elements such as music or voiceover are added to make the commercial more interesting.	
Subject Knowledge	Commercial contains an incorrect or confusing safety message. No supporting facts are included.	Commercial contains an incorrect or confusing safety message. Supporting facts don't support the safety message.	Commercial contains an important safety message and 3 facts related to the safety message.	Commercial contains an important safety message and 3 facts that clearly support the safety message.	
Team Work	Not all team members actively participate in the commercial.	The commercial is mostly presented by one or two members of the group.	All team members have a role in the commercial.	The team came up with creative solutions to ensure that all members are actively involved in the commercial.	
Speech	Students mumble, incorrectly pronounce words, and speak too quietly for students in the back of class to hear.	Students' voices are low. Students incorrectly pronounce words. Audience members have difficulty hearing presentation.	Students' voice are clear. Students pronounce most words correctly. Most audience members can hear presentation.	Students use a clear voice and correct pronunciation of terms so that all audience members can hear presentation.	
Eye Contact	Students present the commercial with no eye contact.	Students occasionally use eye contact.	Students maintains eye contact most of the time but often return to notes or maintain eye contact only with teacher.	Students maintain eye contact with entire audience, Commercial is all or mostly memorized.	

VOCABULARY WORDS

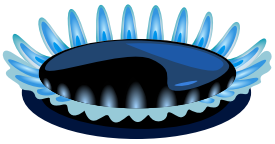
EmPOWERed Kids! Electricity 3-6

All of the definitions below were taken from www.merriam-webster.com/dictionary except for the ones with an asterisk (*) next to them. The (*) next to a vocabulary word indicates a definition provided by the Consumers Energy Education Team.



Atom: The smallest particle of a substance that can exist by itself or be combined with other atoms to form a molecule. *Example — An atom includes a nucleus, and then a series of orbital circles that surround this nucleus, similar to the solar system structure.*

***Burn:** An electrical burn is an injury that results from electricity passing through the body causing rapid damage. *Example — An electrical burn will damage the tissue under the skin.*



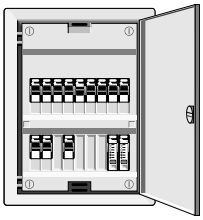
Burner: The part of a furnace, stove, etc., where the flame or heat is produced. *Example — The skillet was placed on the stove and the burner was turned on to fry the food.*

Conductor: A material or object that allows electricity or heat to move through it. *Example — Metal is a good conductor of electricity.*

Electrocute: To kill by electric shock. *Example—He stepped on the power line and was nearly electrocuted.*

Electrons: An elementary particle that has a negative charge of electricity and travels around the nucleus of an atom. *Example—An example of an electron is what orbits the nucleus of an atom. (See atom diagram)*

Fission: The splitting of an atomic nucleus resulting in the release of large amounts of energy. *Example—When the nuclei of atoms divide into two parts and there is energy created by the split, this is an example of fission.*



Fuse box (or circuit breaker): A switch that automatically stops the flow of electricity to a place or device if the current becomes too strong or another dangerous problem occurs. *Example — When you overload the circuit in your house by using too many appliances, the fuse in the box will automatically shut the electricity off.*

Generator: A machine that produces electricity. *Example — A generator is a machine that can produce electrical energy when the power is out in an area.*

Insulator: A material that allows little or no heat, electricity, or sound to go into or out of something.
Example — Metal is not a good insulator.

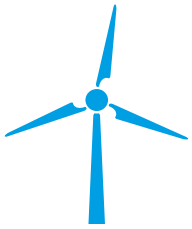
Kilowatt: A unit of electrical power equal to 1,000 watts. *Example — The kilowatt-hour is commonly used by electrical distribution providers for purposes of billing the use of electricity in a home or business.*

Kinetic: Energy associated with motion. (Opposite of potential energy) *Example — Pedaling a bicycle is an example of kinetic action.*

Methane Gas: A colorless odorless flammable gas that consists of carbon and hydrogen and is produced by decay of organic matter. *Example — Biogas digesters collect methane gas underground after the manure from animals decomposes.*

***Nacelle:** The cover housing that stores all of the generating components in a wind turbine. *Example — The nacelle is the part between the tower and rotor of a wind turbine.*

***Non-renewable:** Once you use it you lose it. A resource that can NOT be replaced. *Example — Coal is the most plentiful non-renewable resource in the world.*



*__Renewable:__ A resource that you can use over and over again. *Example — Wind energy is clean and renewable.*

__Pellets:__ A usually small rounded, spherical, or cylindrical body. *Example — A pellet is the size of your finger tip.*

__Penstock:__ A gate or valve for regulating a flow (as of water). *Example — The water flows through the penstock to turn the turbine, to turn the generator.*

__Photon:__ A tiny particle or bundle of electromagnetic radiation. *Example — Solar panels capture the sun's rays and absorb photons.*

__Rotor:__ A part of a machine that turns around a central point. *Example — An example of a rotor is the rotating portion of a turbine engine.*

__Shock:__ A sudden stimulation of the nerves and convulsive contraction of the muscles caused by the discharge of electricity through the body. *Example — I walked across the carpet and then got a shock when I touched the metal doorknob.*

__Substation:__ A place where the strength of electricity is changed as the electricity passes through on its way from the power plant to homes and businesses. *Example — Substations may be enclosed by a fence, underground, or located in special buildings.*

__Tower:__ A tall, narrow building or structure that may stand apart from or be attached to another building or structure. *Example — The tower is one of the most important parts of a wind turbine.*

__Transformer:__ A device that changes the voltage of an electric current. *Example — A transformer is used to transfer electric energy from one circuit to another.*

__Turbine:__ An engine that has a part with blades that are caused to spin by pressure from water, steam or air. *Example — The large blades of wind turbines can interfere with some radar systems used by weather stations or air traffic controls, at times being mistaken for planes or various weather patterns.*

__Voltage:__ The force of an electrical current that is measured in volts. *Example—Substations transform voltage from high to low, or the reverse.*

Low voltage —*The risk from "low voltage" is an electrical shock.*

High voltage — *The risk from "high voltage" is an electrical arc or it can cause death.*

Lightning is a natural electrical arc.