ATCO

POWER WISE

An education resource about electricity for Grade 5

atco.com

Introduction

At ATCO, the safety of our employees and everyone who uses electricity is the most important thing to us. Safety education is one way we can help ensure that everyone knows how to be safe around electricity. We also believe it is important for people to understand how to use electricity wisely.

This resource was built with the help of Alberta teachers. Teaching Power gives teachers everything you need to teach your Grade 5 students about electricity, electrical safety, energy measurement and conservation. You'll get background information and activities complete with lesson plans, answer keys and instructions on how to complete each activity. Learning outcomes, time and materials needed, advance preparation, procedure and extension activities are also provided.

For more information about ATCO's safety education programs, visit **www.atco.com** or call **1-800-668-2248**. If you're not in our service area, please contact your local utility.

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Background information is provided for each lesson. The materials list for each activity refers to background information that will be useful. The terms highlighted in bold in the background information are defined in the glossary.

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ACTIVITIES

The lesson plans and answer keys include information on how to complete each activity. The learning outcomes, time and materials needed, advance preparation, procedure and extension activities are also provided.

The activities in this kit are not all required. However, it is recommended that the activities are completed in the order provided.

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A glossary provides the definitions of some words used in the kit.
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Background Information

1. Why Save Electricity?

There are three important reasons why everyone should use electricity more efficiently:

- to reduce the effects of energy production and use on the environment
- to conserve non-renewable resources
- to save money

1.1 Reducing Environmental Effects

The use of electricity in homes, offices and industries does not directly affect the environment, as no emissions are produced when it is used. However, the generation and transmission of electricity does have an effect on the environment. For example, when we use less electricity we burn less coal or natural gas, the fuels used for most electricity generation in Alberta. When we burn less fuel, we create less pollution.

1.2 Non-Renewable and Renewable Resources

In Alberta we use mostly coal and natural gas to generate electricity. Both coal and natural gas are **non-renewable resources**. Non-renewable resources are resources that cannot be used again after they are consumed. In contrast, **renewable resources** can be used over and over again after they been used. For example, there are hydro (water) generation plants in Alberta. It uses flowing water from a river to generate electricity. Water is a renewable resource because after it is used to generate electricity it can still be used again.

1.3 Reducing Costs

Every family pays a monthly electricity bill. Using less electricity reduces that bill. However, many people don't realize that electricity costs can also be reduced by conserving other natural resources. For example, reducing water consumption also cuts down the amount of electricity used to clean the water and pump it to homes and schools.

2. Measuring Electricity

2.1 Voltage

One way to describe how electricity is measured is to compare it to a garden hose with a nozzle to stop the flow of water. **Voltage** is the pressure of electricity inside an electric wire, like water pressure inside a hose. Voltage is measured in **volts** (V). Once the tap is turned on at a house there is a certain amount of water pressure in the hose. Once the electricity is connected to a house, there is a certain amount of electric "pressure" (voltage) available to be used. There are two electric wires, each carrying 120 volts, connected to most homes in Alberta. All home electric appliances use 120 or 240 volts of electricity.

2.2 Amperage

Amperage (measured in **amps**) measures the electric current, or the number of electrons that are moving through a wire. Amperage can be compared to the spray of water coming out of a garden hose. The nozzle can be opened just a bit, producing a small spray, or opened up wide, producing a much larger spray. Some electric appliances, such as light bulbs, require small amperage of electricity to operate. Larger devices, such as an electric hairdryer, require much higher amperage.

2.3 Wattage

The quantity of electrical energy used is calculated in **watts** (W). This is comparable to the volume of water coming out of the hose. To increase the amount of water flowing out of the hose, you can either open the tap further or increase the size of the nozzle opening (both decrease electron flow resistance and therefore increase amperage). To calculate the number of watts being used, multiply the amperage by the voltage. For example, a 0.5-amp light bulb is connected to 120 volts of electricity. It requires 60 watts of electricity to operate (120 volts x 0.5 amps = 60 watts).

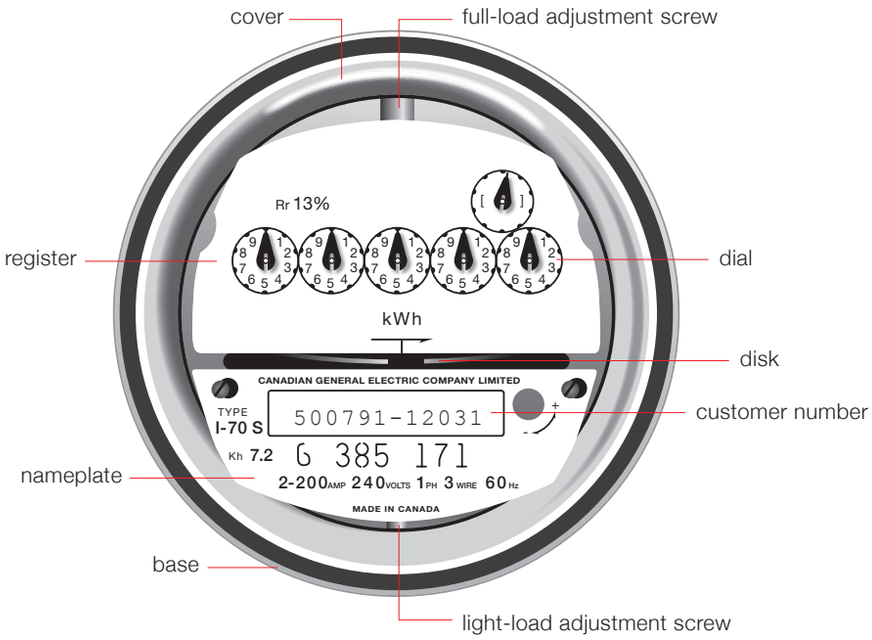
Name	Abbreviation
watt	W
kilowatt	kW
kilowatt hour	kWh
volt	V
amperage	amp

Homes use thousands of watts to operate appliances; therefore wattage at this scale is measured in **kilowatts** (kW). One thousand watts is equal to one kilowatt.

The volume of water that comes out of a hose can be calculated by multiplying the rate of flow of the water (e.g., 1 litre/second) by the length of time that the water is flowing (e.g., 10 seconds). Ten litres of water would flow from the hose in 10 seconds. Electricity works the same way. Ten 100-watt light bulbs left on for one hour would have 1,000 watt-hours of electricity (10 x 100 W x 1 h = 1,000 Wh or 1 kWh).

ATCO does not actually bill consumers for the electricity they use. As an electricity distributor, ATCO builds and maintains the distribution system that delivers the electricity to homes, farms and businesses. Consumers purchase their electricity from a retailer that is responsible for billing customers for the amount of electricity they consume. A customer's electricity bill is based on the number of **kilowatt hours (kWh)** of electricity used. A kilowatt hour is 1,000 watt hours. ATCO provides the number of kilowatt hours a customer uses per month to the retailer. The retailer then bills the customer directly.

3. Reading the Electricity Meter



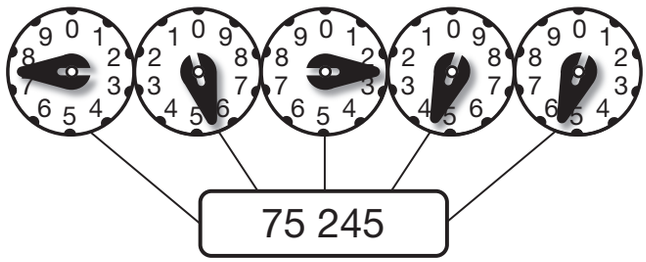
An **electricity meter** helps ATCO keep track of how much electricity is used in homes, schools, offices and industrial plants. The readings determine how much electricity the consumer must pay for. The dials on meters indicate the amount of electricity used in kilowatt hours. ATCO reads these dials every month either remotely or by walking into your yard to check the meter. The meter is connected to the main electricity line coming into your home and counts the watts of electricity your house uses as it comes in.

To read an electricity meter: stand in front of the electricity meter at eye level. You'll notice a series of round dials on the meter face. Each dial has 10 numbers (0 - 9) and a pointer like a clock hand. The pointers advance when electricity flows through the meter, so the dials indicate the total number of kilowatt hours used.

To determine the correct meter reading, simply read the dials in order from right to left. As you read each dial, write down the number. In most cases, the pointer will be between two numbers on the dial. The correct number is the lower of the two numbers.

When reading each dial, pay attention to which direction it runs – some dials run clockwise, and others run counterclockwise. If you're not careful, this could lead you to misread the dials.

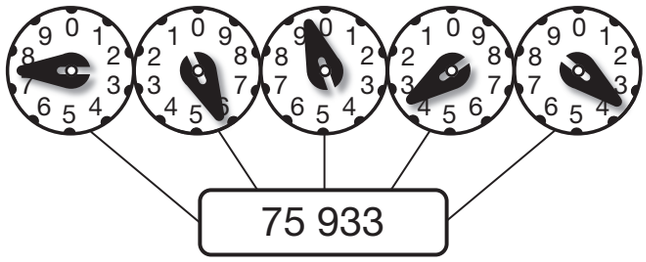
For example:



This should be read as 75,245 kWh.

When a pointer rests directly on a number, as in the second dial of the following example, be sure to check the next dial to the right. If that pointer has not passed zero, as shown here, the number on the previous dial has not yet been reached. Therefore the second dial below should be read as five, not six.

The correct reading for this meter, then, is 75,933 kWh.



To determine how much electricity you've used in a month, ATCO subtracts the latest meter reading from the previous month's meter reading.

In the examples shown above, the difference between the two readings is 688 kWh (75,933 kWh - 75,245 kWh = 688 kWh). So if these readings were taken for two consecutive months, your electricity retailer would bill you for 688 kWh of electricity.

4. Power Wise at Home and at School

There are three ways of saving energy:

- replacing old equipment with more energy efficient technologies
- reducing the use of the appliance and therefore the amount of energy consumed
- using controls and sensors

While students cannot replace large appliances on their own, there are many things they can do to use electricity wisely at home and at school.

4.1 Electricity Use at School

Most artificial light is produced from electricity. **Fluorescent lighting** uses less electricity to produce the same amount of light as **incandescent lighting**. Fluorescent lighting is common in schools. Lower wattage fluorescent tubes have been developed to produce the same amount of light as the standard 40-watt tube. Many schools are converting to lower wattage tubes and reflectors to increase lighting efficiency.

Some schools are installing **motion sensors** in rooms that are unused for much of the day. The motion sensors automatically shut off the lights when no motion is detected for a period of time, and then turn them back on, when activity resumes.

Many believe that leaving fluorescent lights on is more energy efficient than turning them on and off as required. However, modern fluorescent lights require little electricity to start up. While being turned on and off does decrease the life of the tube, the value of the saved electricity is greater than the increased cost of replacing fluorescent tubes. Making a habit of shutting the lights off when leaving a room helps save energy and money!

There are many other ways that schools use electricity, such as:

- running computers
- keeping food cold or making food hot in the cafeteria
- running smoke detectors and fire alarms.

Some of these need a constant supply of electricity. However, there are still changes we can make to decrease our consumption. For example, turning off the computers at the end of the day.

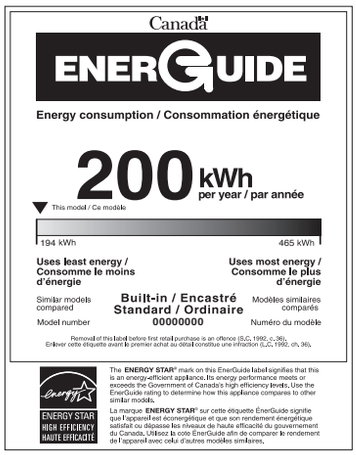
4.2 Electricity Use at Home

An important message that students can take home to their families is to shut off electrical appliances when they are not in use. Lights, TVs, gaming systems, and other appliances are often left on for extended periods, even when they are not in use. Typically, the heaviest **electricity demand** occurs from 6 am to 9 am and then again from 6 pm to 9 pm. This is when the most people are using the greatest number of electrical appliances at the same time. Overall demand also tends to be higher in winter than in summer.

Approximately 40% of home electricity use is in the kitchen (e.g., refrigerator, range, dishwasher, microwave, freezer). Students can do a number of things to reduce electricity use in the kitchen. In Alberta's climate, dishes air dry quickly, and the heat cycle on the dishwasher may not be required. Simply turning the heat cycle off reduces the electricity used. Older fridges and freezers should be defrosted regularly to remove ice buildup. Door seals should be kept in good condition. Frost-free fridges do not require defrosting, but use more electricity. Fridge and freezer doors should be closed as quickly as possible. Many families have a second, older fridge in the

basement. If this second fridge is rarely used, yet remains plugged in, it may be wasting a lot of electricity. Unplugging a secondary fridge can save up to 75 kWh per month. When using an oven, maximize energy efficiency by cooking several dishes at the same time.

Other high electricity users are TVs and computers – which make up almost 10% of home electricity use! Just because you've turned "off" an electric device doesn't mean it has stopped using electricity. Many devices continue to use electricity when turned off or not performing their primary function. This is known as standby power. It may also be referred to as phantom power. You can avoid this by unplugging devices that are not used as frequently.



Since 1978, the federal government has been helping Canadians buy energy efficient appliances. Most major appliances sold in Canada must display an **EnerGuide** label. The EnerGuide label states the amount of electricity that the appliance will typically use in one year. It also helps when comparing electricity use to other models in the same category. The lower the number, the less electricity the appliance uses.

The ENERGY STAR® symbol can be found on qualifying appliances or can form part of the EnerGuide label. This international symbol identifies specific models that meet or exceed premium levels of energy efficiency.

There is no EnerGuide label on smaller electrical appliances (e.g., alarm clocks), however, there is a label showing the average wattage. To calculate the amount of energy consumed by an appliance, first convert watts to kilowatts. This is done by dividing the wattage by one thousand. After this conversion, multiply the kilowatts by the length of time the device operates. For example, a five-watt (W) clock that operates all day uses 0.12 kilowatt hours (kWh) of electricity (5 W ÷ 1,000 = 0.005 kW x 24 hours = 0.12 kWh).

To convert amps to watts, multiply the amperage by the outlet voltage (a standard electrical outlet uses 120 volts). For example, an appliance that uses 50 amps through a standard outlet uses 6,000 watts (50 amps x 120 V = 6,000 W).

For some appliances, electricity consumption is not quite that simple. For example, while freezers and fridges are plugged in continuously, they are **thermostatically controlled** so the motor runs only as required. The electricity used by a stove depends on whether a small burner, large burner, stove or broiler is used. The oven and elements are also thermostatically controlled, so the wattage they use varies.

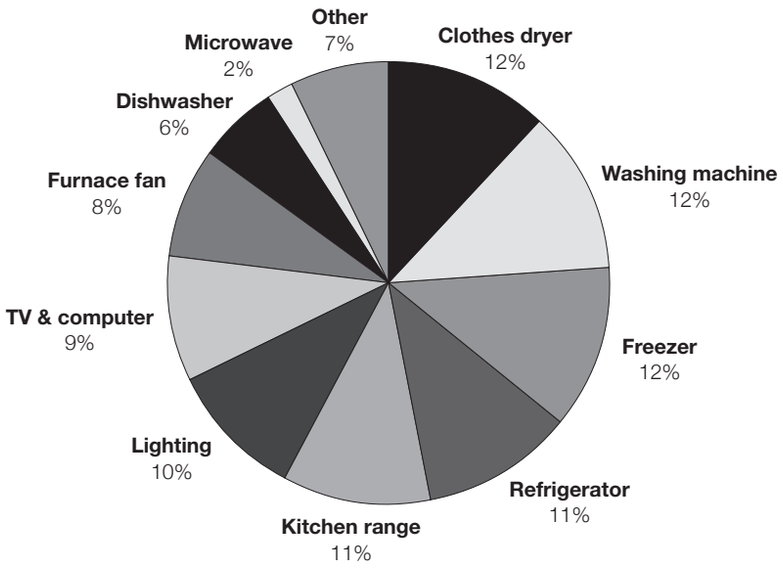
Families can also try using **compact fluorescent light (CFL) bulbs** at home. While the initial cost of these lights is higher, they cost less to operate and last longer than incandescent bulbs. A 13 to 15 watt CFL can replace a 60-watt incandescent light. Fluorescent lights usually last 10 times longer than incandescent bulbs and use 75% less energy.

Compact fluorescent lights		Incandescent bulbs
3 Watts	=	15 Watts
9 Watts	=	40 Watts
14 Watts	=	60 Watts
19 Watts	=	75 Watts
23 Watts	=	100 Watts
30 Watts	=	120 Watts
32 Watts 3-Way	=	150 Watts 3-Way

In some cases, using one appliance instead of another can save energy. For example, using the microwave or slow cooker instead of a range or oven saves electricity. Of course, choosing not to use equipment also saves electricity. For example, families may hang up wet clothes instead of using the clothes dryer. This can save approximately 76 kilowatt hours per month.

Typical Alberta Home Electrical Consumption*

*figures based on Alberta home electrical consumption at time of printing



5. Categories of Electrical Use

There are many ways to use electricity. The following are a couple of categories to identify our types of electricity usage with examples of each:

Category of Electrical Use	Example
heating	clothes dryer
lighting	light bulb
communicating	cell phone
entertaining	TV
computing	laptop

6. Customer Information and Education

Visit **www.atco.com** or call 1-800-668-2248 (toll free) for more energy management materials.

Visit **www.atco.com/en-ca/for-home/energy-101.html** or more energy efficiency information including information on the most effective actions to reduce your energy use and to better understand your bill.

LESSON PLAN

Hooked on Electricity

Energy is something we use every day in many different forms. Driving a car uses energy in the form of gasoline. Digesting your food requires chemical energy. A TV uses electrical energy. In fact, many of the things that make our lives more comfortable use electrical energy.

General/Specific Learner Outcomes for Grade 5 Science	Time
5-6 Construct simple circuits, and apply an understanding of circuits to the construction and control of motorized devices. **1.** Identify example applications of electrical devices in the school and home environment, and classify the kinds of uses. Categories of electrical use may include such things as: heating, lighting, communicating, moving and computing.	30 minutes

Materials

- **Hooked on Electricity** teacher answer key (page 11-12)
- **Hooked on Electricity** student worksheet (copy master page 13-14)

Background information	• **#1 Why Save Electricity?** (page 3) • **#5 Categories of Electrical Use** (page 8)

Procedure

1. In pairs or groups, have students go on a scavenger hunt to identify items that depend on electricity. As a class, pool the findings using a graphic organizer (e.g., chart or grid) into each category of electrical use:
   - heating
   - lighting
   - communicating
   - entertaining
   - computing
2. Distribute the **Hooked on Electricity** student worksheet and review the relevant background information with students.
3. Individually or as a class, identify the items illustrated on the worksheet and print the names of the items in the space provided. Have students identify the type of energy each item needs to operate. You may wish to point out that not all the items on the worksheet use the same type of electrical energy. You may have to assist students with some of the less common items on the worksheet.
4. Once the items are identified, have students place the letters in the boxes on the message line at the bottom of the page. They will need to separate the words to find the hidden message "**Electricity has many uses**."

5. Have students complete the rest of the worksheet. Spend some time with students talking about the energy sources used in Alberta to produce electricity.

Extension Activities

Have students write an essay, play, comic strip, song, poem or story on one of the following themes:

- what electricity means to me
- the day the electricity disappeared

Cross-Curricular Link

While talking about Alberta's energy sources, keep in mind the Grade 5 Social Studies Unit 5.1 – Physical Geography of Canada.

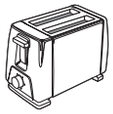
activity 1

Hooked on Electricity

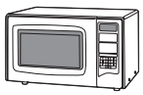
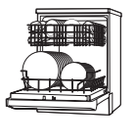
Teacher Answer Key

Identify the following pictures. Print the name of the item in the space provided, and then identify the category of energy it uses (e.g., moving, computing, heating/cooling, lighting and communicating). Keep in mind – each item may fit into more than one category!

*Student answers may vary

Illustration	Name of the Item	Categories
	c [e] [l] l p h o n [e]	Communicating
	[c] a r	Moving
	r e f r i g e r a [t] o [r]	Cooling
	[i] r o n	Heating
	a i r [c] o n d [i] [t] i o n e r	Cooling
	b l o w d r [y] e r	Heating
	l i g [h] t b u l b	Lighting
	t o [a] [s] t e r	Heating
	c o [m] p u t e r	Computing

Hooked on Electricity

Illustration	Name of the Item	Categories
	m i c r o w [a] v e	Heating
	b l e [n] d e r	Moving
	c l o t h e s d r [y] e r	Heating
	v a c [u] u m	Moving
	[s] m a r t b o a r d	Computing
	d i s h w a s h [e] r	Heating
	t o o t h b r u [s] h	Moving

1. Write the selected letters from the above exercise on the following lines in the order that they appear. You will need to separate the words for the message to be revealed.

E L E C T R I C I T Y H A S M A N Y U S E S
— —

Electricity has many uses.

2. With all the electrical devices we use, we need to keep in mind the conservation of electricity. Why do you think it is important for Albertans to reduce electricity use?

When you reduce the amount of electricity you use, you are reducing the impact to the environment. For example, when we use less electricity, we burn less coal and natural gas, the fuels used for most electricity generation in Alberta.

*students answers may vary

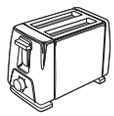
activity 1

Hooked on Electricity

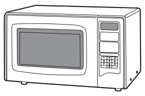
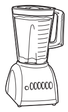
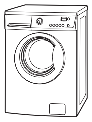
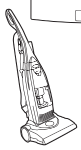
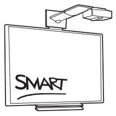
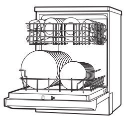
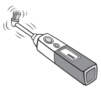
Name _____ **Date** _____

Teacher _____

Identify the following pictures. Print the name of the item in the space provided, and then identify the category of energy it uses (e.g., moving, computing, heating/cooling, lighting, communicating). Keep in mind – each item may fit into more than one category!

Illustration	Name of the Item	Categories
	__ [__] [__] __ __ __ __ __ [__]	_____
	[__] __ __	_____
	__ __ __ __ __ __ __ __ __ [__] __ [__]	_____
	[__] __ __ __	_____
	__ __ __ [__] __ __ __ [__] [__] __ __ __ __ __	_____
	__ __ __ __ __ __ [__] __ __	_____
	__ __ __ [__] __ __ __ __ __	_____
	__ __ [__] [__] __ __ __	_____
	__ __ [__] __ __ __ __ __	_____

Hooked on Electricity

Illustration	Name of the Item	Categories
	_ _ _ _ _ _ [_] _ _	________
	_ _ _ [_] _ _ _	________
	_ _ _ _ _ _ _ _ _ [_] _ _	________
	_ _ _ [_] _ _	________
	[_] _ _ _ _ _ _ _ _ _	________
	_ _ _ _ _ _ _ _ [_] _	________
	_ _ _ _ _ _ _ _ [_] _	________

1. Write the selected letters in brackets from the above exercise on the following lines in the order that they appear. You will need to separate the words for the message to be revealed.

   _ _ _ _ _ _ _ _ _ _ _   _ _ _ _   _ _ _ _   _ _ _ _

   ____

2. With all the electrical devices we use, we need to keep in mind the conservation of electricity. Why do you think it is important for Albertans to reduce electricity use?

   ____

   ____

Activity Two – Part A

LESSON PLAN

Electricity Audit

Electricity is measured and sold just like any other product – you pay for what you use. We use electricity every day, but rarely do we stop to consider how much we are using. To decide if we are using electricity wisely, we must understand where and how much we actually use.

General/Specific Learner Outcomes for Grade 5 Science	Time
5-5 Demonstrate safe methods for the study of magnetism and electricity, identify methods for measurement and control, and apply techniques for evaluating magnetic and electrical properties of materials. **8.** Recognize that the amount of electricity we use in our homes is measured in kilowatt hours.	Part A 30 minutes Part B 30 minutes

Materials – Part A

- **Electricity Audit – Part A** teacher answer key (page 16-17)
- **Electricity Audit – Part A** student worksheet (copy master page 18-19)

Background information

- **#2 Measuring Electricity** (page 3)
- **#4 Power Wise at Home and at School** (page 6)

Procedure – Part A

1. Distribute the **Electricity Audit – Part A** student worksheet. Review the list of appliance examples. These are appliances students and their families may use at home. Explain that this list shows the average use of each appliance by consumers in Alberta.
2. Have students take the worksheet home, discuss it with family members, and estimate the length of time they use the appliances in their home.
3. As a class, pool the data and create average usage for each appliance.
4. Students may use the class average estimates in Part B.

Cross-Curricular Link

While talking about mathematical averages, keep in mind the Grade 5 Math Unit of Numbers (2 and 6).

As an extra mathematical challenge to students, ask them to use their class data and compare it to the estimated Alberta usage data (Background information #4, page 8) in a double bar graph. This corresponds with the Grade 5 Math Unit of Stats & Probabilities (2).

activity 2

Part A – Electricity Audit

Teacher Answer Key – Part A

On the following chart, record the length of time that electric appliances and devices are used in your home. To help you, estimated averages are provided. **Remember to multiply your estimated use by the number of each appliance/device you own**.

*Student answers may vary

Electric Appliance/ Device	Average Estimated Use (per day)	Number of Each Appliance/ Device	Your Estimated Use per Appliance/ Device	Total Estimated Use (per day)
e.g., Computer/ laptop	2 hours/day	2	2 hours	2 x 2 hours = 4 hours
Computer/laptop	2 hours/day (and in sleep mode for 22 hours per day)			
Television	5 hours/day			
Dishwasher	1 load/day			
Freezer	Continuous			
Fridge	Continuous			
Toaster	5 minutes/day			
Light bulb	7 hours/day			
Phone charger	1 hour/day			
Microwave	30 minutes/day			
Clothes dryer	1 load/day			
Washing machine	1 load/day			

Part A – Electricity Audit

1. a) Which appliances does your family use for the **longest** period of time?

Student answers will vary but should include the fridge and freezer.

b) Which appliances does your family use for the **shortest** period of time?

Student answers will vary, but will likely include microwave and cell phone charger.

c) In your opinion, which appliances use the **highest** amount of electricity?

A clothes dryer, washing machine and freezer each account for 12% of electricity use in the home, for a total of 36%.

activity 2

Part A – Electricity Audit

Name _____ **Date** _____

Teacher _____

On the following chart, record the length of time that electric appliances and devices are used in your home. To help you, estimated averages are provided. **Remember to multiply your estimated use by the number of each appliance/device you own**.

*Student answers may vary

Electric Appliance/ Device	Average Estimated Use (per day)	Number of Each Appliance/ Device	Your Estimated Use per Appliance/ Device	Total Estimated Use (per day)
e.g., Computer/ laptop	2 hours/day	2	2 hours	2 x 2 hours = 4 hours
Computer/laptop	2 hours/day (and in sleep mode for 22 hours per day)			
Television	5 hours/day			
Dishwasher	1 load/day			
Freezer	Continuous			
Fridge	Continuous			
Toaster	5 minutes/day			
Light bulb	7 hours/day			
Phone charger	1 hour/day			
Microwave	30 minutes/day			
Clothes dryer	1 load/day			
Washing machine	1 load/day			

Part A – Electricity Audit

1. a) Which appliances does your family use for the **longest** period of time?

_____

_____

b) Which appliances does your family use for the **shortest** period of time?

_____

_____

c) In your opinion, which appliances use the **highest** amount of electricity?

_____

_____

Activity Two – Part B

LESSON PLAN

Electricity Audit

Materials – Part B

- **Electricity Audit – Part A** completed student worksheet
- **Electricity Audit – Part B** teacher answer key (page 22-23)
- **Electricity Audit – Part B** student worksheet (copy master page 24-26)
- Each student should have their copy of **Electricity Audit - Part A** worksheet.
- Calculator (optional)

Background information	• **#2 Measuring Electricity** (page 3) • **#4 Power Wise at Home and at School** (page 6)

Procedure – Part B

1. Ensure students have their **Electricity Audit – Part A** student worksheet.
2. Distribute the **Electricity Audit – Part B** worksheet.
3. Discuss the term kilowatt hour with your students. Use the explanation provided in the instructions on the worksheet.
4. As a class (or individually) complete the rest of the calculations in Question 1. Review the answers using the teacher answer key.
5. The students will need to fill in the "Estimated Use" column in the **Electricity Audit – Part B** with their information from **Electricity Audit – Part A** worksheet.
6. For each appliance, the students should check the "Your Cost Higher" or "Your Cost Lower" column based on the estimated values that were provided. If their estimate is the same as the estimate provided, they do not put a mark in either column.
7. Complete the rest of the worksheet. Have the students total the number of check marks in each of the two columns. If they had more marks in the "Your Cost Higher" column, then their electricity use is higher than estimated. If they had more marks in the "lower" column, then their electricity use is lower than estimated.
8. Have them complete the last question on the worksheet and review.
9. As a class, lead a discussion asking students to consider:
   - Why is electricity consumption higher in some areas?
   - If your electricity consumption is higher, how could you lower it?

Extension Activities

- Challenge students to determine how much electricity is used for lighting in their home. They count the number of lights in their home, determine the wattage of each light and calculate the length of time each light is used per day. Using this data, the students can calculate kilowatt hours for each light.
- Using the number of kilowatt hours identified in Question 1 of the **Electricity Audit – Part B** worksheet, have students figure out how much coal would be burned to supply the electricity for each appliance. See the example below.

  Example: It takes 0.6 kilograms of coal to produce one kilowatt hour of electricity. Have students try to equate the amount of coal with a familiar item. A 500 gram package of butter would almost equal 0.6 kilogram of coal. They could use the "average kilowatt hour per month" figures from the **Electricity Audit – Part B** chart to determine how much coal would be required to operate each appliance for one month.

activity 2

Part B – Electricity Audit

Teacher Answer Key – Part B

Why do you think it is good to know how much electricity costs?

Electricity is measured and sold just like any other product. You pay for the amount you use.

To calculate your electricity consumption, ATCO Electric measures electricity use in kilowatt hours (kWh). For example, a 100-watt light bulb that was on for 10 hours would use one kilowatt hour of electricity, as shown in the calculations below:

100 watts ÷ 1,000 = 0.1 kW
0.1 kW x 10 hours = 1 kWh

1. Complete the following calculations to determine the kilowatt hours of electricity used.

Appliance	Watts (W)	W ÷ by 1,000 = kW	kW x hours = kWh	kWh
Lights on for 8 hours	240 W	240 W ÷ 1,000 = 0.24 kW	0.24 kW x 8 hrs = 1.92 kWh	1.92 kWh
Phone charger on for 2 hours	3 W	3 W ÷ 1,000 = 0.003 kW	0.003 kW x 2 hrs = 0.006 kWh	0.006 kWh
Stereo on for 2 hours	100 W	100 W ÷ 1,000 = 0.1 kW	0.1 kW x 2 hrs = 0.2 kWh	0.2 kWh
Car Block Heater on for 4 hours	600 W	600 W ÷ 1,000 = 0.6 kW	0.6 kW x 4 hrs = 4.8 kWh	2.4 kWh
Microwave on for 1 hour	1,400 W	1 400 W ÷ 1,000 = 1.4 kW	1.4 kW x 1 hr = 1.4 kWh	1.4 kWh
Air purifier on for 8 hours	90 W	90 W ÷ 1,000 = 0.09 kW	0.09 kW x 8 hrs = 0.72 kWh	0.72 kWh
Clothes dryer on for 2 hours	2,100 W	2,100 W ÷ 1,000 = 2.1 kW	2.1 kW x 2 hrs = 4.2 kWh	4.2 kWh
Top-load washing machine on for 3 hours	2,360 W	2,360 W ÷ 1 000 = 2.36 kW	2.36 kW x 3 hrs = 7.08 kWh	7.08 kWh
Game console on for 3 hours	200 W	200 W ÷ 1,000 = 0.2 kW	0.2 kW x 3 hrs = 0.6 kWh	0.6 kWh

Part B – Electricity Audit

2. Using your electricity consumption data from the **Electricity Audit – Part A** worksheet, fill in the "estimated use" column on the following chart (Electricity in the Home).

3. Compare your data to the "Average Estimated Use/Day" column. Place a check mark in the "Your Cost Higher" column if your data from the "Estimated Use" column is higher than the "Average Estimated Use/Day" column. Check the "Your Cost Lower" column if your data from the "Estimated Use" column is lower than the "Average Estimated Use/Day". For continuous appliances such as a fridge or freezer, check the "Your Cost Lower" column if the appliance is energy efficient (refer to the background information for information regarding energy efficiency). If the appliance is not energy efficient check "Your Cost Higher." If your estimate is the same as the "Estimated Use Per Day" column, do not put a mark in either column.

4. Total the number of check marks in the "Your Cost Higher" and "Your Cost Lower" columns. If you have more check marks in the "Your Cost Higher" column, your electricity cost will be higher than the total in the "Estimated Use" column.

5. Based on the number of checkmarks in each of your "Your Cost Lower" and "Your Cost Higher" columns, you can see which of your appliances you are using more than average. Identify which appliances you used more than average and explain why you think so.

*Students answers may vary. However, they could include using energy efficient appliances or using them more often than they need.

activity 2

Part B – Electricity Audit

Name _____ **Date** _____

Teacher _____

Why do you think it is good to know how much electricity costs?

_____

To calculate your electricity consumption, ATCO Electric measures electricity use in kilowatt hours (kWh). For example, a 100-watt light bulb that was on for 10 hours would use one kilowatt hour of electricity, as shown in the calculations below:

100 watts ÷ 1,000 = 0.1 kW
0.1 kW x 10 hours = 1 kWh

1. Complete the following calculations to determine the kilowatt hours of electricity used. For hourly usage, use the respective number from the **Electricity Audit – Part A** worksheet.

Appliance	Watts (W)	W ÷ by 1,000 = kW	kW x hours = kWh	kWh
Lights on for 8 hours	240 W	240 W ÷ 1,000 = 0.24 kW	0.24 kW x 8 hrs = 1.92 kWh	1.92 kWh
Phone charger on for 2 hours	3 W	3 W ÷ 1,000 = 0.003 kW	0.003 kW x 2 hrs = 0.006 kWh	0.006 kWh
Stereo on for 2 hours	100 W			
Car Block Heater on for 4 hours	600 W			
Microwave on for 1 hour	1,400 W			
Air purifier on for 8 hours	90 W			
Clothes dryer on for 2 hours	2,100 W			
Top-load washing machine on for 3 hours	2,360 W			
Game console on for 3 hours	200 W			

Part B – Electricity Audit

2. Using your electricity consumption data from the **Electricity Audit – Part A** worksheet, fill in the "estimated use" column on the following chart (Electricity in the Home).

3. Compare your data to the "Average Estimated Use/Day" column. Place a check mark in the "Your Cost Higher" column if your data from the "Estimated Use" column is higher than the "Average Estimated Use/Day" column. Check the "Your Cost Lower" column if your data from the "Estimated Use" column is lower than the "Average Estimated Use/Day". For continuous appliances such as a fridge or freezer, check the "Your Cost Lower" column if the appliance is energy efficient. If the appliance is not energy efficient check "Your Cost Higher." If your estimate is the same as the "Estimated Use Per Day" column, do not put a mark in either column.

4. Total the number of check marks in the "Your Cost Higher" and "Your Cost Lower" columns. If you have more check marks in the "Your Cost Higher" column, your electricity cost will be higher than the total in the "Estimated Use" column.

5. Based on the number of checkmarks in each of your "Your Cost Lower" and "Your Cost Higher" columns, you can see which of your appliances you are using more than average. Identify which appliances you used more than average and give explain why you think so.

_____

_____

activity 2

Part B – Electricity Audit

Name _____ **Date** _____

Teacher _____

Electricity in the Home

Electric Appliance	Average Estimated Use/Day	Average kWh/ month*	Estimated Cost/ month*	Estimated Use	Your Cost Higher	Your Cost Lower
Oven	1 hour/day	54	$5.94			
Computer/laptop	2 hours/day (and in sleep mode for 22 hours per day)	11	$1.21			
Television	5 hours/day	16	$1.76			
Dishwasher	1 load/day	30	$3.30			
Freezer	Continuous	44	$4.84			
Fridge	Continuous	43	$4.73			
Toaster (2 slice)	5 minutes/day	2.5	$0.28			
Cell Phone Charger	1 hour/day	0.09	$0.01			
Microwave	30 minutes/day	21	$2.31			
Clothes Dryer	1 load/day	76	$8.36			
Washing Machine	1 load/day	56	$6.16			
				Total		

**figures based on electricity rate at time of printing ($0.11 per kilowatt hour)*

Meter Reader

Every month, consumers pay their electricity bills. The ability to read electricity meters can help customers better understand how much electricity (in kilowatt hours) they use and where it can be used more wisely.

General/Specific Learner Outcomes for Grade 5 Science	Time
5-5 Demonstrate safe methods for the study of magnetism and electricity, identify methods for measurement and control, and apply techniques for evaluating magnetic and electrical properties of materials. **9.** Interpret and explain: • the reading on a household electrical meter.	45 minutes

Materials

- **Meter Reader** teacher answer key (page 29-30)
- **Meter Reader** student worksheet (copy master page 31-32)
- **Your Electricity Meter** for teacher use (page 28)

Background information	• **#2 Measuring Electricity** (page 3) • **#3 Reading the Electricity Meter** (page 4)

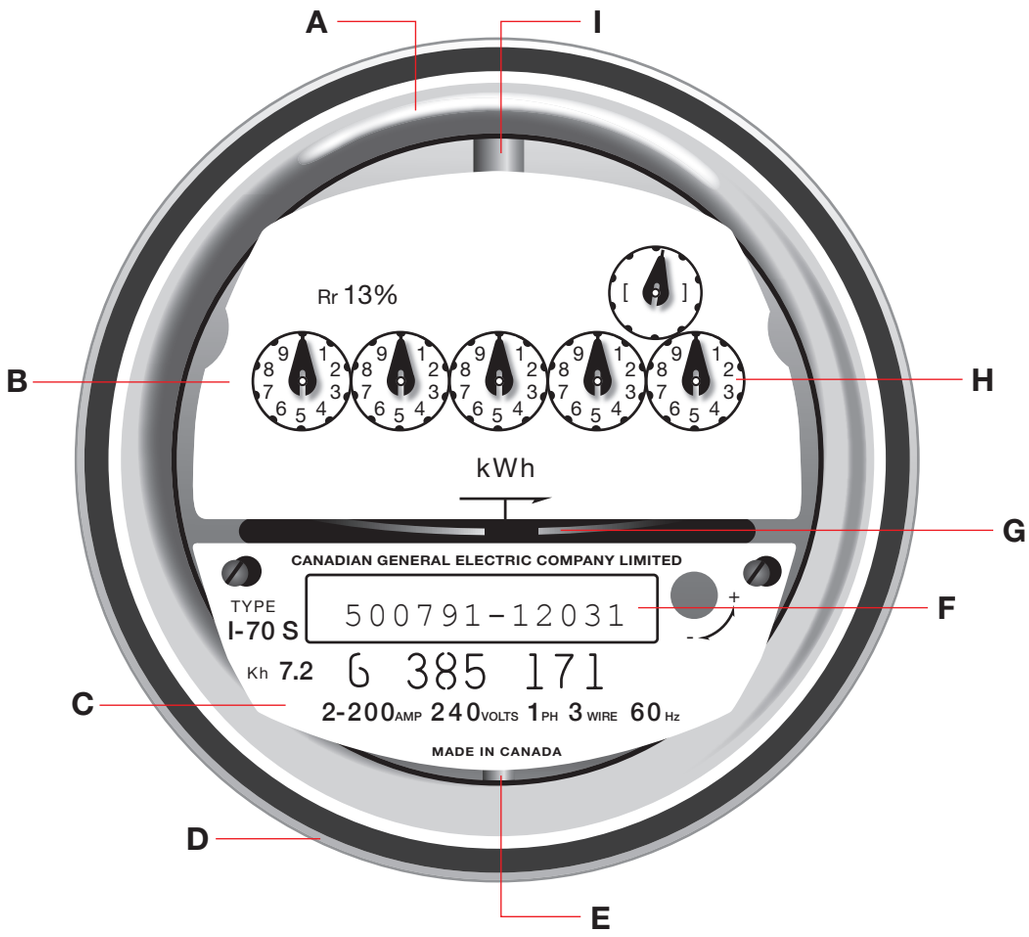
Procedure

1. Start this lesson with discussion questions, such as:
   a. Why do you think people should control or measure their electricity use?
   b. How do we measure electricity to make sure people are paying for what they use? Why is this important?
2. Distribute the **Meter Reader** student worksheet.
3. Display the **Electricity Meter** master and review parts of the electricity meter with students
4. Display the corresponding background material (refer to background information #3 Reading The Electricity Meter) and instruct students how to read their electricity meter.
5. Have students read the meters on the worksheet.

Extension Activities

- Have students read their electricity meter at home.
- Have students go home, look at the electricity meter and take note of how fast the electricity meter disk is spinning. Inform students to turn off as many electrical devices as they can inside the home. Then have them go back to look at the speed of the spinning disk on the meter. It should be spinning considerably slower.

Your Electricity Meter



A. Cover
B. Register – metering system measuring a home's electricity consumption expressed in kilowatt hours (kWh)
C. Nameplate – plate bearing the various features of an electric meter
D. Base
E. Light-load adjustment screw – screw allowing the rotation speed of the disk to be adjusted so that it corresponds to light consumption, such as from a lamp, toaster or ceiling fan
F. Customer number – each customer has a different number
G. Disk – spins faster or slower based on high or low electricity consumption, respectively
H. Dial – these numbers are used to calculate your monthly electricity usage
I. Full-load adjustment screw – screw adjusting the rotation speed of the disk so that it corresponds to high consumption, such as in large appliances requiring a great deal of electricity

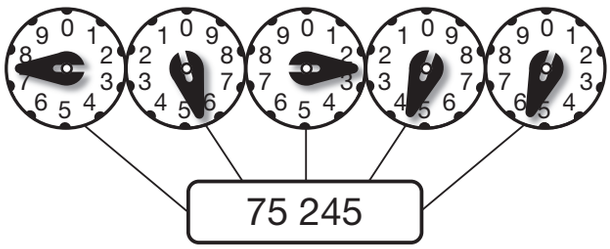
activity 3

Meter Reader

Teacher Answer Key

An electricity meter helps ATCO keep track of a customer's electricity use. The readings determine how much customers pay. The dials read a number (in kilowatt hours) to indicate the amount of electricity used. ATCO reads these dials monthly. To determine how much electricity a home has used in a month, ATCO subtracts the latest meter reading from the previous month's meter reading. This number is provided to the retail company that sends the electricity bill to the customer.

The following dials should be read as 75,245 kWh.



QUESTION 1

June

July

Use the following dials to identify this customer's electrical consumption.

a) What is the June reading?

65,253

b) What is the July reading?

65,789

c) What is the monthly consumption from June to July?

536 kWh

d) If the cost of electricity is $0.11 per kWh, then how much would the energy cost be between June and July?

536 kWh x $0.11= $58.96

Meter Reader

QUESTION 2

January

February

Use the following dials to identify this customer's electrical consumption.

a) What is the January reading?

73,291

b) What is the February reading?

73,941

c) What is the monthly consumption from January to February?

650 kWh

d) If the cost of electricity is $0.11 per kWh, then how much would the energy cost be between January and February?

650 kWh x $0.11= $71.50

QUESTION 3

a) Refer to the dials in the previous two questions to answer the following question. The energy cost is higher in question 2. **True**/False

b) Based on your response to the previous question, why do you think the electricity use is higher/lower?

Students' answers may vary, e.g., a home may use more lights in January/February because:

- the sun goes down earlier; therefore, more lights may be used;
- people stay indoors more due to the cold weather, watch more TV, use the computer or play video games; and,
- the furnace will be on more and electricity powers the furnace fan.

activity

3

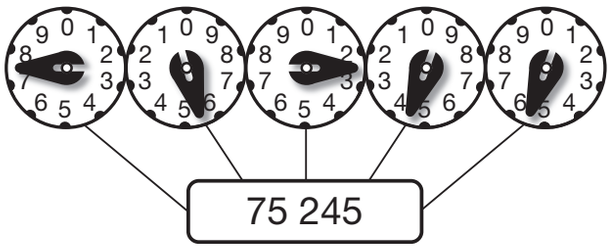
Meter Reader

Name _____ **Date** _____

Teacher _____

An electricity meter helps ATCO keep track of a customer's electricity use. The readings determine how much customers pay. The dials read a number (in kilowatt hours) to indicate the amount of electricity used. ATCO reads these dials monthly. To determine how much electricity a home has used in a month, ATCO subtracts the latest meter reading from the previous month's meter reading. This number is provided to the retail company that sends the electricity bill to the customer.

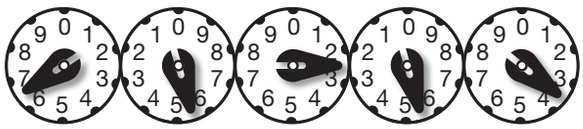
The following dials should be read as 75,245 kWh.



QUESTION 1

Use the following dials to identify this customer's electrical consumption.

June



July

a) What is the June reading?

_____

b) What is the July reading?

_____

c) What is the monthly consumption from June to July?

_____

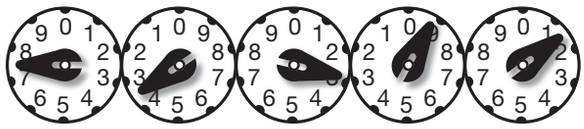
d) If the cost of electricity is $0.11 per kWh, then how much would the energy cost be between June and July?

_____

Meter Reader

QUESTION 2

January



February

Use the following dials to identify this customer's electrical consumption.

a) What is the January reading?

_____

b) What is the February reading?

_____

c) What is the monthly consumption from January to February?

_____

d) If the cost of electricity is $0.11 per kWh, then how much would the energy cost be between January and February?

_____

QUESTION 3

a) Refer to the dials in the previous two questions to answer the following question. The energy cost is higher in question 2. True/False

b) Based on your response to the previous question, why do you think the electricity use is higher/lower? Keep in mind factors such as seasonal temperatures, sunset/sunrise, etc.

_____

_____

_____

LESSON PLAN

Understanding EnerGuide

Using less electricity will not only help us to reduce our environmental footprint, but also save money. Three specific actions can help us be more Power Wise:

- changing how we use electricity;
- purchasing more energy-efficient appliances using **EnerGuide** labeling; and,
- trying not to use appliances at the peak times (6 am to 9 am and 6 pm to 9 pm).

General/Specific Learner Outcomes for Grade 5 Science	Time
5-5 Demonstrate safe methods for the study of magnetism and electricity, identify methods for measurement and control, and apply techniques for evaluating magnetic and electrical properties of materials. **9.** Interpret and explain: • efficiency labels on electrical appliances	Part A 15 minutes Part B 20 minutes

Materials – Part A

- **Understanding EnerGuide - Part A** teacher answer key (page 34)
- **Understanding EnerGuide - Part A** student worksheet (copy master page 35)

Background information	• **#2 Measuring Electricity** (page 3) • **#4 Power Wise at Home and at School** (page 6)

Procedure – Part A

1. Start this lesson with discussion questions:
   a. Do we need to change how we use electricity? Why?
   b. What is energy efficiency?
   c. How can we be sure that we're buying energy efficient devices/appliances?
   d. Peak times for electricity use are 6 am to 9 am and 6 pm to 9 pm. What are some ways you could help to reduce electricity use during these peak times?
2. Distribute the **Understanding EnerGuide – Part A** student worksheet.
3. As a class, review and brainstorm the three steps to being more Power Wise.
4. Display the **EnerGuide Label** and discuss the information provided about the label.

activity 4

Part A – Understanding EnerGuide

Teacher Answer Key

POWER WISE

Understanding how we use electricity helps us determine how to use less of it. We can do three things to be more Power Wise:

- change how we use electricity, e.g., turning off lights, TV, computer and stereo when not in use; using controls and sensors
- purchase energy efficient appliances, e.g., when buying new appliances, we can purchase the appliance that uses the least amount of electricity
- try not to use appliances at the peak times (6 am to 9 am and 6 pm to 9 pm).

ENERGUIDE LABEL

Match the descriptions for the **EnerGuide** label to the appropriate letter on the label. Write the correct letter on the space provided before the description.

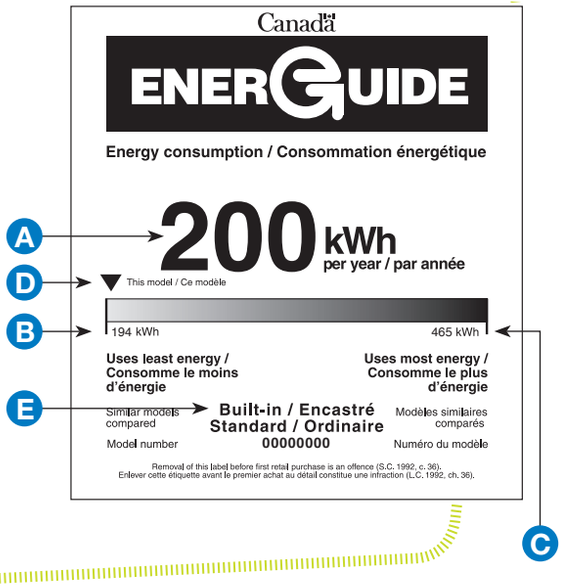
E Type and size of similar models compared to this one.

B Energy use of the most energy efficient model with the same type and size.

A Yearly energy use of this model in kilowatt hours (kWh).

D Efficiency indicator compares model's electricity use to other models.

C Energy use of the least energy efficient model with the same type and size.



activity 4

Part A – Understanding EnerGuide

Name _____ **Date** _____

Teacher _____

POWER WISE

Understanding how we use electricity helps us determine how to use less of it. We can do three things to be more Power Wise:

1. _____
2. _____
3. _____

ENERGUIDE LABEL

Match the descriptions for the **EnerGuide** label to the appropriate letter on the label. Write the correct letter on the space provided before the description.

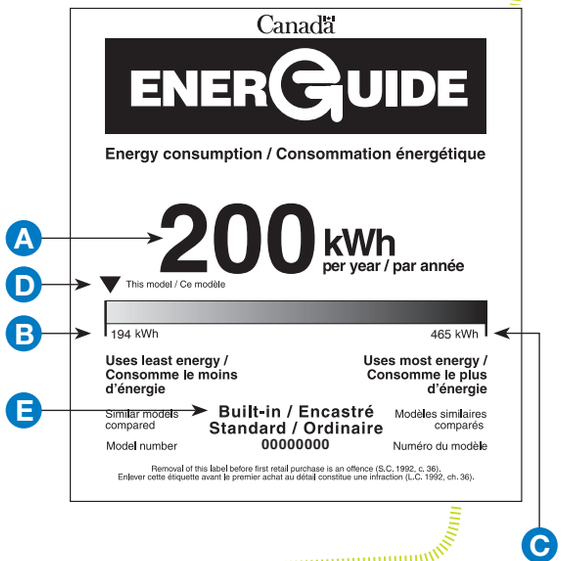
_____ Type and size of similar models compared to this one.

_____ Energy use of the most energy efficient model with the same type and size.

_____ Yearly energy use of this model in kilowatt hours (kWh).

_____ Efficiency indicator compares model's electricity use to other models.

_____ Energy use of the least energy efficient model with the same type and size.



Activity Four – Part B

LESSON PLAN

Understanding EnerGuide

Materials – Part B

- **Understanding EnerGuide – Part B** teacher answer key (page 37-38)
- **Understanding EnerGuide – Part B** student worksheet (copy master page 39-40)
- Calculator (optional).

Background information	• **#2 Measuring Electricity** (page 3) • **#4 Power Wise at Home and at School** (page 6)

Procedure – Part B

1. Distribute the **Understanding EnerGuide – Part B** student worksheet.
2. As a class or individually, complete the worksheet.
3. Review the worksheet using the teacher answer key.

Extension Activities

- In partners or groups, have students develop an advertising campaign to sell energy efficient appliances or to inform the public about the use of energy efficient appliances. The **EnerGuide Label** should be used to aid their campaign.

activity 4

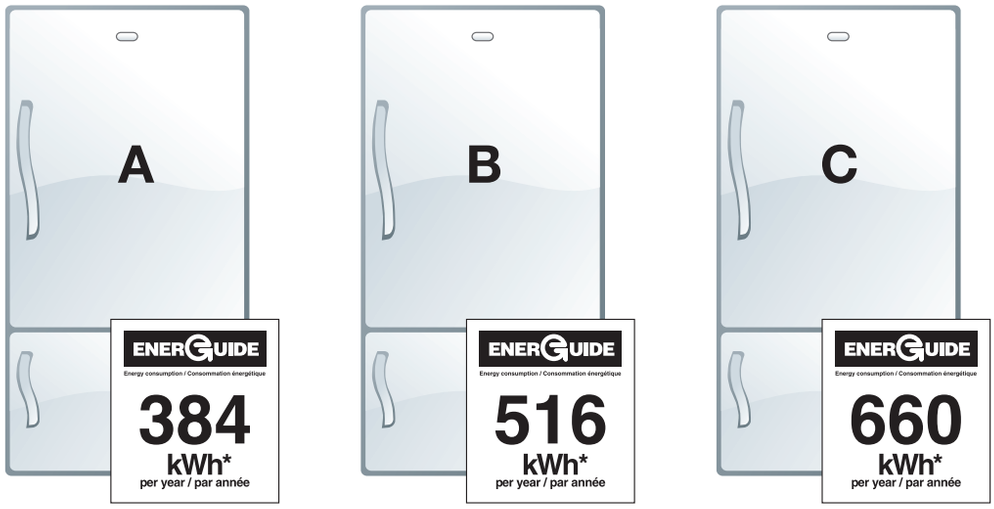
Part B – Understanding EnerGuide

Teacher Answer Key

Imagine yourself moving into an apartment for the first time. You will have to start thinking about ways to save money. One way to do that would be to look for the most energy efficient appliances to save money on your electricity bill.

1. For each of the appliances below, circle the model that is the most energy efficient. Determine the electricity cost to operate each appliance per year based on a cost of electricity of $0.11* per kilowatt hour.

A REFRIGERATOR



A 384 kWh X $0.11/kWh = $42.24

B 516 kWh X $0.11/kWh = $56.76

C 660 kWh X $0.11/kWh = $72.60

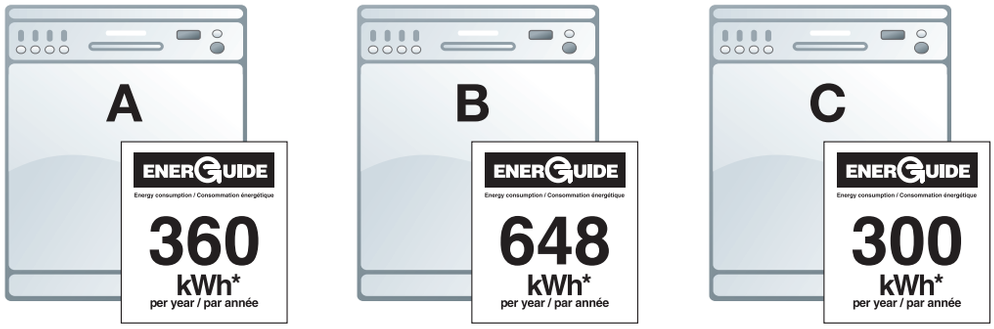
How much more would it cost per year to operate the least efficient refrigerator than the most efficient refrigerator?

$72.60 – $42.24 = $30.36

**figures based on electricity rate and average kilowatt hour values at time of printing*

Part B – Understanding EnerGuide

B DISHWASHER



A 360 kWh X $0.11/kWh = $39.60

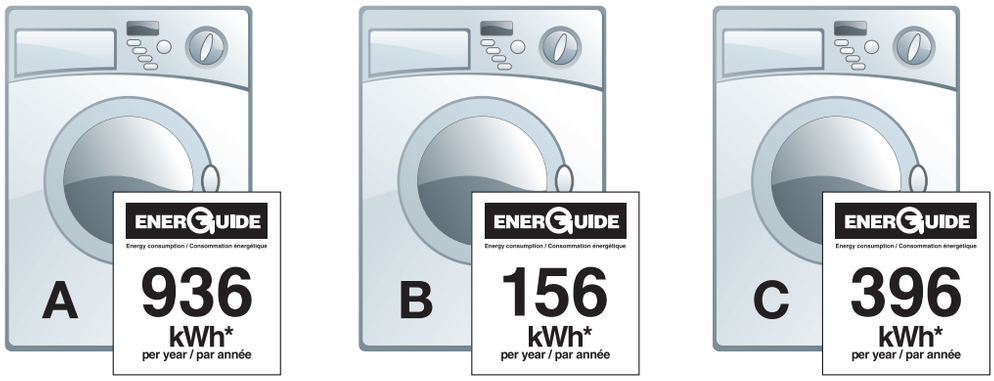
B 648 kWh X $0.11/kWh = $71.28

C 300 kWh X $0.11/kWh = $33.00

How much more would it cost per year to operate the least efficient dishwasher than the most efficient dishwasher?

$71.28 – $33.00 = $38.28

C WASHING MACHINE



A 936 kWh X $0.11/kWh = $102.96

B 156 kWh X $0.11/kWh = $17.16

C 396 kWh X $0.11/kWh = $43.56

How much more would it cost per year to operate the least efficient washing machine than the most efficient washing machine?

$102.96 - $17.16 = $85.80

**figures based on electricity rate and average kilowatt hour values at time of printing*

activity 4

Part B – Understanding EnerGuide

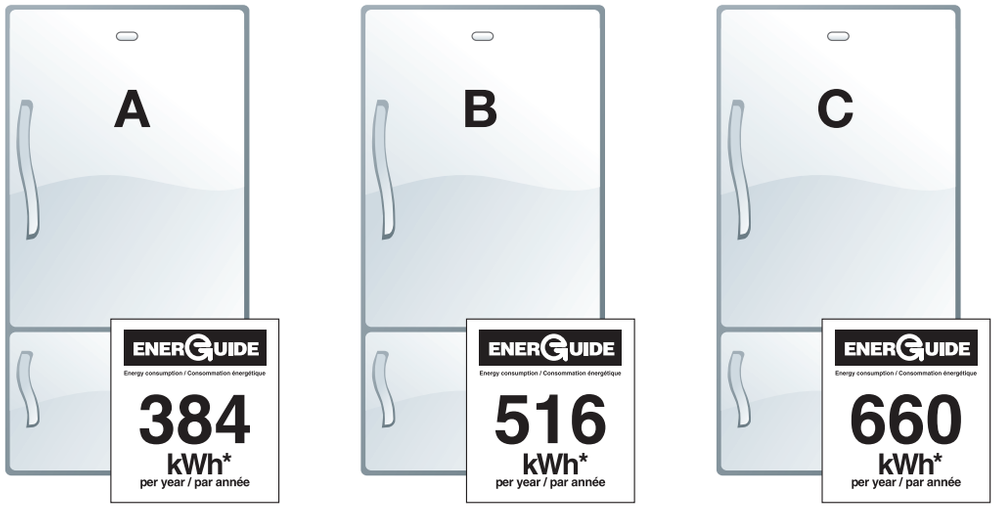
Name _____ **Date** _____

Teacher _____

Imagine yourself moving into an apartment for the first time. You will have to start thinking about ways to save money. One way to do that would be to look for the most energy efficient appliances to save money on your electricity bill.

1. For each of the appliances below, circle the model that is the most energy efficient. Determine the electricity cost to operate each appliance per year based on a cost of electricity of $0.11* per kilowatt hour.

A REFRIGERATOR



A _____kWh X $0.11/kWh =_____

B _____kWh X $0.11/kWh =_____

C _____kWh X $0.11/kWh =_____

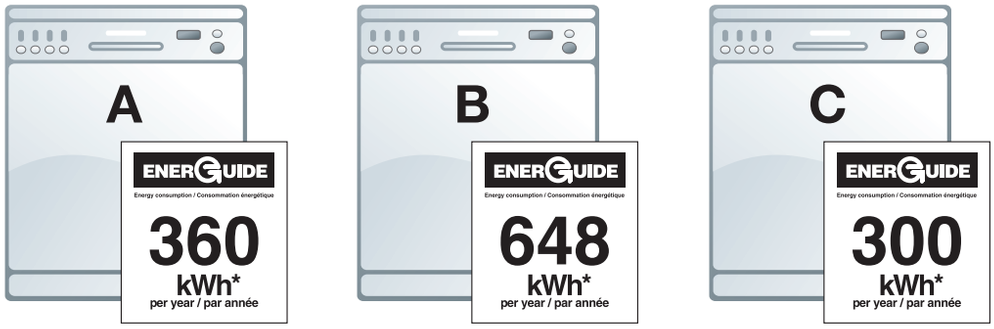
How much more would it cost per year to operate the least efficient refrigerator than the most efficient refrigerator?

_____

**figures based on electricity rate and average kilowatt hour values at time of printing*

Part B – Understanding EnerGuide

B DISHWASHER



A _____kWh X $0.11/kWh =_____

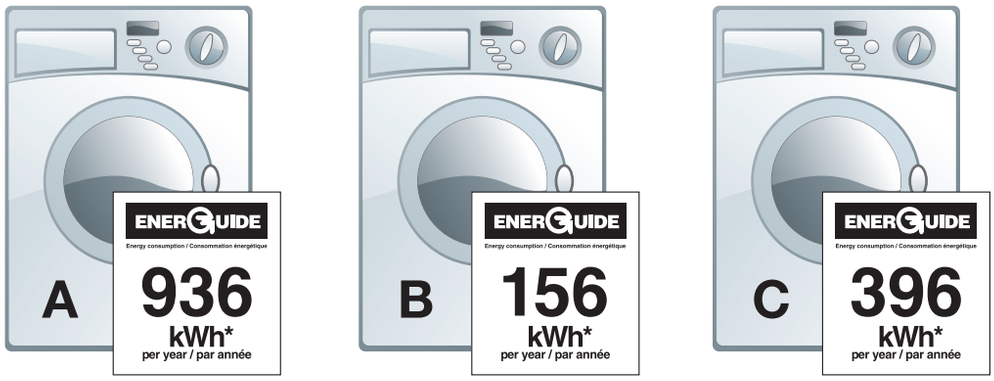
B _____kWh X $0.11/kWh =_____

C _____kWh X $0.11/kWh =_____

How much more would it cost per year to operate the least efficient dishwasher than the most efficient dishwasher?

_____

C WASHING MACHINE



A _____kWh X $0.11/kWh =_____

B _____kWh X $0.11/kWh =_____

C _____kWh X $0.11/kWh =_____

How much more would it cost per year to operate the least efficient washing machine than the most efficient washing machine?

_____

**figures based on electricity rate and average kilowatt hour values at time of printing*

LESSON PLAN

Be Power Wise

Taking a look at our lifestyles helps determine how we use electric appliances and devices. Now that students know which items use electricity and how much each uses, they can determine what things they can do to be Power Wise.

General/Specific Learner Outcomes for Grade 5 Science	Time
5-3 Design and carry out an investigation of a practical problem, and develop a possible solution. **5-4** Demonstrate positive attitudes for the study of science and for the application of science in responsible ways.	40 minutes

Materials

- **Be Power Wise** teacher answer key (page 42-43)
- **Be Power Wise** student worksheet (copy master page 44-45)
- **Power Wise** poster

Background information • **#4 Power Wise at Home and at School** (page 6)

Procedure

1. As a class, brainstorm ways that students can be "Power Wise" in their home or at school.
2. Distribute the **Be Power Wise** student worksheet.
3. Using the poster, have students list the five things they can do to be Power Wise.
4. Have students complete the energy use checklist on the worksheet.
5. Have students review all the check marks they have in the "No" column. Discuss the impacts of not using energy efficiently and what they could do differently to be Power Wise. Have them write some of their ideas on the worksheet. Review the worksheet using the teacher answer key.

Extension Activities

- Students can make reminder notices (e.g., light switch covers) for school and home, reminding everyone to use electricity wisely.

  For example: Going out? Lights out!
  Think before opening the refrigerator door!

Online Student-Led Activity

Visit **http://eneraction.greenlearning.ca** for a 'carbon calculator.' This will help students find out how much energy, greenhouse gas (GHG) emissions and money their home or school can save on lighting. From this site, you can also print worksheets for students to complete while using the online calculator.

activity 5

Be Power Wise

Teacher Answer Key

Understanding how we use electricity helps us make decisions on how we can be more Power Wise. Now that you know which items use electricity in your home and how much each uses, you can look for ways to be more Power Wise.

QUESTION 1

From the Be Power Wise poster, list five things you can do to be Power Wise.

1. Turn off lights in unoccupied rooms.
2. Use compact fluorescent lights.
3. Use the microwave and other small appliances instead of the oven.
4. Turn off electronic devices when they are not being used.
5. Use energy efficient appliances.

Be Power Wise

QUESTION 2

Complete the following checklist to determine if you and your family are Power Wise. You may have to ask family members to help you answer some of the questions.
*Student answers will vary.

Always	Sometimes	Never	
☐	☐	☐	Do you turn lights off when not in use?
☐	☐	☐	Do you turn the TV, stereo, computer and radio off when not in use?
☐	☐	☐	Do you use small appliances whenever possible (e.g., toaster oven instead of an oven)?
☐	☐	☐	Do you use natural sunlight during the day instead of switching on lights?
☐	☐	☐	Do you think first about what you want from the refrigerator before opening the door?
☐	☐	☐	Does your family run the dishwasher only when you have full loads?
☐	☐	☐	Does your family use only one refrigerator instead of two?
☐	☐	☐	Do you keep your freezer full and quickly close the door to keep the cold air in?
☐	☐	☐	Does your family use a block heater cord with a timer?

QUESTION 3

Review the items that have a check mark in the “never” and “sometimes” columns. What could you do differently to be more Power Wise?

I could remember to turn the lights off in unoccupied rooms and also remember to turn off other electric equipment such as the TV, stereo and computer.

I could use small appliances such as a toaster oven.

Our family can make sure we only run the dishwasher with full loads.

Our family can buy a timer or purchase a power saver cord for our vehicle block heater.

Our family can turn down the thermostat at night or when we are not at home.

activity 5

Be Power Wise

Name _____ **Date** _____

Teacher _____

Understanding how we use electricity helps us make decisions on how we can be more Power Wise. Now that you know which items use electricity in your home and how much each uses, you can look for ways to be more Power Wise.

QUESTION 1

From the Be Power Wise poster, list five things you can do to be Power Wise.

1. _____

_____

2. _____

_____

3. _____

_____

4. _____

_____

5. _____

_____

Be Power Wise

QUESTION 2

Complete the following checklist to determine if you and your family are Power Wise. You may have to ask family members to help you answer some of the questions.

Always	Sometimes	Never	
☐	☐	☐	Do you turn lights off when not in use?
☐	☐	☐	Do you turn the TV, stereo, computer and radio off when not in use?
☐	☐	☐	Do you use small appliances whenever possible (e.g., toaster oven instead of an oven)?
☐	☐	☐	Do you use natural sunlight during the day instead of switching on lights?
☐	☐	☐	Do you think first about what you want from the refrigerator before opening the door?
☐	☐	☐	Does your family run the dishwasher only when you have full loads?
☐	☐	☐	Does your family use only one refrigerator instead of two?
☐	☐	☐	Do you keep your freezer full and quickly close the door to keep the cold air in?
☐	☐	☐	Does your family use a block heater cord with a timer?

QUESTION 3

Review the items that have a check mark in the “never” and “sometimes” columns. What could you do differently to be more Power Wise?

_____

_____

_____

_____

_____

_____

_____

Glossary

Amperage – measures electric current - the number of electrons flowing though an electric wire. Amperage can be compared to the size of the spray that comes out of a hose with a nozzle on the end. A large spray compares to high amperage.

- **Amp** – unit used to measure amperage
- **Milliamps** – small units measuring the flow of electricity (1 amp = 1,000 milliamps)

Compact Fluorescent Light – (also known as CFL) small fluorescent lights that can be used in most standard light fixtures. They use only 1/4 of the electricity to provide the same amount of light as a traditional incandescent light bulb (average wattage ranges from nine to 23).

Electricity Demand – the amount of electricity that is required at any given time. Demand for electricity varies daily and throughout the year.

Electricity Meter – round device on the outside of houses that records the amount of electricity that is used inside the house. Power companies use the meter readings to figure out the cost of energy used by customers for billing purposes.

EnerGuide – is a label on electrical appliances. This label states the amount of electricity that will typically be used by the appliance in one year of service. It also compares the electricity use to all other models of that appliance in the same category.

ENERGY STAR® – is a label on electrical appliances. This label is an international symbol that identifies major electrical appliances that meet or exceed technical specifications designed to ensure they are among the most energy efficient in their class.

Fluorescent Lights – tubular lights that are more energy efficient than incandescent lights with an average wattage ranging from 30 to 40 watts. Fluorescent lights are commonly used in schools and office buildings.

Incandescent Lights – globe-like lights that are less energy efficient than Fluorescent Lights.

Motion Sensor – device that automatically turns off the light when no motion is detected in a room for a period of time.

Non-Renewable Resources – resources that cannot be replaced after they are used. For example, coal or natural gas cannot be replenished after they are burned to create electricity.

Renewable Resources – resources that can be used again and again. For example, water can be used again after it has been used to generate electricity.

Thermostatically-Controlled – automatically responds to temperature changes to activate switches controlling the device (e.g., refrigerator).

Voltage – the "pressure" of electricity in a circuit, like the water pressure in a garden hose.

- **Volt** – unit used to measure voltage, or the "pressure" of electricity in an electric circuit. Household appliances either require 120 or 240 volts of electricity.
- **Kilovolts** – larger units to measure volts. 1 kilovolt equals 1,000 volts.

Name	Abbreviation
amperage	amp
kilowatt	kW
kilowatt hour	kWh
volt	V
watt	W

Watt – basic unit used to measure electrical energy. Watts is like the volume of water that comes out of the end of a hose. The volume of water depends on the pressure in the hose (voltage) times the size of the nozzle opening (amperage). To calculate watts, multiply the voltage and the amperage together. A 120-volt light bulb that uses 0.5 amps requires 60 watts of electricity.

- **Kilowatt** – larger unit to measure wattage. 1 kilowatt equals 1,000 watts.
- **Kilowatt hours** – unit to measure how much electricity is used over a period of time. Ten 100-watt light bulbs burning for one hour will use 1 kilowatt hour of electricity.

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