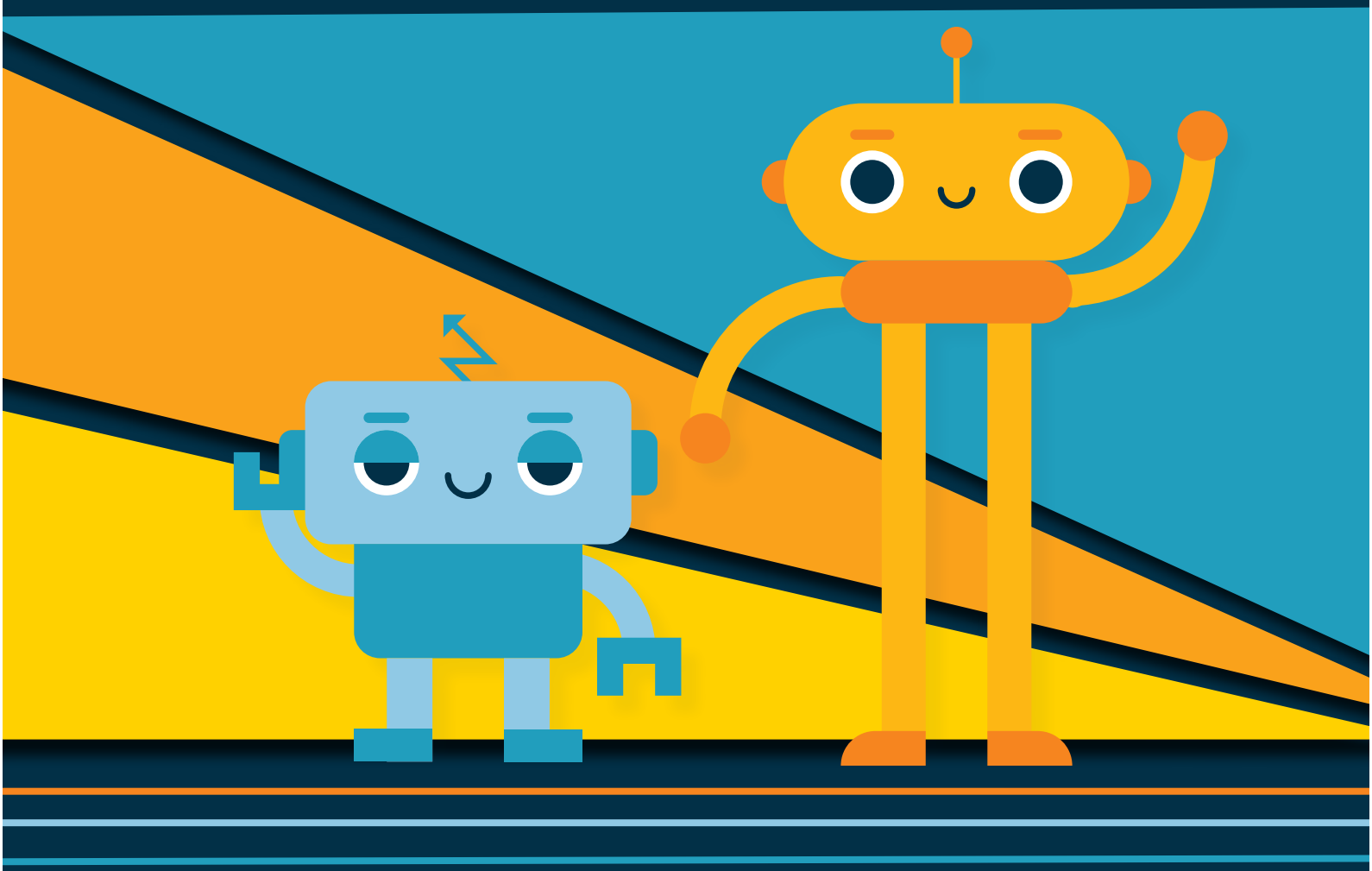
ELECTRICITY & NATURAL GAS

THE GOOD, THE BAD, AND THE SCARY



- How does electricity and natural gas get to you?
- When can electricity or natural gas be dangerous?
- What are renewable and nonrenewable sources of energy?
- How can you save energy?

Manitoba Hydro

The Power of Electricity

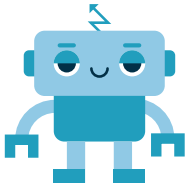
Can you imagine life before the invention of electricity? Back then, we didn't have refrigerators, microwave ovens, televisions, computers or cell phones - not even lights! We cooked our food, heated our homes and entertained ourselves in very different ways than we do now.

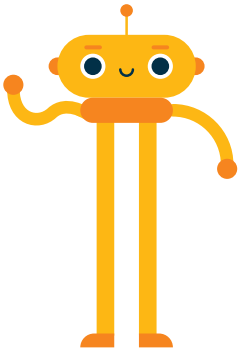
Today, electricity is everywhere. We use it every day – in fact, almost every minute! If you look around the room right now you can probably name at least five things that use electricity.

Play safe. Beware of dangers.

Electricity has become so important to us that we sometimes forget that it can be dangerous. Carelessness, neglect or lack of information can cause electrical accidents. The results can be fire, serious injury, severe shocks, burns or even death if electrical current travels through the body.

By learning about the dangers, and following basic safety tips, you can keep yourself and your family safe. The activities in this resource will help develop an awareness of both electrical and natural gas safety hazards.





Scan the QR code to **watch our safety video.**

Learn more at ***hydro.mb.ca/safety***

1 We use electricity every day without thinking much about it.

Electricity is part of our daily activities.
Write down 10 different ways you use electricity.

1. _____ 2. _____

3. _____ 4. _____

5. _____ 6. _____

7. _____ 8. _____

9. _____ 10. _____

2 What is electricity?

It begins with the **atom**, the extremely tiny units of matter from which everything is made – your pencil, the floor - even you! The centre of the atom is called the **nucleus**. Inside the nucleus are very small particles called **protons** and **neutrons**. Spinning around the outside of the nucleus are **electrons**. An atom usually has the same number of protons and electrons. Electrons have a negative (-) charge, protons have a positive (+) charge, and neutrons don't have any charge at all.

Most of the time electrons stay with their own atom, but sometimes they get pulled away from one atom to another. The flow of electrons from one atom to the next is what we call **electricity!**

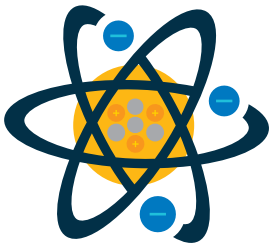
Label the parts of the atom

_____

_____

_____

_____



FUN FACT:
Atoms are so small that it would take more than a million of them to stretch across the width of just one human hair!

Types of electricity

Electricity is a form of energy resulting from the flow of electrons. There are two types of electricity: **static** and **current.**

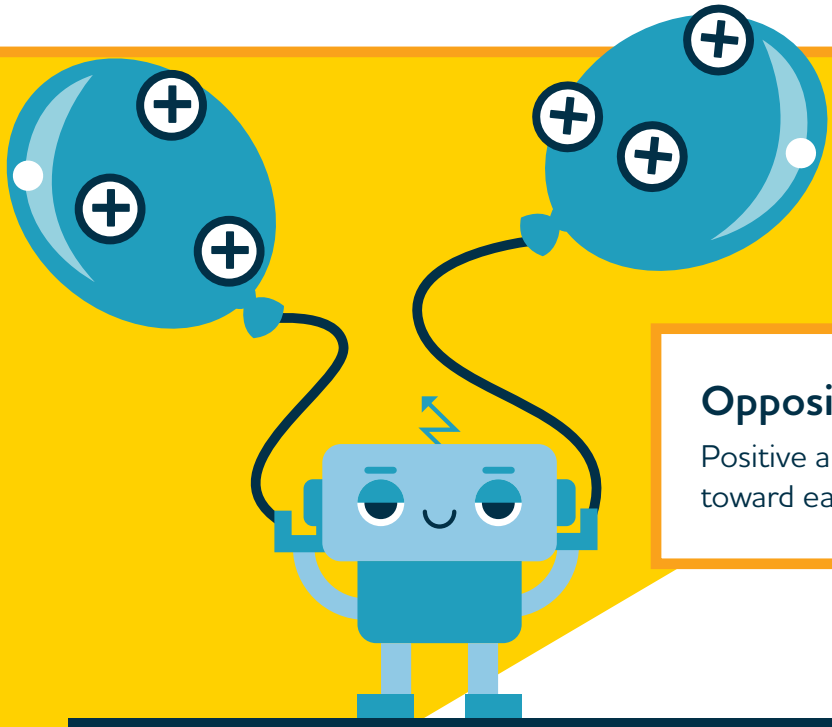
Static electricity happens when an electric charge builds up on the surface of an object. It's called "static" because the charges stay in one area instead of flowing to another. Sometimes objects gain or lose electrons by rubbing together. If you rub a balloon against your hair, electrons will transfer from the atoms of your hair to the balloon, giving it a negative charge and leaving your hair with a positive charge.

This "separation of charge" creates static electricity. If you hold the balloon close to your hair, your hair will pull toward the balloon. This happens because opposite charges are attracted to one another.

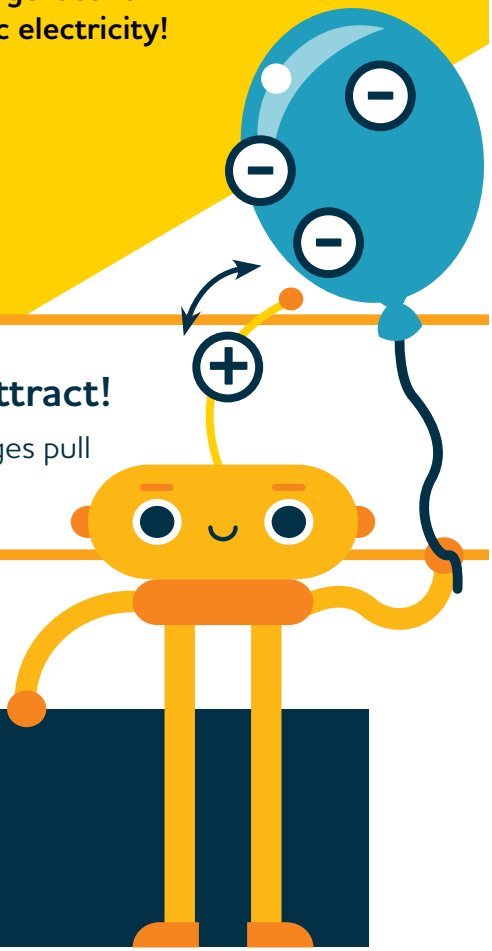
Current electricity is the steady flow of electrons. When electrons move from one place to another in a circuit, they are carrying electrical energy from place to place like marching ants carrying leaves. Instead of carrying leaves, electrons carry an electric charge. Current electricity flows through wires to power our televisions, appliances, computers, and lights.

Like charges repel!

Positive charges push away from positive charges. Negative charges push away from negative charges.



Lightning is a powerful and dangerous form of static electricity!



Opposite charges attract!

Positive and negative charges pull toward each other.

Did you know?

Energy cannot be created or destroyed; it can only be changed from one form into another.

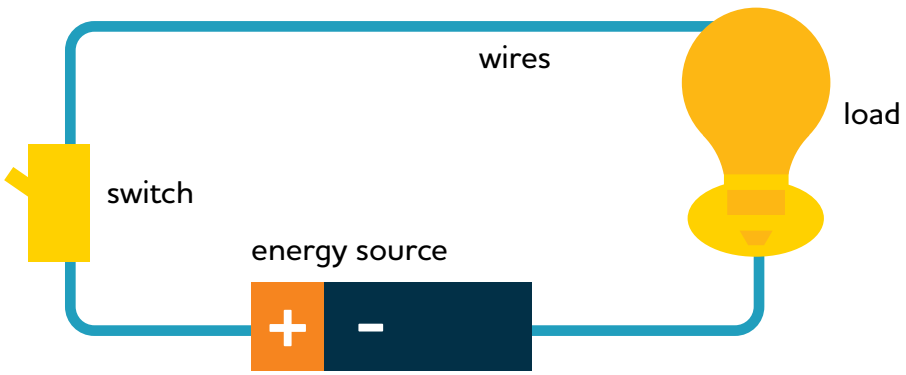
Types of circuits

The electricity we use every day travels in a loop called a **circuit**. A circuit has an **energy source** (battery or generator), a **load** (output device) that changes electrical energy into another form (light, heat, sound, motion), a **switch** to open and close the circuit and **wires** to connect it all together.

There are two types of circuits: **series** and **parallel.**

Your home is part of a large, complex circuit. The generating station is the energy source and the power lines that carry electricity to the wires inside your home connect it all together. Your lights, appliances and electronics are the load, and the on/off switches open and close the circuit!

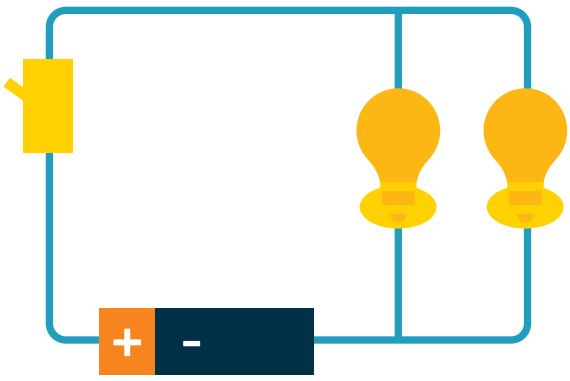
Simple circuit



Series circuit

A series circuit has only one path that electricity can travel.

Parallel circuit



A parallel circuit has several paths that electricity can travel.

Energy from water - hydropower

About 97% of Manitoba's electricity is made from renewable hydropower.

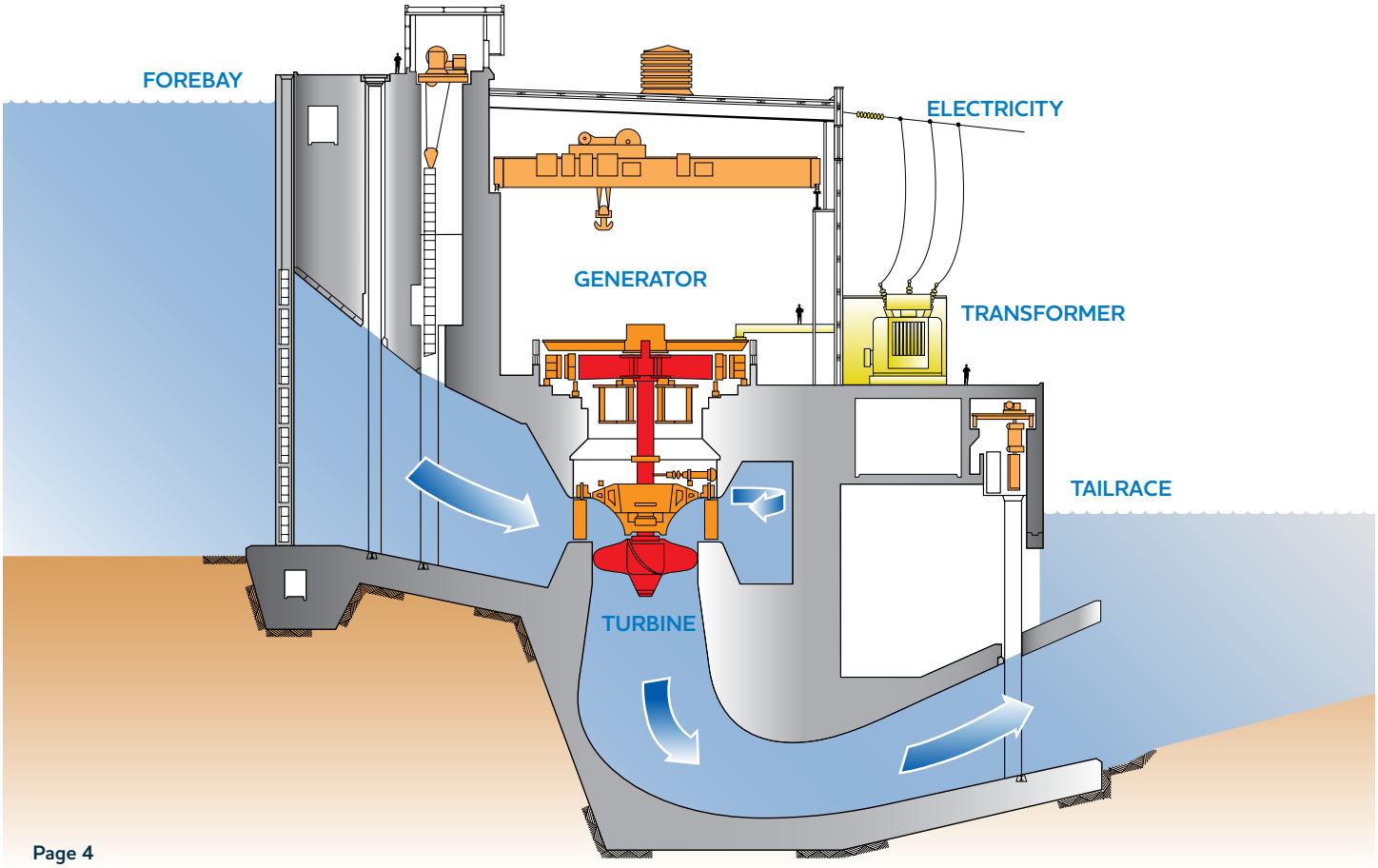
Hydroelectric generating stations convert energy from flowing water into electricity - called **hydropower.**

Manitoba Hydro has 16 hydroelectric generating stations located on the Nelson, Winnipeg, Burntwood, Saskatchewan, and Laurie Rivers.

Water that is stored behind a dam is released and pushes against the blades of a large wheel called a **turbine**. The spinning motion of the turbine activates a magnetic **generator**, pulling the electrons away from their atoms. The flow of electrons along the metal wires that make up power lines carry electricity to wherever it's needed.

Hydroelectricity is a **renewable** form of energy because the water that goes through the turbine can be replenished. In fact, hydroelectric energy is the main source of electricity in Canada.

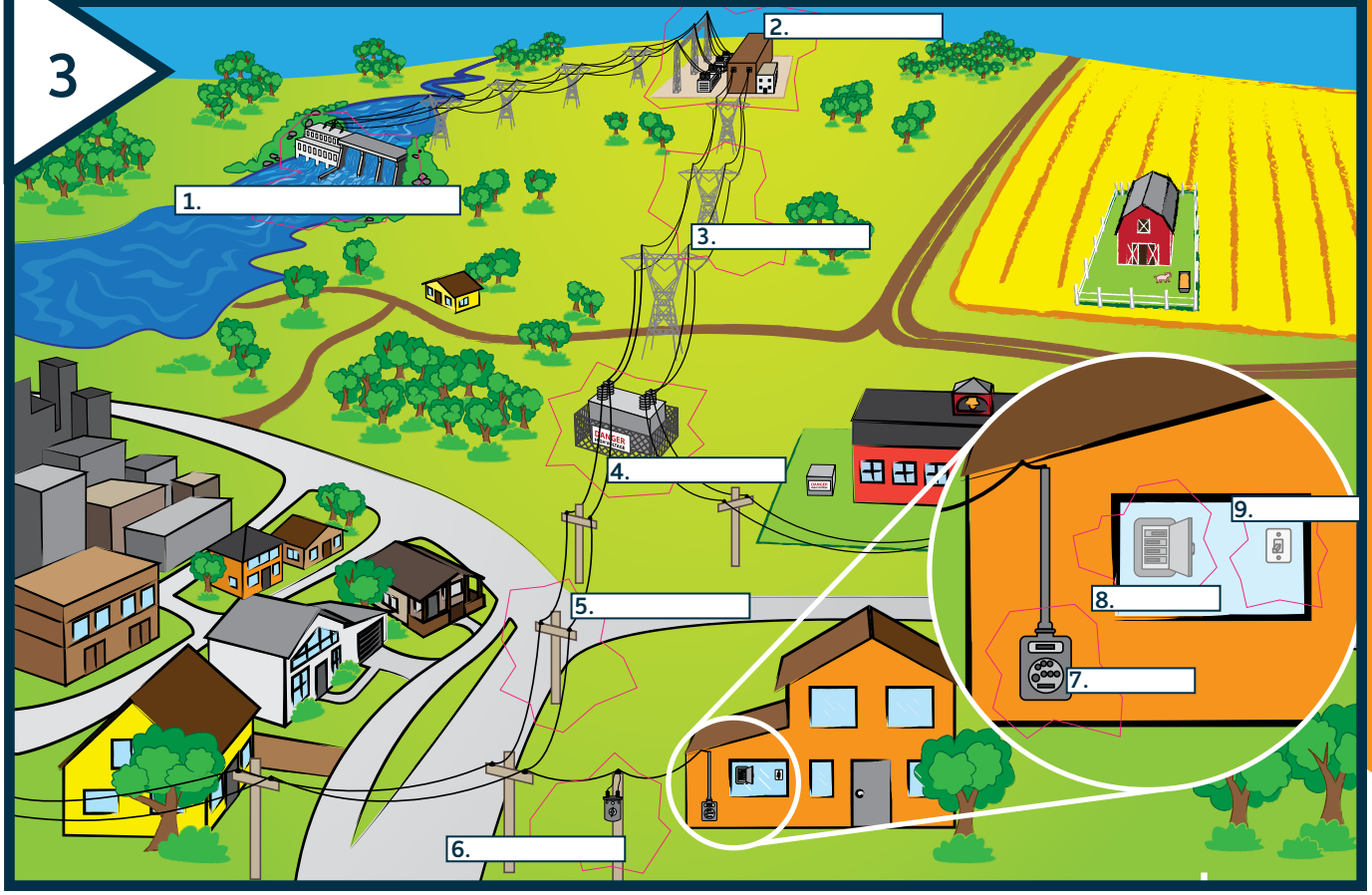
Other energy sources like coal, oil, nuclear, wind, solar, and natural gas are used to generate electricity in Canada as well. Some of these energy sources are **nonrenewable** which means they cannot be replenished and one day, they'll be gone for good!



HOW DOES ELECTRICITY GET TO YOU?

Did you know the electricity you use was made just a moment ago? In less than a second, it travels from where it's made to where it's needed. Label the path it takes using the word bank.

3



WORD BANK

TRANSMISSION LINES • CONVERTER STATION • SERVICE PANEL • METER • DISTRIBUTION LINES
HYDROELECTRIC GENERATING STATION • SWITCH • SUBSTATION • TRANSFORMER

1. A structure where electricity is made using the power of flowing water.

2. A place that changes the voltage from AC to DC (alternating to direct current) for travelling long distances.

3. Power lines that carry high voltage electricity across the province.

4. A structure that lowers the voltage of electricity to send on smaller power lines.

5. Smaller power lines that carry electricity to towns and cities.

6. A cannister on a pole or a box on the ground that lowers the voltage of electricity to use in homes.

7. A device that measures how much electricity you use.

8. Contains breakers or fuses to control the circuits in your home.

9. Powers your device by closing the circuit.

Electricity flows through **conductors** but not through **insulators**

Electricity can flow through some items more easily than others.

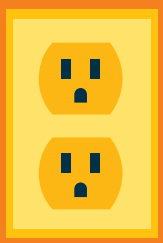
Conductors are materials that allow electricity to flow through them easily. Water and metal are both good conductors of electricity. Seventy percent of the human body is made of water, making people conductors of electricity too.

Insulators are materials that DO NOT allow electricity to flow through them. Rubber tires, glass and plastic are all examples of good insulators. Be aware! Some insulators can turn into conductors of electricity if they get wet.

4 Circle all of the items below that are conductors.

Foil balloon

Copper wire



Outlet cover

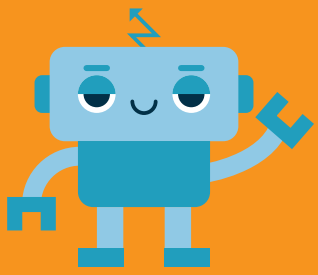
People

Window

Tree branch

Lemon juice

Industrial rubber lineman gloves



Did you know?

The sap found in trees is mostly water. This makes trees excellent conductors of electricity. **Stay safe!** Never climb trees that are close to power lines.

When can electricity be dangerous?

Electricity is always looking for the easiest way to get to the ground. Since 70% of the human body is made of water, your body can conduct electricity. If you touch an electrical circuit and the ground at the same time, you become the easiest path to ground for electricity to travel through. Don't let that happen! Electricity can shock, burn or kill you.

5

Find the path of electricity from the energized line to the ground.

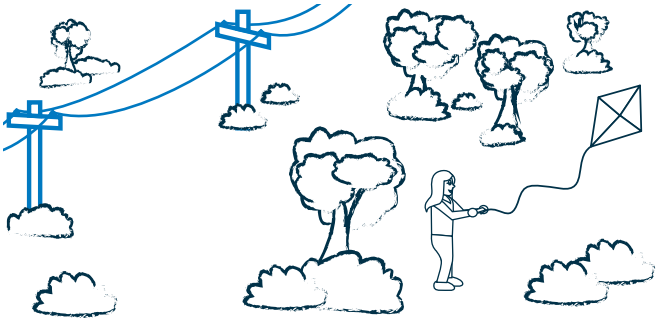
What happens to the human body when electricity passes through it?

- Electricity leaves burns where it enters and exits the body. Internal tissues are damaged as well.
- Muscles tighten, making it almost impossible to let go of an energized item.
- Lungs constrict, making it hard to breath.
- The heart cannot pump blood because blood vessels tighten.

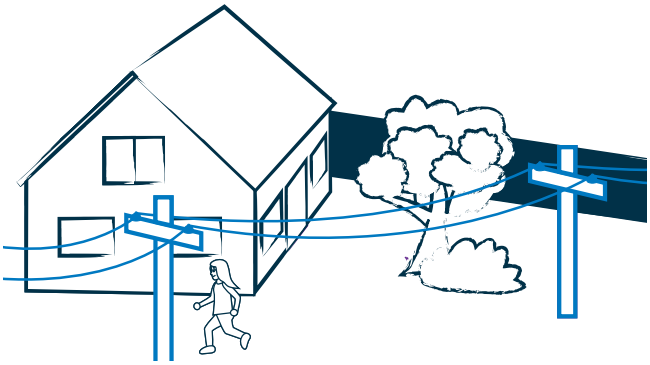
Accidents happen quickly. The effects of electricity are immediate and a person is not able to pull themselves away fast enough. Anyone who touches a person being electrocuted can become part of the circuit. That's why you should never touch anyone who is being shocked.

Stay clear of overhead power lines

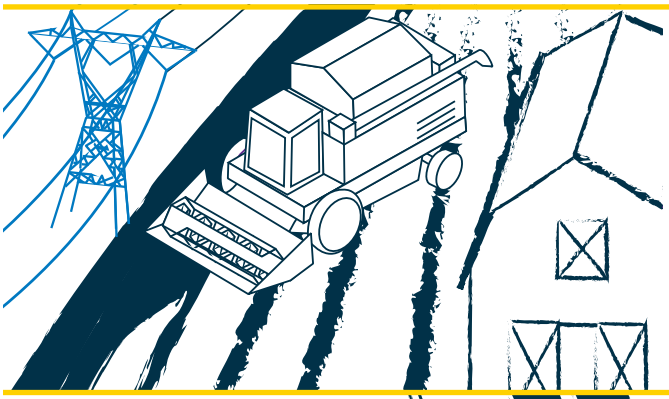
Colour in each of the safety scenes below.



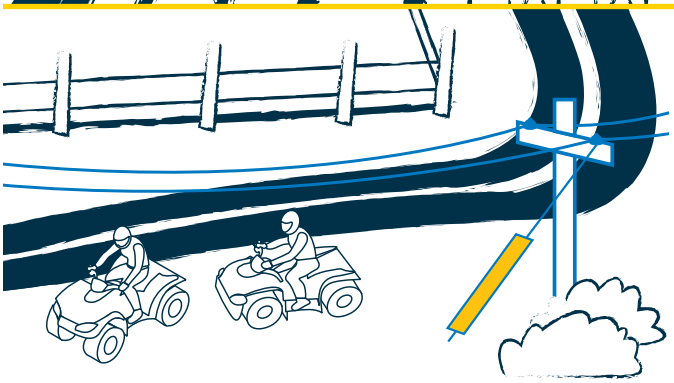
When flying kites, drones, model airplanes or foil balloons, always be aware of overhead power lines. If an item comes in contact with a line and you are touching it, electricity can travel down and electrocute you.



Never climb trees or other structures close to overhead power lines. If you see a low hanging power line that is touching a fence, tree or building, stay away and alert others of the danger. Have an adult call 911.



Tall farm equipment and large truck boxes must be lowered before driving under power lines.



If you're riding on an ATV or snowmobile, always look out for guy wires. Although there is no electricity running through these wires, they are very tight and sharp, and could cut or injure you if you drive into one.

Remember to keep ladders away from power lines.

Don’t hang around if lines are down

Storms can knock power lines to the ground, onto a tree or a fence. If you see a downed power line, stay far away from it and tell others to stay clear of it as well.

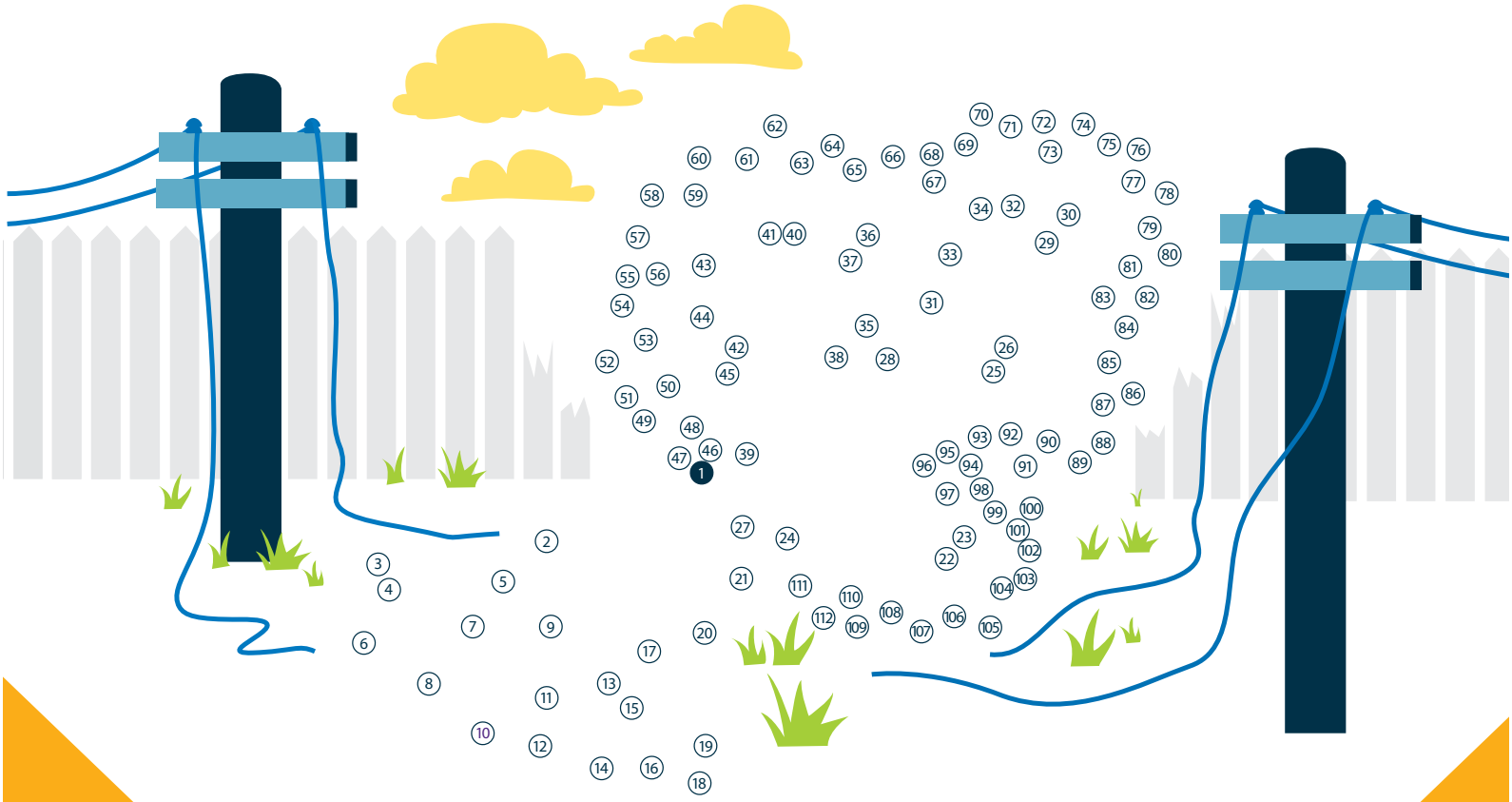
Never touch a fallen power line or move it with a stick or tree branch – electricity may still be flowing through the line and could electrocute you. Instead, tell an adult to call Manitoba Hydro. They will send someone out to safely de-energize the line and repair it.

If an energized line falls on your car …

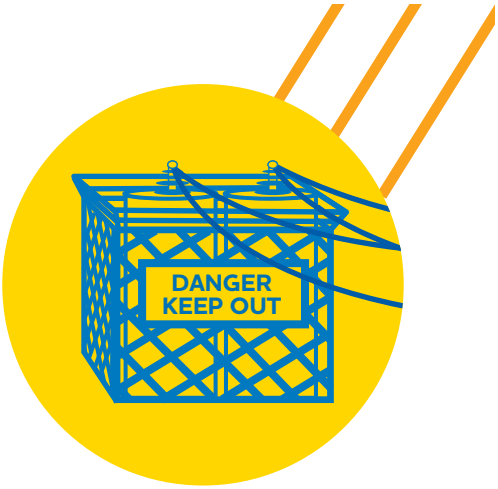
Stay in the vehicle until help arrives. In an emergency (like a fire) where you must exit the vehicle, follow these safety steps:

- Jump clear without touching the ground and car at the same time.
- Land with your feet together and arms at your sides.
- Shuffle away, keeping both feet on the ground, until you are a safe distance from the car.
- If you exit one foot at a time while touching the car, you could become a path to ground and be electrocuted.

Connect the dots to reveal the image.



Be alert. Stay safe.



Substations

A substation is one of the places electricity flows through on its way to powering your home. Here, high voltage electricity from generating stations and utility towers is converted to a lower voltage. This way, it can be sent through many smaller power lines and wires.

The high voltage electricity in a substation is very dangerous. Fences, locks and signs like "Danger" and "Keep Out" are put in place for your safety. Never play near substations or padmount transformers and never try to climb over a substation fence to retrieve a ball or other item.

Only trained Manitoba Hydro workers with special insulated safety gear can enter a substation.

7

Safety secret agent

Unscramble the words below to decode a secret safety message. Fill in the spaces to see what it says.

S L W A Y A O Y B E N I W G A R N I S S G N

_ _ _ _ _ _ _ _ _ _ WHAT THE

_ _ _ _ _ _ _ _ _ _ _ _ SAY!

Dams & generating stations

Never play or swim near a dam or hydroelectric generating station. Water around generating stations is turbulent, and can be unsafe for fishing and boating.

The sound of a horn or siren at a generating station means the spillway is going to open. Water levels can change very quickly. Stay away from the edge of the water near generating stations – the rocks are slippery and falling could pull you into the current.

Water & electricity - a dangerous mix

Water and electricity can be a dangerous combination. Water is a conductor, allowing electricity to move through it very easily. Keep electrical cords away from water and avoid plugging in electrical devices like phone chargers, radios or hairdryers near sinks, bathtubs, pools, or other wet areas.

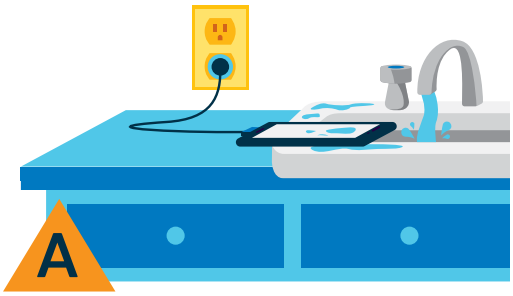
Don't use electricity near water!

If an electrical device gets wet while it is plugged in, electricity powering that device can flow through the water and flow through you as well! This can be fatal.

Remember: when switching on lights or plugging things into an outlet, always make sure your hands are dry to avoid being shocked or electrocuted.

8

Think about the hazards. Which image is more dangerous and why?



Option _____

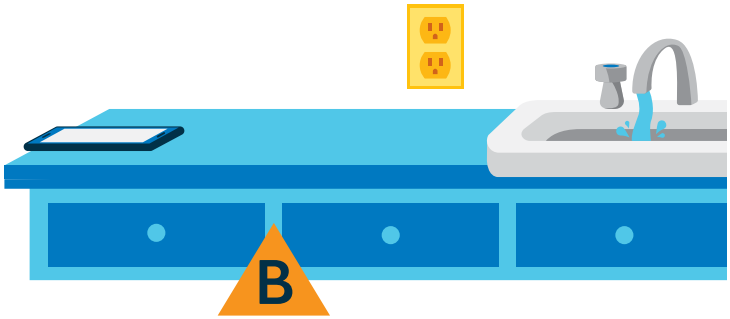
Why? _____

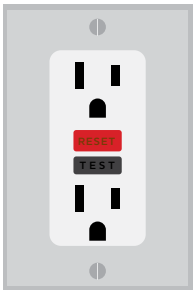
_____

_____

_____

_____

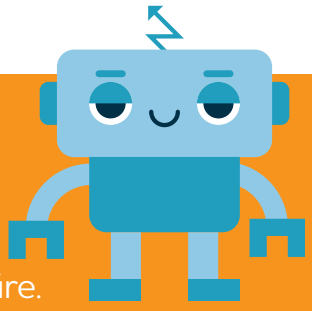




What is a GFCI?

A ground fault circuit interrupter (GFCI) is a special kind of outlet which can prevent you from being electrocuted. The GFCI cuts off the flow of power automatically if it detects that electricity is escaping from a circuit and trying to ground itself.

GFCIs are typically found in areas where there is a higher risk of electricity and water coming in contact.



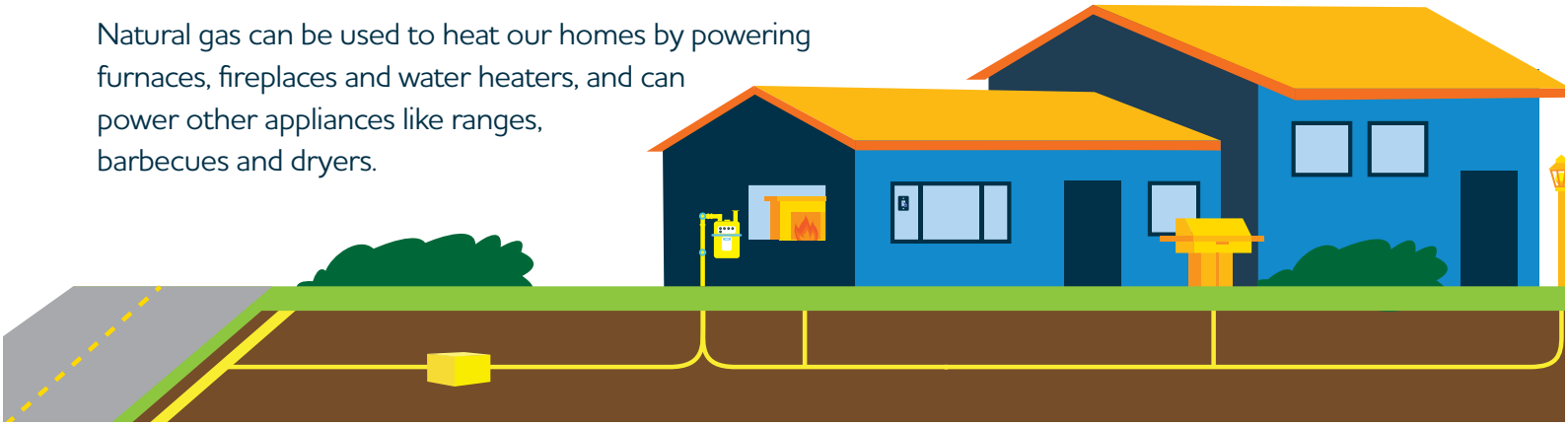
Safety tip

Never use water to put out an electrical fire! Call 911 for help.
A multi-purpose fire extinguisher can be used to put out an electrical fire.

How does natural gas get to you?

Natural gas is a form of energy that is pumped from wells drilled deep into the ground. It is delivered to homes and businesses through underground pipelines. Most of the natural gas that is distributed throughout Manitoba is brought in from Alberta by a pipeline.

Natural gas can be used to heat our homes by powering furnaces, fireplaces and water heaters, and can power other appliances like ranges, barbecues and dryers.



9

Complete the secret message by writing down every third letter starting with the letter 'C' at the arrow.

Dangers below the surface

Natural gas pipelines and some electrical lines run underground. Hitting an underground pipeline or power line can cause serious injury or death.

Before digging any holes deeper than 15 cm, visit **ClickBeforeYouDigMB.com** and request a line locate. Manitoba Hydro will send someone to mark where underground pipes and power lines are, preventing you from hitting a line and being harmed.

Prevent fires at home

Natural gas uses a flame and can make appliances heat up. Always keep items like paper, curtains, towels, clothing, toys and flammable liquids (cleaning chemicals, paint thinner etc.) away from fuel burning appliances. These objects can overheat and catch fire if they are nearby.

Natural gas leaks stink!

Learn how to recognize a natural gas leak

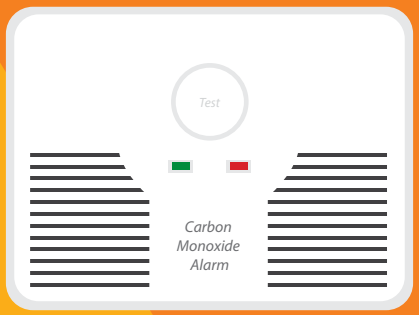
Did you know that natural gas smells like rotten eggs? This is because a chemical, called **mercaptan**, is added to natural gas. Although this smell is unpleasant, it is used to help us detect if there is a natural gas leak.

10

Use the word bank to complete the safety story.

leave	device	candles	leak
spark	inside	tell	explosion
smell	natural gas	safe	

___ ___ ___ ___ ___ ___ ___ ___ ___ ___ can start a fire or cause an ___ ___ ___ ___ ___ ___ ___ ___ ___ if even a tiny ___ ___ ___ ___ ___ ignites it. Never use ___ ___ ___ ___ ___ ___ ___ or any electrical ___ ___ ___ ___ ___ ___ that could create a spark if you think there is a natural gas ___ ___ ___ ___ in your home. If you ___ ___ ___ ___ ___ natural gas in a building, ___ ___ ___ ___ ___ right away and ___ ___ ___ ___ an adult to call 911 or Manitoba Hydro. Only go back ___ ___ ___ ___ ___ ___ once a trained worker tells you it is ___ ___ ___ ___ .



Things to know about CO

Carbon monoxide (CO) is an odourless, colourless gas, that you cannot see, smell or taste. Dangerous levels of CO can be created by a faulty appliance, a clogged chimney, or a buildup of engine exhaust. CO can make you feel dizzy and nauseous and can be fatal if you breath in too much of it.

Do you have a CO alarm installed in your home to warn you of this danger? If you hear the alarm go off, alert your family members and leave immediately. Call 911 to report the emergency.

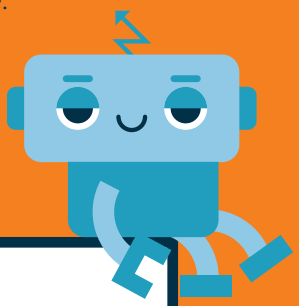
11

Sources of energy

Energy sources are categorized as either **renewable** or **nonrenewable.**

Renewable energy sources are naturally replenished and can be used again in the future.
Nonrenewable energy sources cannot be replenished and will eventually be used up.

Complete each sentence using the word bank below. Then, write each circled letter in the spaces near the bottom of the page to complete the message.



WORD BANK

SOLAR • ENERGY • BIOMASS • WATER • COAL • CARBON • NUCLEAR
NATURAL • WIND • GEOTHERMAL • RENEWABLE • GASOLINE • GREENHOUSE

Renewable resources

1. To take care of our planet, we need to reduce our O_ _ _ _ _ footprint.
2. Installing special panels on a rooftop can create _ _O _ _ energy from the sun.
3. _ O _ _ power turns flowing air into electricity using a turbine.
4. _ _ _ _ _ _ _ O _ _ energy comes straight from the earth.
5. Energy produced by burning plants and organic material is called _ _ _ _ O_ _ .
6. Hydroelectric stations create electricity by using the power of flowing _ _ O_ _ .
7. _ O_ _ _ _ _ _ _ energy is replenished and reused in a short period of time.

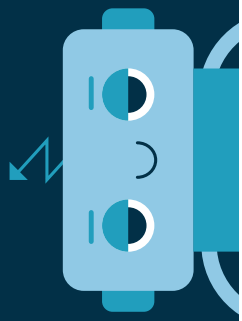
Nonrenewable resources

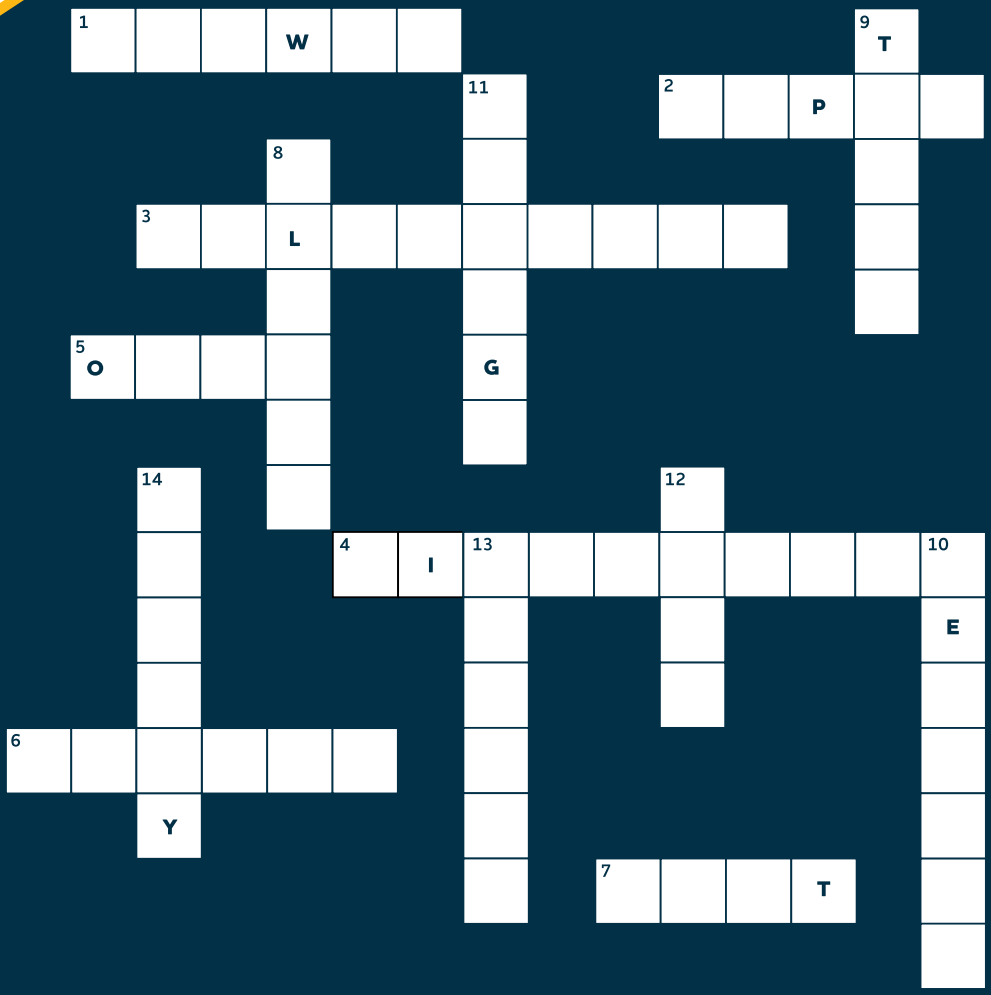
8. O_ _ _ is a black rock that is burned to produce heat and electricity.
9. Nonrenewable energy sources cause _ _ _ _ _ O_ _ _ _gas emissions.
10. _O_ _ _ _ _ gas is a fossil fuel from dinosaur deposits found deep in the earth.
11. O_ _ _ _ _ _ fission is the splitting of uranium atoms, a mineral found in rocks.
12. Oil drilled from the ground is used in making O_ _ _ _ _ _ _ to run our vehicles.
13. Nonrenewable _ _ O_ _ _ sources will be used up one day.

OOOOOOO OOOOOO is happening all around us.
Scientists advise that human activity is an important cause of this, especially the use of nonrenewable energy.

12

Saving energy crossword



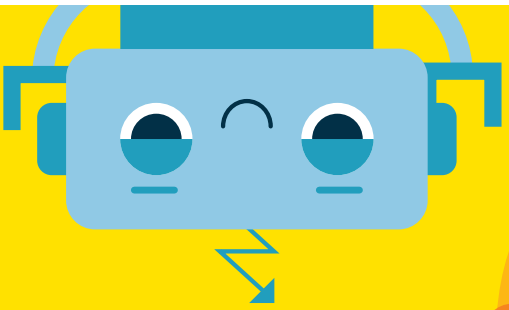


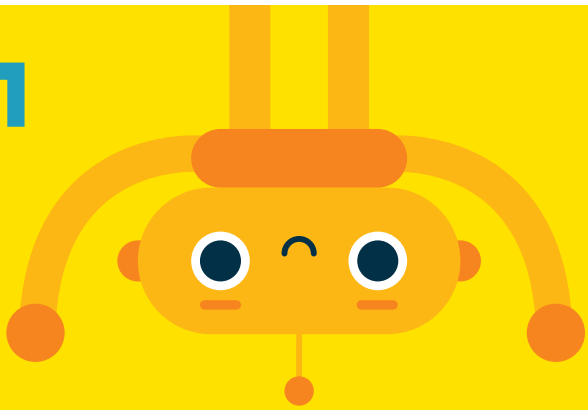
ACROSS

1. Take a fast _____ instead of filling a bathtub to save water.
2. Re-use _____ for school and home projects.
3. Turn off the _____ when you're finished watching a show.
4. Use the energy-saving cycle on the _____.
5. Use the microwave instead of the ____.
6. Turn off the _____ when you leave a room.
7. Put on a sweater if you're cold instead of turning up the ____.

DOWN

8. Close the _____ on hot, sunny days to keep your home cool.
9. Turn off the tap while brushing your _____.
10. Re-use and _____ as much as you can.
11. Decide what you want before opening the _____ door.
12. Let your ____ air dry instead of using a blow-dryer.
13. Turn down the air conditioning in the _____. It's okay to be a little warm.
14. Saving _____ saves money and it's good for the environment.





13

Home safe home

Answer the questions with either True or False.

	True	False
Never poke a knife in the toaster while it's plugged into an outlet.		
It's safe to cover an extension cord with furniture or a rug.		
Keep your phone charger and other electronics away from water.		
Leaving your laptop on the bed can overheat and start a fire.		
You won't get a shock if you touch a light switch with wet hands.		
Plugging in too many electrical devices into the same outlet can start a fire.		
Carbon monoxide poisoning can make you feel like you have the flu.		
It's okay to store cardboard boxes close to your furnace or hot water tank.		
Using a damaged electrical cord can give you a serious shock.		
The smell of rotten eggs is added to natural gas so you can tell if there's a gas leak.		
Ignoring your beeping carbon monoxide alarm is safe. It means a low battery.		
Water can be used to put out an electrical fire.		

Did you know?

Electricity moves through wires and power lines very fast. It can travel all the way from Halifax to Vancouver and back in less than half a second!

Answer key

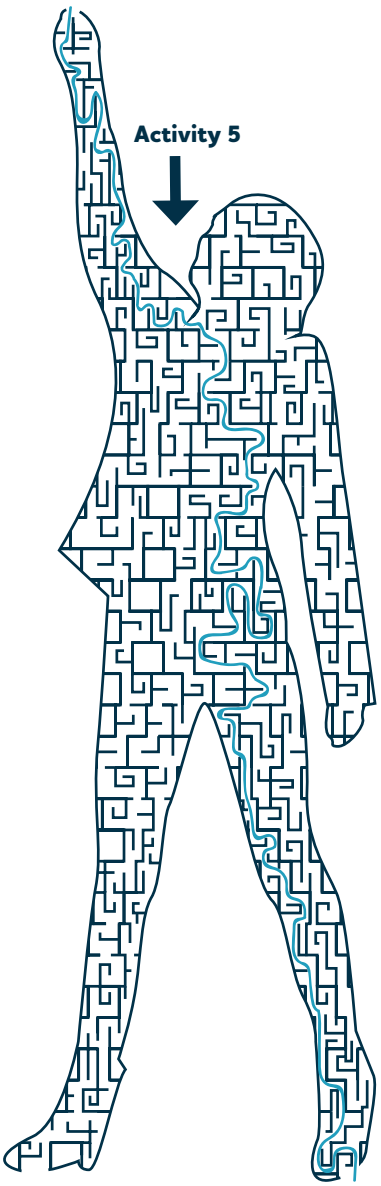
Activity 1
Examples:
Cell phone charger
Toaster
Video games
Lights
Microwave
Refrigerator
Hot water for shower
Computer
Television
Furnace

Activity 2
Nucleus
Proton
Neutron
Electron

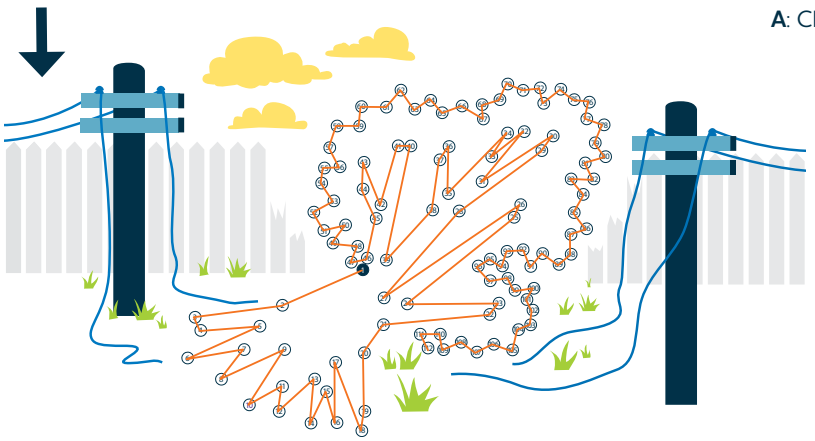
Activity 3
1. Hydroelectric Generating Station
2. Converter Station
3. Transmission Lines
4. Substation
5. Distribution Lines
6. Transformer
7. Meter
8. Service Panel
9. Switch

Activity 4
Foil balloon
Tree branch
Copper wire
Lemon juice
People

Activity 5



Activity 6



Activity 7
Always obey what the **warning signs** say!

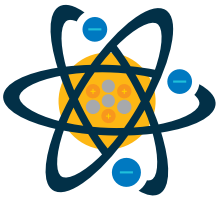
Activity 8
Option **A** – Electricity and water are a dangerous combination. You could be electrocuted if your phone falls into water and you retrieve it while it is plugged into an electrical outlet. Never use anything with a plug or cord around water.

Activity 9
Click Before You Dig

Activity 10
natural gas
explosion
spark
candles
device
leak
smell
leave
tell
inside
safe

Activity 11
1. Carbon
2. Solar
3. Wind
4. Geothermal
5. Biomass
6. Water
7. Renewable
8. Coal
9. Greenhouse
10. Natural
11. Nuclear
12. Gasoline
13. Energy

A: Climate change



Activity 12
ACROSS
1. Shower
2. Paper
3. Television
4. Dishwasher
5. Oven
6. Lights
7. Heat

DOWN
1. Blinds
2. Teeth
3. Recycle
4. Fridge
5. Hair
6. Summer
7. Energy

Activity 13
True
False
True
True
False
True
True
False
True
True
False
False

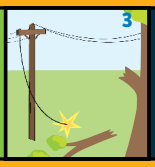
PLUG INTO SAFETY

Follow the instructions as you go and learn about electrical and natural gas safety.

START

1 Manitoba Hydro

2 You stay away and report a downed power line. ***Safe choice. Take the shortcut.***

3 

4 You dare a friend to climb a substation fence. ***Return to START.***

5 

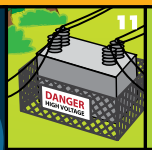
6 A power line is down. You stay in the vehicle where it's safe. ***Advance 3 spaces.***

7 

8 You climb a tree that is touching a power line. ***Miss a turn.***

9 

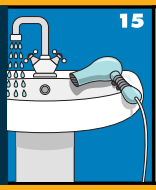
10 You obey the danger sign at a substation and keep out. ***Advance 3 spaces.***

11 

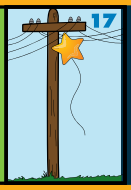
12 You climb a utility pole. ***Return to START.***

13 You never overload an outlet with too many plugs. ***Roll again.***

14 You use a hairdryer near a wet sink. ***Slide back to #9.***

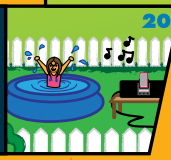
15 

16 You report a broken lock on a padmount transformer. ***Safe choice. Take the shortcut.***

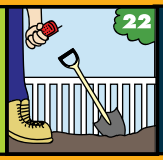
17 

18 Your foil balloon gets caught in a power line. ***Slide back to #5.***

19 You remind your friend to keep electrical cords away from water. ***Advance 3 spaces.***

20 

21 You smell natural gas (it's like rotten eggs) and don't leave your house immediately. ***Miss a turn.***

22 

23 You have underground lines marked before planting a tree. ***Roll again.***

24 You use a damaged extension cord. ***Go back 2 spaces.***

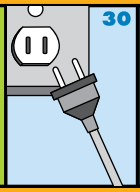
25 You have a carbon monoxide (CO) alarm in your home ***Safe choice. Take the shortcut.***

26 

27 You throw a stone at the insulators on a hydro pole. ***Miss a turn.***

28 

29 You remember to pull by the plug, not the cord. ***Advance 3 spaces.***

30 

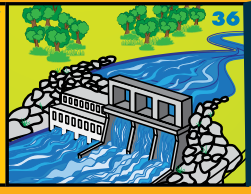
31 You move a ladder without looking up for overhead power lines. ***Slide back to #20.***

32 

33 You watch for guy wires and other hazards when riding a snowmobile or ATV. ***Advance 1 space.***

34 

35 You ignore the warning signs and fish near a hydro dam. ***Slide back to #28.***

36 

37 Manitoba Hydro

38 **STAY SAFE!**

Manitoba Hydro

04/2022

Available in accessible formats upon request.