

# TEACHER'S PACKAGE

## MODULE 2

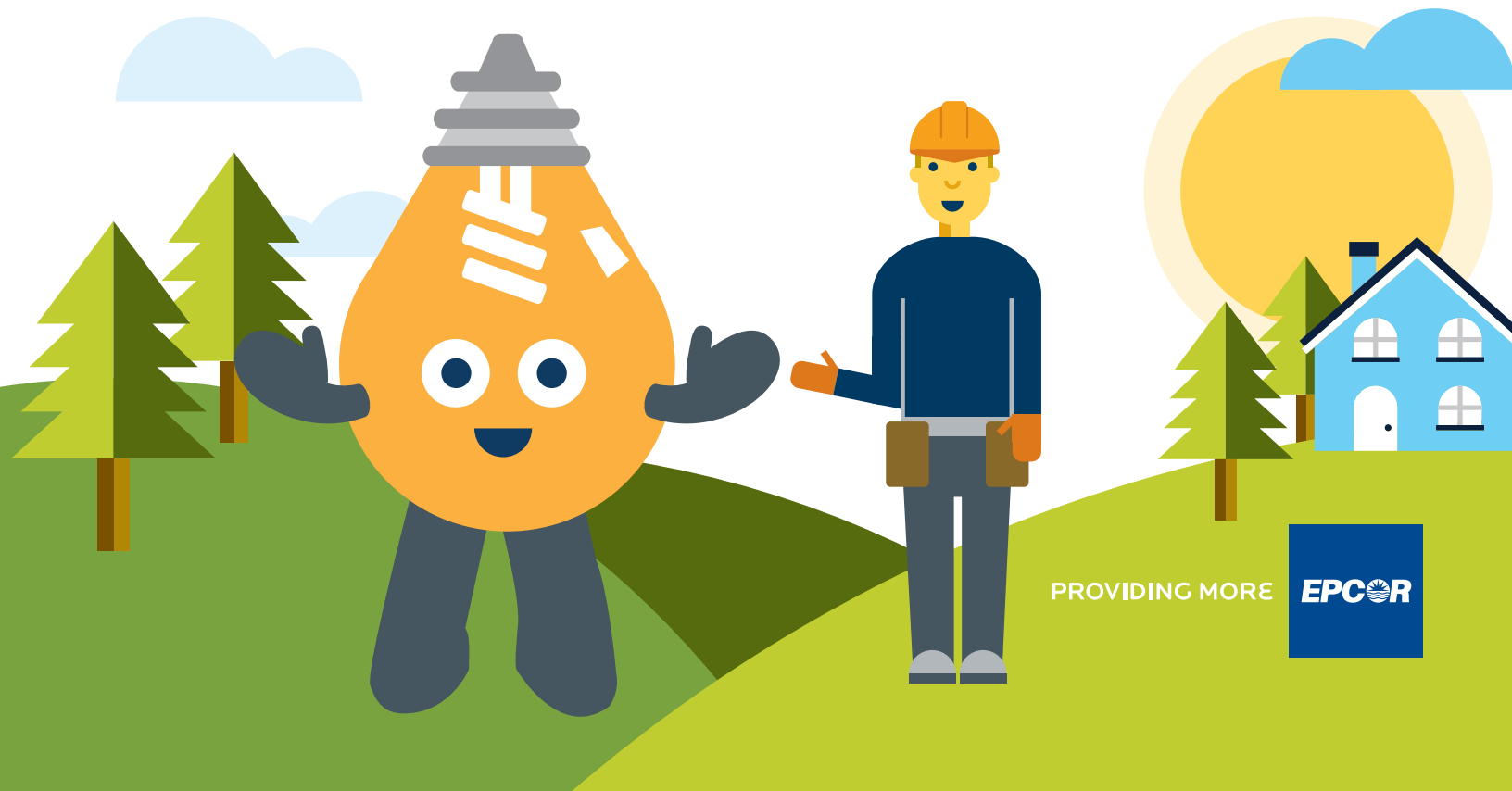
### ELECTRICITY SAFETY AND MEASUREMENT

#### Grade 5 Science – Topic A: Electricity and Magnetism

##### Specific Learner Expectations:

- Students will recognize and appreciate the potential dangers involved in using sources of electrical currents
- Understand that household electrical currents are potentially dangerous and not a suitable source for experimentation.
- Students will understand that short circuits may cause wires to heat up.
- Recognize that the amount of electricity we use in our homes is measured in kilowatt hours.

**Cross curricular competencies:** Manage information, identify and solve complex problems, think critically.



## SUGGESTED SPEAKING NOTES

1

- In the last module, we learned about how an electrical circuit works and how it travels around the city.
- Now we're going to focus on how we can be safe by treating it with respect and how power is measured.

2

- Remember, electricity flows through a circuit and all power lines are part of a circuit.
- Circuits have a power source, conductors, and insulators; and can have resistors and transformers.

3

- Do you remember what we discussed about short circuits?
- ! **Solicit responses from the class.**
- When the plastic coating on the wire becomes damaged and the wires are exposed, this can be a safety risk. The exposed wires can potentially shock you or start a fire.
- What do we say we should do with cords that are frayed like this?
- ! **Solicit responses from the class.**
- The best and safest thing to do is stop using that cord, have an adult safely remove it from the outlet. You can take it to the ECO center and replace it with a new one.

4

- Some people use adaptors to increase the number of appliances they can plug into a wall socket, like the one seen here.
- However, although there is space to plug in four appliances, this does not mean it is always safe to do so.
- In your own home, be careful not to overload your plugins or extension cords. Plugging too many devices requiring electricity can exceed the maximum amount of current for the circuit and can cause the circuit to overheat and potentially cause a fire.
- Also, don't stick objects into outlets. This can lead to electric shock, which means that an electric current is passing through your body!
- Remember, being a conductor of electricity is no fun!



## SUGGESTED SPEAKING NOTES

5

- Does anyone know why the electrical outlets in the bathroom and by the kitchen sink are different than the ones in the rest of the house?
- Power and water should not mix, EVER!
- These outlets are specially designed so that if the circuit gets overloaded the circuit opens and stops the flow of electricity. Once you unplug the electronics that are causing the issue, you have to push the reset button on the outlet.
- Part of the reason why this type of outlets exist is because water can act as a conductor and helps to carry electricity. If the two mix, like if a radio fell into the kitchen sink while you are washing dishes or your mom left her hair dryer plugged in and it accidentally fell into a bathtub full of water.
- In both instances, the water would become electrified and it can be very dangerous and potentially deadly. These special breakers are designed to break the circuit if electricity comes into contact with water.
- Similarly, if an electronic device is resting on the edge of a sink, you should not run the water!

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- Let's talk about electrical safety outside now.
- What safety rules do you remember when we talked about substations?
- When you are out playing with your friends, stay away from electrical substations that look like this.
- If you see signs like this then you know that there is electrical equipment that is dangerous and you shouldn't go inside.

**If you lose a ball or Frisbee over the fence, call EPCOR to let them know and they can retrieve it for you the next time they are there.**

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- What do you remember about transformers?
- ! Solicit responses from the class.**
- That's right, they transform the power so that it is safe to use in our homes. Also, we're not supposed to play on or around them.
  - If there is a power outage in your neighbourhood, EPCOR employees might need to access the transformer to restore power, so we should also make sure they have room to work around it. This means we shouldn't plant or build anything close by.



SLIDE NO.

	SUGGESTED SPEAKING NOTES
8	<ul style="list-style-type: none"> <li>Remember when I said that electricity wants to get to the ground as fast as it can? When it gets there, electricity travels THROUGH the ground in waves that lose power as they spread. So the further away you are, the safer you are.</li> <li><b>! Measure out 10 meters in the class room to give students the perspective of how far that is. This is close to the length of a school bus.</b></li> </ul>
9	<ul style="list-style-type: none"> <li>Can you see what is wrong with this picture? <b>(Branch fell on line).</b></li> <li><b>! Solicit responses from the class.</b></li> <li>Storms can cause downed power lines. Sometimes this is because a tree branch has fallen on top of the line. A downed power lines means that a circuit has been broken.</li> <li>This is a very dangerous situation. Please do not go near downed power lines! Stay at least 10 metres away and call 911 or EPCOR and we will make sure it gets repaired safely.</li> </ul>
10	<ul style="list-style-type: none"> <li>If you see a vehicle come in contact with electrical equipment like this transformer or a power line, make sure you and everyone else stays at least 10 metres away.</li> <li>If a power line or transformer comes into contact with the vehicle you and your parents are in, remain in the vehicle and call 911.</li> <li>You are not a direct path to ground while you are inside the car and you act like a bird on the power line, floating in the air with no direct path to the ground. An EPCOR employee will come and turn off electricity to the area and assist you to safety.</li> </ul>



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## SUGGESTED SPEAKING NOTES

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11

- If you find yourself in an unsafe situation, and are very close or right in an area where there has been an electrical circuit break, it is really important that you remember how to safely remove yourself.
- Please remember that you cannot lift one of your feet/legs without the other! You have to jump clear of your vehicle. Keep your feet close together, landing on the ground with both feet at the same time. Do not touch the vehicle and the ground at the same time and don't return to, or reach back into, the vehicle to get anything you may have forgotten.
- Once on the ground, shuffle your feet keeping both feet on the ground at all times until you are at least 10 metres away from your vehicle.
- Call 911 and EPCOR will come to make everything safe again.
- Keep everyone else 10 metres away so they stay safe too.

**! Demonstrate and have students practice!**

**A video demonstrating how to exit the vehicle can be found here:**

**<https://www.youtube.com/watch?v=HtfkypKXr-I>**

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- Drones and kites can be fun to fly. Has anyone here ever flown a kite before? What about a drone?

**! Solicit responses from the class.**

- When flying drones and kites, there are a few safety reminders we should always keep in mind.
- First, never fly your drone or kite near overhead power lines in your neighbourhood. Drones can get caught in the wires, damaging equipment. This is also why you shouldn't release balloons outside.
- Remember how we talked about circuits? A kite has a string. If your kite touches a power line, while you're holding it, it creates a path for the electricity to touch and hurt you.
- Don't fly drones and kites at night or when it's windy, as you may lose control of them.
- If your drone does get stuck in overhead lines, don't try to fly it out, and don't try to climb trees or anything to get it down. Leave it and have your parent or guardian call EPCOR who will remove it safely. And if your drone or kite lands in a substation, call EPCOR to get it back to you safely. Never climb into or enter the substation.



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## SUGGESTED SPEAKING NOTES

SLIDE NO.

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- Boys and girls, every month, your family pays money for the electricity, water and natural gas that you all have used/consumed at home. It's easy to turn on a switch, but there is a cost each time you do.
- The billing unit used by electric utilities like EPCOR is called the Kilowatt hour or kWh. If you look at a power bill you will see these letters. This measure of electric energy is equivalent to a power consumption of 1,000 watts for 1 hour.

**! Write these figures down as you are speaking to give the students a visual and to help them track this line of thought.**

- In Canada, all energy and fuel that is sold need to be measured by a Measurement Canada approved meter. This is true for your power meter, natural gas meter, the pumps at the gas station and many more.

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- Here is what a power meter looks like in Edmonton. How many of you have seen this on the outside of your home?

**! Have students raise their hands.**

- It has several display screens, but this one – the one that starts in DEL is the one that shows you the total amount of electricity used at your home.
- DEL stands for power that is DELivered to the site from the electricity grid or circuit.
- Every month, your electricity retailer takes this total amount of energy and subtracts the reading from the previous month. This tells them how much electricity your family has used during that time.
- So if your power meter reading for this month was 2,152 kWh and your reading last month was 1,476 kWh. How much electricity did your family use?

**! Write these figures down as you are speaking to give the students a visual.**

**! Have them solve the problem  $2,152 - 1,476 \text{ kWh} = 676 \text{ kWh}$ .**

- If you have solar panels on your home, the electricity produced by the panels is recorded on the power meter too. It shows up in the REC display. REC stands for Received to the electricity grid from the site, your home.



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EPCOR

## SUGGESTED SPEAKING NOTES

SLIDE NO.

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- Let's look at how this shows up on an EPCOR power bill.
- On the front page of your bill, there is a graph which shows your family how this month's energy consumption in kilowatt hours compares to the same month last year as well as the previous month.
- On the second page, you will see the meter readings from your home listed. As well as the cost of electricity for that month per kilowatt hour.
- Can you guess how much electricity the average Albertan household uses per month in kilowatt hours?

**! Have students guess and write them down.**

- Well, you're pretty close – the answer is 600 kWh/month. When it is warm in the summer time and brighter out during the day people can use less energy. And when it is colder out during the winter and darker out, people tend to use more electricity to keep their homes bright.

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- Energy efficiency helps Canadians:
  - Save energy
  - Lower utility bills
  - Reduce our impact on the environment.
- In Canada, you will see two logos that help determine energy efficiency: EnerGuide and Energy Star.
- EnerGuide is the official mark of the Government of Canada for its energy performance rating and labeling program for key consumer items—houses, light-duty vehicles, and certain energy-using products.
- The information provided by EnerGuide allows consumers to compare different models with confidence. The data may be a rating number based on a standard measure or a verified average of energy consumption.
- EnerGuide works in concert with Canada's Energy Efficiency Regulations and the ENERGY STAR® Initiative in Canada to promote energy efficiency in Canada.

**Source: [nrcan.gc.ca](http://nrcan.gc.ca)**

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**EPCOR**

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- EnerGuide labels are mandatory for clothes dryers, clothes washers (including integrated washer-dryers), dishwashers, freezers, electric ranges, cooktops, ovens, refrigerators, refrigerator-freezers, and air conditioners.
- There are four things displayed on an Energy efficiency label that help consumers understand its power usage:
  - Annual energy consumption of the model in kilowatt hours (kWh)
  - Energy consumption indicator, which positions the model compared with the most efficient and least efficient models in the same class
  - Type and capacity of models that make up this class
  - The model number
- Can you help find this information on the refrigerator label displayed here?

**! Solicit responses from the class.**

- This label shows the appliance uses 300 kWh of electricity each year. And the shaded bar or consumption indicator shows you how the energy usage of this make and model of appliance compares to others being sold in Canada.
- As you can see by this indicator, this particular appliance does fairly well and is on par with others that use the least amount of energy.
- It is a Type 3 model of 16.5 – 18.4 cubic feet capacity.
- The model number for this example is 00000.

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- Remember, electricity is an incredible resource that we can all enjoy when we treat it with respect and stay safe.
- It's also important to use it wisely by being as energy efficient as we are able.
- Can you think of ways that you are or can save energy around your house or the school?

**! Solicit responses from the class and have a volunteer write them on the board.**

**Examples include; making sure the fridge or freezer door is closed tight, turning lights off when you leave the room, shut down your computer and video game consoles, etc.**

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Final slide.