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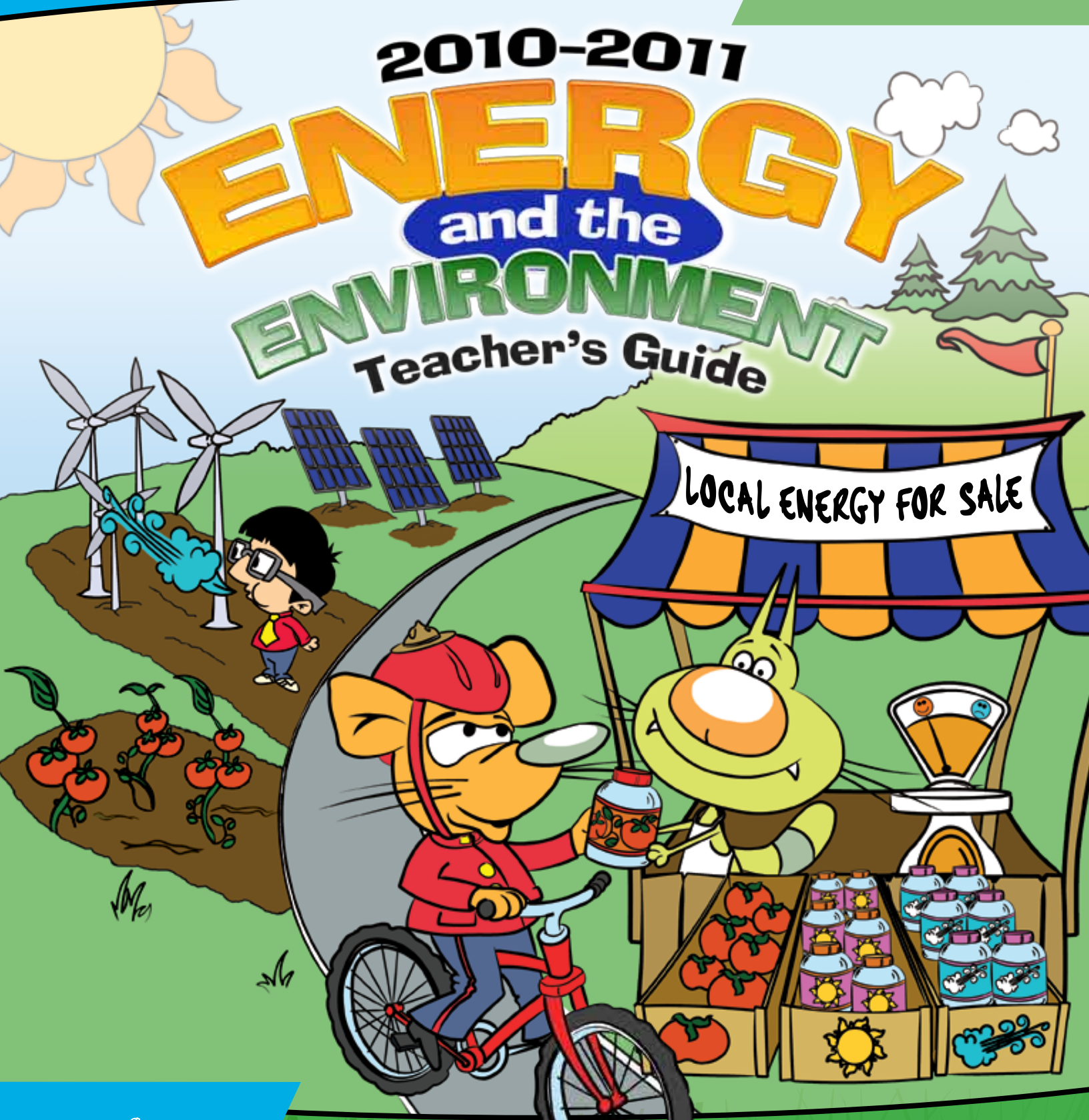
2010–2011 ENERGY and the ENVIRONMENT Teacher's Guide



Canada

Natural Resources Canada's Office of Energy Efficiency
Leading Canadians to Energy Efficiency at Home, at Work and on the Road

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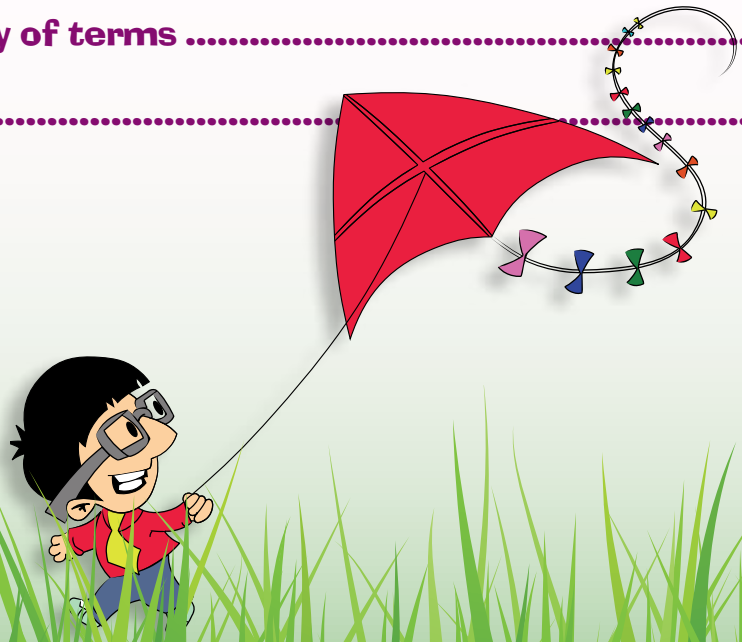
Contents



Foreword

Well Hi there! My name is Simon and I am an energy-wise kid. I try to do my best to use as little energy as I can. This is good for me, for my parents and for our environment.

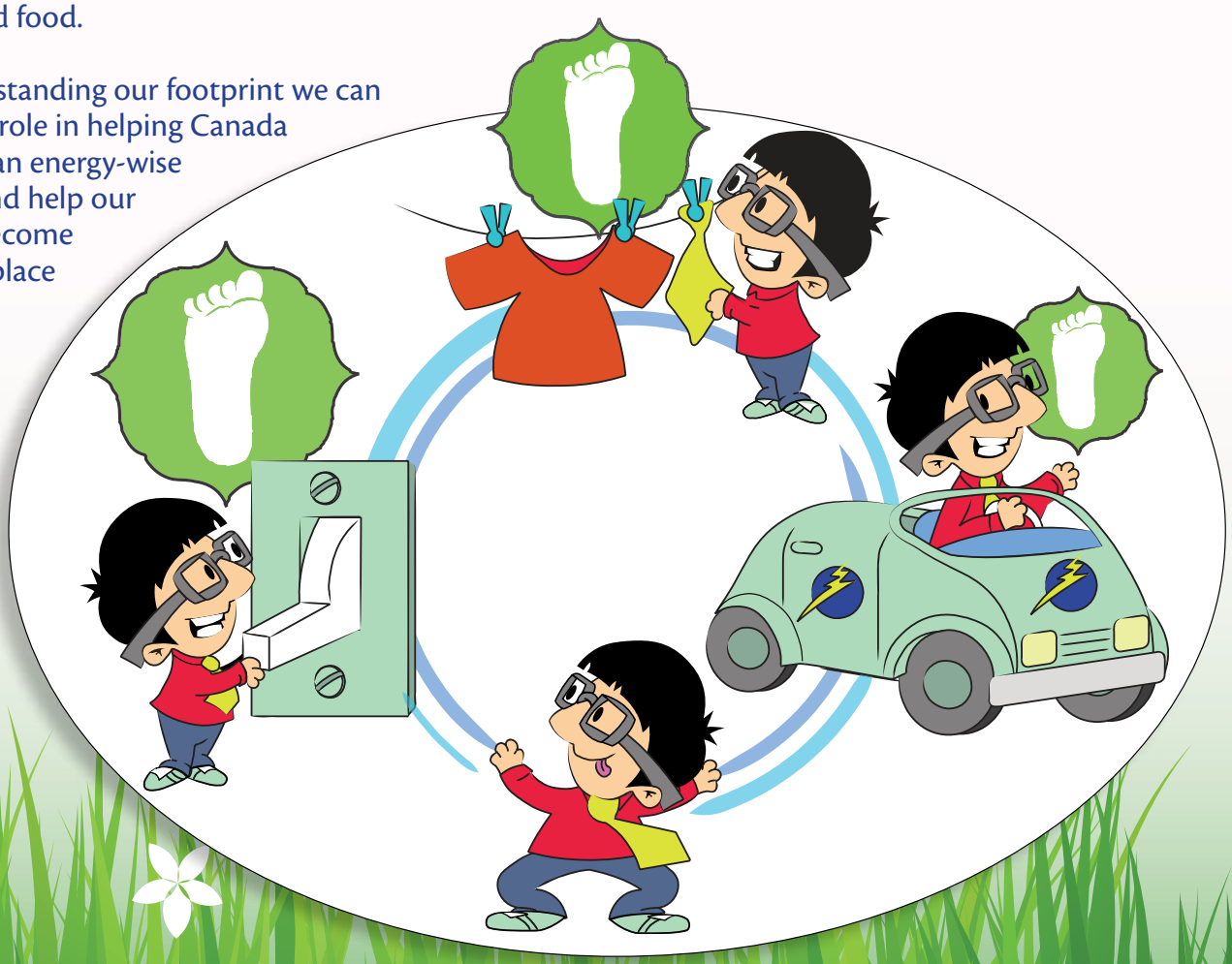
Throughout this third edition of the *Energy and the Environment Teacher's Guide*, I will try to help you understand some basic information about energy. The guide contains 10 lessons to help us live in a world where we use less energy.

With the help of my friends Inspector Joules and NRCat, we will answer some interesting questions:

1. Where does energy come from?
2. What are the two sources of energy that we use in our daily lives?
3. What are the differences between energy conservation and energy efficiency?
4. How does direct energy use differ from indirect use?

We will look at how we can use the wind and the sun to produce energy. We will learn about our ecological footprint and ways we can reduce it by investigating the way we consume water and food.

By understanding our footprint we can all play a role in helping Canada become an energy-wise nation and help our planet become a better place to live.



Kids' Club resources

The Kids' Club offers teachers and students three linked tools for learning about energy conservation and efficiency. Each tool engages students in different ways.

Energy and the Environment Teacher's Guide and the ***Energy and the Environment Student's Booklet***

These resources are practical hands-on workbooks designed for teachers and students, for grade 1 to 8. They feature energy conservation and energy efficiency as key paths to smarter energy choices.

- **Teacher's guide**: includes 10 learning activities with matching teaching notes and answer keys. Use, photocopy and adapt these exercises to meet the needs of your students.
- **Student's booklet**: includes 10 energy-related activities
- Look in the glossary for handy definitions and key concepts related to energy conservation.
- Help improve the book. Fill out the attached survey card or contact us through our Web site.

NEW! You can now use our on-line form to order copies of the *Energy and the Environment Teacher's Guide* and the *Energy and the Environment Student's Booklet*. Visit our Web site at Kidsclub.nrcan.gc.ca/OrderForm. Hurry while quantities last!

National art contest

Our annual national art contest brings out the beauty and the best of students. Their images and messages of energy conservation are inspiring. This year, winners from each participating province and territory are featured on a classroom poster. For details and the winning pictures, visit our Web site.

Web site

Have fun learning with the special teaching assistants on our Web site. NRCat, Inspector Joules and Simon have great games, activities and cartoons goin' on. Explore the tree clubhouse; play detective on energy mysteries; and click some cool links.

Kidsclub.nrcan.gc.ca

Acknowledgements

We extend our thanks to the following organizations for participating in the coordination and promotion of our art contest:

Alberta: Alberta Environment
British Columbia: Ministry of Energy, Mines and Petroleum Resources
Manitoba: Manitoba Hydro
New Brunswick: Enerplan Consultants
Newfoundland and Labrador: Lewisporte /Gander School Board
Northwest Territories: Arctic Energy Alliance
Nova Scotia: Conserve Nova Scotia
Nunavut: Department of Environment
Ontario: Ministry of the Environment
Prince Edward Island: Department of Environment, Energy and Forestry
Quebec: Agence de l'efficacité énergétique
Saskatchewan: Ministry of Energy and Resources
Yukon: Northern Climate ExChange

Energy, what is it?

Instructions

After a classroom discussion about energy, give your students a creative writing assignment. They can choose any topic – from hockey or their summer vacation to what they want to do when they grow up – as long as they use as many energy terms as they can from the list provided. If they use additional terms, even better!

Answer key

Here are a few opening sentences for those having trouble getting started:

When I got up on Saturday, my mother said I had to help clean the garage. I was mad – I didn't want to work. I wanted to play in the fresh air and sunshine. First, we opened the door to let the solar energy in . . .

I love playing soccer. I deplete all my energy on the field. Usually, my dad drives me to my games. This uses fossil fuels but it's too far to walk . . .

Last night, I watched a show about monsters. They invaded the hydroelectric plant. They turned off the electricity so the heat and lights wouldn't work. They said they were shipping all our water and fossil fuels to Mars . . .

Key points

Where does it come from?

Energy is everywhere, and it is very special. Thanks to its super power, it makes things happen. Here is how it works:

- The food we eat and the air we breathe give us the power to walk, run and swim, as well as the energy to listen, think and talk.
- The electricity created by hydroelectric dams, geothermal stations, fuel and coal enables us to bake yummy cookies, turn on the lights and play video games.
- The fuels we burn allow us to power motors to make our cars, buses and trucks move.
- The movement and expansion of very small particles make light, and make the sun shine and the wind blow.

Without energy, none of this could happen. So, we need energy every day of our lives.

What can we do?

It is unreasonable to think we will stop using energy – our way of life has evolved in the manner it has in large part because of the abundance of energy available to us. But we can use less, be more efficient with what we do use, and develop alternative sources of energy.

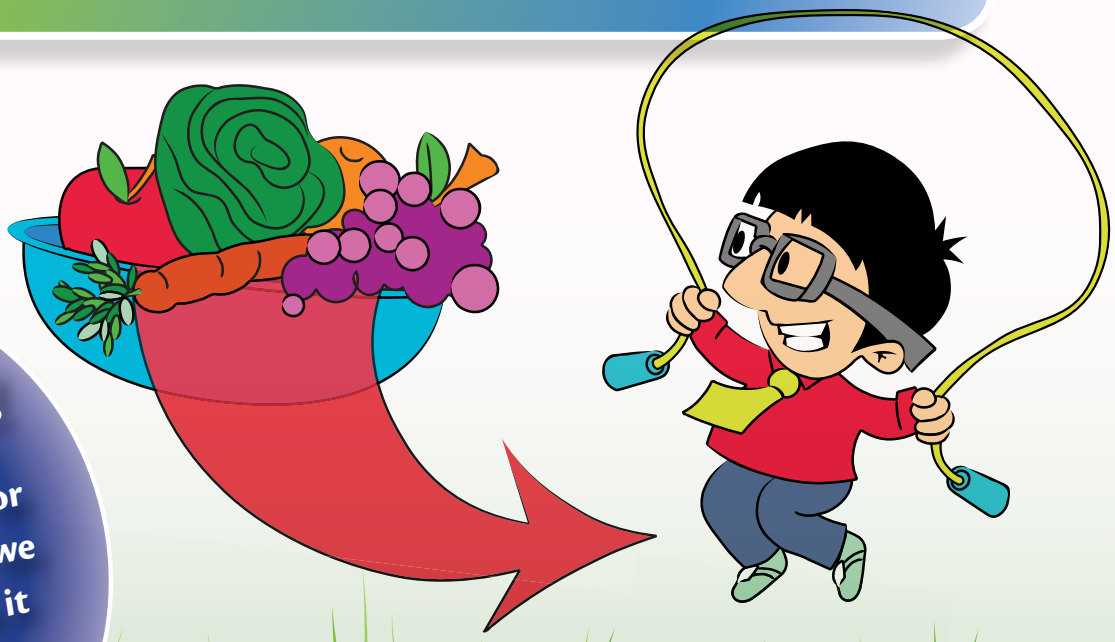
Energy, what is it?

Whether we think about it or not, we use energy every day. We use energy from our bodies to get ready for school in the morning and energy from the Earth to heat our houses, to power our video games, televisions and refrigerators, and to create light. What a lot of energy!

Use your creative energy!

The words below are all about energy. Choose a topic – any topic – and write a story that includes as many of these words as possible.

fossil fuel	deplete	water
renewable energy	solar energy	air
sunshine	hydroelectric plant	work
electricity	cars/trucks	heat
oil	green energy	light
conservation	coal	power
recycle	pollution	



Fun fact!

We cannot make or destroy energy – we can only change it from one form to another.

Renewable versus non-renewable energy

Instructions

Use this word scramble to help your students learn about the various sources of renewable energy available in Canada.

Answer key

WIND POWER

BIOMASS

SOLAR

GEOTHERMAL

HYDRO-ELECTRICITY

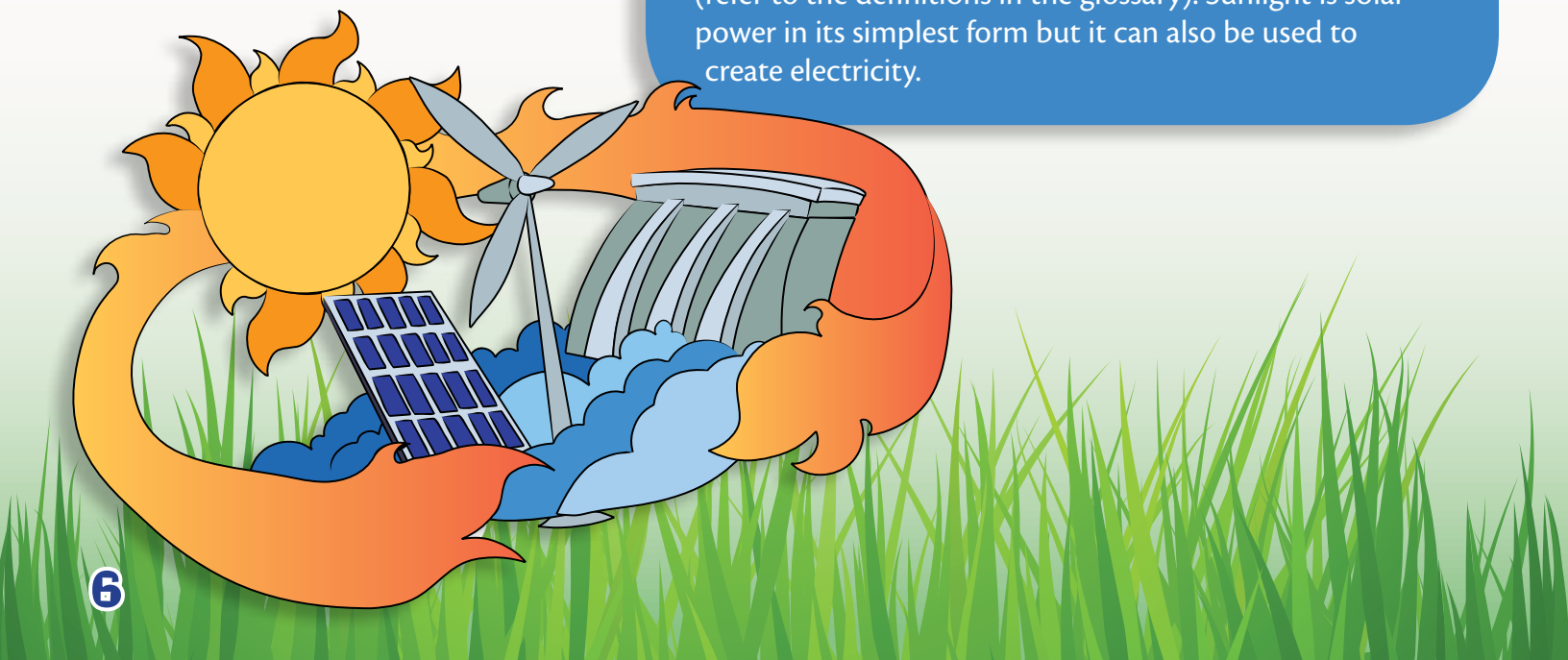
Mystery word:
E A R T H

Key points

Energy sources are divided into two types.

Non-renewable: In Canada, much of our energy is from **non-renewable sources**, such as coal, oil or gas. We also call them fossil fuels because they took billions of years to form underground. There are two problems with fossil fuels – after we use them up, they cannot be replaced, and they cause pollution. They are used to heat buildings and, in the case of gasoline and diesel fuel derived from oil, power our vehicles. Oil, natural gas and coal are also used to make electricity.

Renewable: **Renewable energy sources** are freely available and will last forever. We often call them "clean energy" or "green power" because they don't pollute our air or water. What's more, unlike fossil fuels, they do not create greenhouse gas emissions that contribute to climate change. These sources are wind energy, solar energy, biomass energy, hydro-electricity and geothermal energy (refer to the definitions in the glossary). Sunlight is solar power in its simplest form but it can also be used to create electricity.



Renewable versus non-renewable energy

Harness your energy!

Read the text below to learn more about energy. When you are finished, try to unscramble the words. Use the highlighted letters to discover the secret word!

Where does energy come from?

Mostly, we get energy from **non-renewable** sources, such as coal, oil or natural gas. We extract them from the ground and burn them to power our cars, planes, computers and televisions.

Unfortunately, all this energy use puts a lot of stress on the Earth's natural balance. What's more, after we use up our non-renewable energy sources, we can't replace them.

So, what can we do? Fortunately, we also have **renewable** sources of energy. They are free and will last forever. The sun and wind are two examples. We can harness them to create energy. What's more, they don't pollute, and there will always be more!

Unscramble these letters, and you will uncover five sources of renewable energy. When you are finished, use the highlighted letters to create the secret word.

N W D I R E W P O

S O M B I S A

O L R S A

T G L O R H E A E M

O R D Y H -
C E I L T Y C E R T I

MYSTERY WORD:

Fun fact!

All renewable energy, and even energy in fossil fuels, ultimately comes from the sun.

Wind energy

Instructions

Students will build their own windmill. Have everyone seated at a flat surface – at their desks or tables – and let the windmill construction begin!

Here is what they will need:

- 20-centimetre square of paper (bright wrapping paper, recycled comics or a colour they like)
- Plasticine
- sharp pencils, rulers and scissors
- paper fasteners
- beads (with centre holes wide enough to slide onto the paper fastener)
- drinking straws

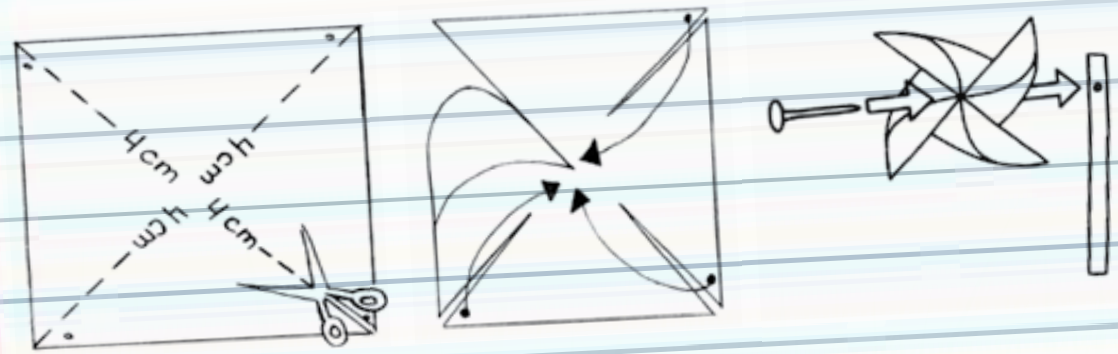
Key points

Wind is caused by the sun's uneven heating of the Earth. The air above the land heats up much faster than the air above water. As the warmer air rises, and cooler air is pushed down to take its place, wind is created.

Wind energy is one of the fastest growing energy sources in the world – it requires no fuel, so it does not produce greenhouse gas emissions. Using the power of the wind to produce energy has been done for a very long time. For centuries, windmills have been used to pump water or grind grain.

Today, we use wind turbines, which are a modern adaptation of the windmill. These huge turbines have three blades. The blowing wind spins the blades, which in turn spin a shaft connected to a generator. The generator converts the mechanical energy into electrical energy. These structures are starting to dot the landscape in many countries. Sometimes used alone, they are more often installed in groups, commonly called "wind farms."

Answer key



Wind energy

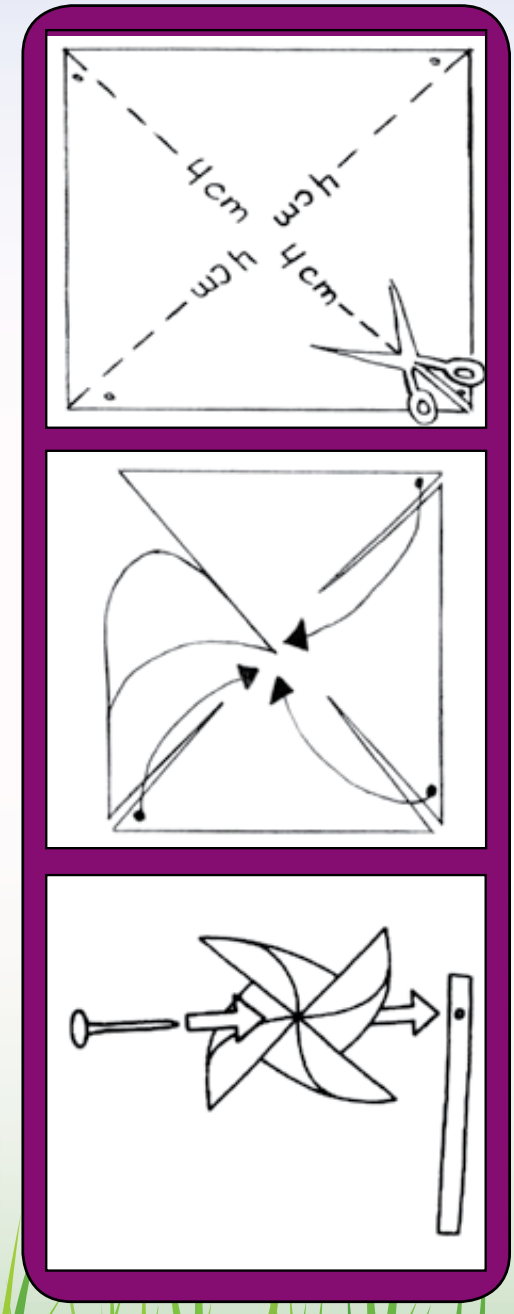
Wind is free.

A fan uses electricity to produce wind, but a wind turbine uses the wind to produce electricity. As long as the wind continues to blow, wind energy can be produced.

Generate your own wind power!

It's easy. Just follow these steps:

1. Fold your paper in half diagonally. Press along the crease. Unfold it. Fold it across the other diagonal and press along the crease. Flatten it out again.
2. From the centre where the creases meet, measure 4 centimetres (cm) along each crease line and make a dot with your pencil. Cut from the outside corner along the crease to the dot. Don't cut all the way to the middle.
3. Roll some plasticine into a ball. Place it under the centre spot of your paper. Use a sharp pencil to make a small hole in the centre of your paper. Using the plasticine again, make a hole on the left side of each corner so you have five small holes.
4. Fold each corner toward the centre so the holes line up with the hole in the middle. Push a paper fastener through all five holes.
5. Thread a bead onto the back of the paper fastener. This will make it spin better.
6. Measure down 2 cm from the top of your straw. Make a small hole through both sides of the straw with a sharp pencil.
7. Push the paper fastener through the holes and fold the ends back to hold your windmill together.



Fun fact!

The earliest known windmills were in Persia (Iran) and looked like large paddle wheels. Today the largest wind turbines in the world have blades longer than a football field.

Did you know that just one wind turbine can produce enough electricity to power up to 300 homes?

Solar energy

Instructions

Renewable resources are an important part of conserving energy and saving the environment. Researchers around the world are looking for better ways to capture these energy sources.

Solar energy is a key renewable energy source. Describe solar energy and solar technologies and ask students to use the table on the next page – each symbol represents two letters. Use the codes to find the mystery phrase.

Answer key

Mystery phrase!

"Solar energy is free, clean and renewable!"

*** for younger students, give them a few letters to make it easier

Key points

The sun has produced energy since the beginning of time. All forms of life – including plants, animals and humans – depend on the sun for food and for life.

Like electricity and gas, solar energy can also be used as power. We can use solar energy to cook food, power vehicles and heat our homes. But, unlike electricity and gas, solar energy is renewable – there may be days when the clouds get in the way, and we can't feel the sun on our skin, but it is and always will be there creating energy.

Humans have learned to harness solar energy so that it can be converted into other forms of energy such as heat and electricity. The most common uses of solar energy are to

- **heat water** – for use in homes, buildings and swimming pools
- **heat spaces** – inside homes, greenhouses and other buildings

Technologies to convert solar energy into heat or electricity are getting a lot of attention as we look for "greener" energy sources. The most common ways to create electricity from the sun are as follows:

- **Solar power plants** generate electricity by using the heat from solar collectors to heat a fluid. The boiling fluid produces steam to power a generator.
- **Photovoltaic (or solar) cells** change sunlight directly into electricity. The cells are grouped in panels that can be used for many purposes. Signs warning of construction ahead are one example.

Scientists have been looking for ways to get the most out of the sun's energy for a long time. In fact, it was in the late fifteenth century when Leonardo Da Vinci suggested mirrors could be used to heat the water needed by industry.

And scientists continue to use their creative juices to find a way to generate large amounts of electricity from the sun. Their goal is to reduce our dependence on fossil fuels that contribute to climate change.

4. Learning activity – Mystery phrase

Solar energy

Everywhere the sun shines, there is solar energy. We take advantage of this energy in simple ways – by opening the curtains in winter to help heat the air or by filling our pool before we want to swim so the water has a chance to warm up.

Every day, scientists work to find better and better ways to harness solar energy. Your teacher has described their best discoveries to date. Some, like solar or photovoltaic cells, you can find around you – they may be powering your calculator, heating your friend's swimming pool or making the lights flash in construction zones on the highway. Electricity produced at a solar power plant, on the other hand, will seem no different than electricity produced from another fuel source.

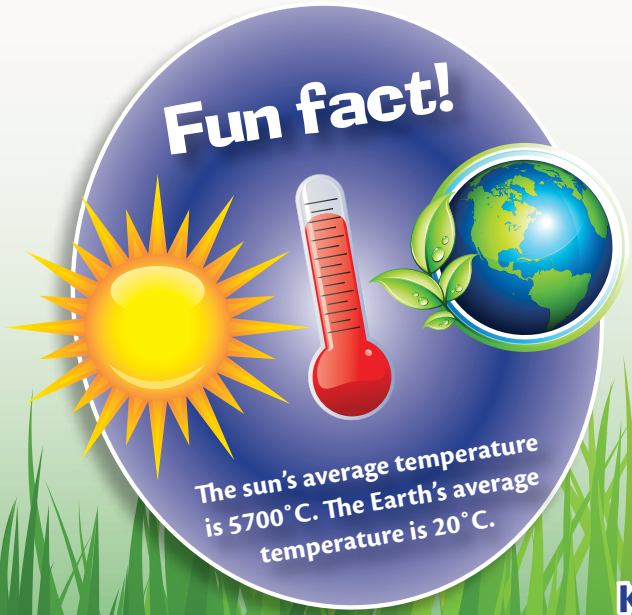
Scientists rely on all their creative powers to come up with ways to capture and use the sun's power. Now it's your turn to solve a mystery! Use the following table – each symbol represents two letters. Use the following codes to find the mystery phrase.

^ @ : ! % % ! % % & : ? ^ ^ % % %,

: % ! ! ! ! $ % % ! % < ! @ : %!

!	@	#	$	%	^	&
A	B	C	D	E	F	G
N	O	P	Q	R	S	T

0	?	<	>	:	[
H	I	J	K	L	M
U	V	W	X	Y	Z



Energy conservation versus energy efficiency

Instructions

Explain the difference between energy conservation and energy efficiency to your class. Invite students to work in small groups and brainstorm to come up with as many examples as they can for each.

Here are some examples. Students are likely to be more familiar with the concept of energy conservation – initially, they may need help coming up with examples of energy efficiency.

Energy conservation	Energy efficiency
• taking a short shower instead of a bath • washing your clothes in cold water • wearing a sweater instead of turning up the heat • turning off the lights when you leave the room • giving your friend a ride instead of taking two cars • closing the refrigerator door promptly • recycling	• using a low-flow shower head • using a high efficiency washer • using a programmable thermostat • using a sensor that will automatically turn lights off • using a hybrid car • using an ENERGY STAR® qualified refrigerator

Key points

Reducing our energy use is very important – by doing so, we put less stress on our environment. The ways we do this are referred to as "energy conservation" or "energy efficiency," and it can get confusing. So what's the difference?

Energy conservation: Energy conservation is about changing our behaviour to use less energy. By doing so, we conserve energy and save money. Turning the lights off when leaving a room is a good example of energy conservation.

Energy efficiency: Energy efficiency means using technology, such as appliances, equipment or lighting, that uses less energy to perform the same function. An example is replacing an incandescent light bulb with an energy-efficient compact fluorescent lamp (CFL), which uses at least 66 percent less energy to produce the same amount of light. Light-emitting diode (LED) lights also consume less energy and last much longer.

Energy conservation, or changing your behavior to use less energy, does not cost anything. Energy efficiency usually has a cost, which can be low or high, but the efficiency saves you money over a period of time. Both methods reduce energy use, pollution and greenhouse gas emissions.

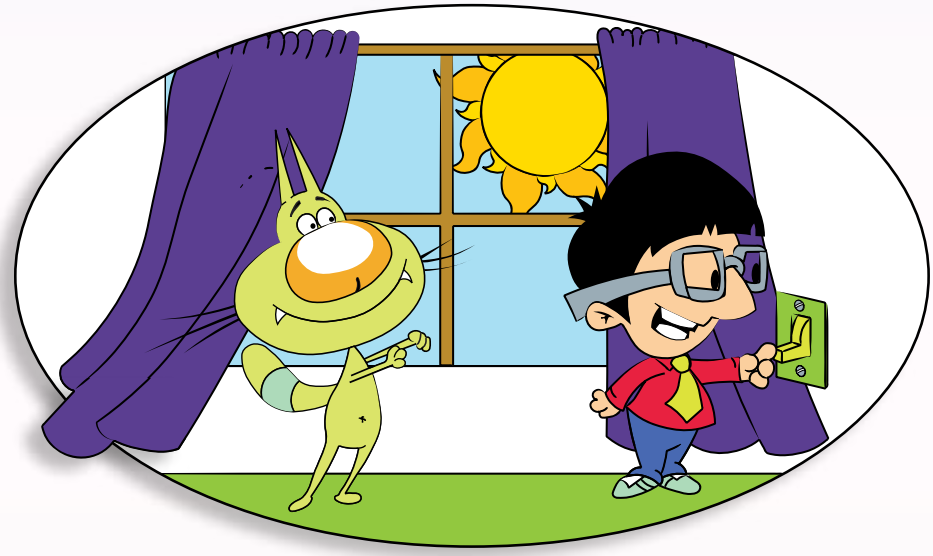
Energy conservation versus energy efficiency

Do you turn the lights off when you leave a room? Does your family use CFLs? One is about conservation, the other is about efficiency. So what's the difference?

If your behaviour saves energy, it is ENERGY CONSERVATION. A good example is turning off the lights when leaving a room.

If you install technology that uses less energy to do the same work, it is ENERGY EFFICIENCY. A CFL is a good example – it provides the same amount of light, but uses much less energy.

The choice is yours!



Can you think of more acts of energy conservation? How about energy-efficient technologies?

Energy conservation	Energy efficiency

Energy use: direct versus indirect

Instructions

Get the students to reflect on the concept of direct versus indirect energy use. Working in teams, students will prepare a presentation on a product of their choice that represents a good example of indirect energy use.

Answer key

Suggested topics for indirect energy use:

- paper plates
- plastic utensils
- going on vacation
- buying clothing/footwear
- any other ideas

Key points

We use a lot of energy in our daily activities, and it is as easy as turning on a switch to turn on some device. But what about when we are putting products in our shopping carts, are we using energy then (besides our own energy, of course)?

Everyday, we use energy in a **direct** or **indirect** manner. Our direct use is pretty obvious, like turning on the lights or driving the car. Our indirect use, however, is a bit fuzzier and less obvious – but still adds up to a whole lot of energy. Let's go back to the shopping cart and take a good look at what's inside.

Take those plastic water bottles for example: they are convenient because it's so easy to grab a cold one out of the fridge. But the energy expended in their production and shipping has a huge impact on the environment.

First, they are made from oil (petroleum), which is a non-renewable resource. Then, the oil is shipped to factories, so more fuel is burned. Then, the factories use more energy to process the oil into plastic bottles. Off they go again on a truck across the country to get to the store where we can all go and put them in our carts . . . and yep, drive them home! And it doesn't end here – more energy is used for recycling the bottle (but yes, do recycle), or they just end up in a landfill, where they can take hundreds of years to decay.

Energy use: direct versus indirect

There are two ways we use energy every day – directly and indirectly.

We're pretty aware of our direct energy use – we fill the gas tank to run our car, we burn coal or propane for summer barbeques, and draw on our own personal energy in gym class. But there are also indirect ways we use a lot of energy but we don't always realize it. Indirect energy is the energy used to create all the stuff we buy and use every day. Do you have any idea how much indirect energy you use?

Now that you have talked about your indirect use of energy in class, work with your team to prepare a presentation on a product of your choice that represents a good example of indirect energy. You can draw, use pictures from a magazine or anything that comes to mind. Just use your imagination!

Fun fact!

Bottled water is more costly than tap water. Environment Canada says 1000 litres of bottled water costs $1,500 while the same amount of tap water only costs $1.26.

Ecological footprint

Instructions

Using the footprints on the activity page, engage students in a discussion of how their ecological footprints compare to animals and of the impacts of human activity on the environment.

Key points

As humans, we depend on the Earth to give us food, air, water and energy. Everything we do – eat, drink, drive, use a computer, buy new clothes – makes an impression on the Earth. We are using a part of nature.

The ecological footprint is a way to describe human impact on the Earth – the imprint we leave when we use nature.

Our ecological footprint measures the amount of land and water we need to produce all the things we use (food, clothing, houses, etc.) and to absorb the waste we produce in our everyday lives.

We can divide the ecological footprint into five categories – food, water, energy, transportation and waste. There are steps we can take in each category to reduce our ecological footprint.

Answer key

	Human	Bear
Food	The food we eat uses a lot of energy for such things as processing, packaging, shipping and recycling.	The bear eats what's available in nature. The fish and fruit are the freshest right out of the water or off a tree.
Energy	We use electricity for just about everything – lighting, cooking, heating and playing.	No lights needed, he's not afraid of the dark, and his fur keeps him cozy and warm!
Waste	We produce a lot of garbage everyday from our food, toys and everything we use.	Because the bear uses nature, he "bearly" produces any waste.
Water	We wash dishes, take baths and showers, brush our teeth, and the list goes on.	The bear washes in the lake, and he is not fussy, no dishes needed!
Transportation	We drive cars, ride the bus and take airplanes.	The bear walks and swims his way around. Talk about keeping in shape!

Ecological footprint

How big is your footprint?

Have you ever walked on a sandy beach and watched your footprints, only to see them get washed away by the tide? We also leave another kind of footprint that may not be easy to see but it's much bigger. It's our "ecological footprint," and it does not wash away.

The ecological footprint measures the amount of resources we use everyday to support our lifestyle. For example, every time we turn the computer on, drive the car or put something in the trash, we make our footprint bigger. We are actually using the Earth's precious resources. And that's not so bad as long as we don't take more than what the Earth has to offer.

So what can we do?

Typically, our ecological footprint is made up from everyday actions that can be divided into five categories. Look at the two footprints – a human and a bear footprint. For each one, list actions for the five categories. Which one do you think has a bigger ecological footprint? Which one is heavier?
Hint: it has nothing to do with weight!

	Human	Bear
Food		
Energy		
Waste		
Water		
Transportation		

How green is your kitchen?

Instructions

Have a brief discussion early in the week about the energy used to supply and cook the meals we eat every day. Then ask students to take part in a kitchen energy audit in which they can identify ways their families can use less energy for buying, storing and cooking food. Have them use the chart on the activity page to track their "green behaviour" in the kitchen for a week. At the end of the week, students can share ideas on saving energy through the entire food cycle – from the field to their stomachs, and see how green their kitchen is.

Key points

We often hear "buy locally, save the environment." That's because a great deal of energy goes into shipping the food we eat. The food often comes from across the country or even from other countries, so it sometimes travels a very long way before it gets to us. Then, energy is used for packaging and storing the food. Finally, it gets to our kitchen, and we use energy to refrigerate, freeze and cook it. So there are lots of ways we can use less energy to create the food that fuels us!

Answer key

Have a classroom discussion about what we can do.

There are lots of ways to reduce the energy we use to grow, transport, prepare and package our food. And when we do, we'll be helping to protect our environment and make our ecological footprint smaller.

- Buy local food when it is in season – it travels a shorter distance, using less fuel.
- Look for products with less packaging.
- Find out how long it takes your oven to get hot – and don't preheat longer than you need to!
- Decide what you want before you open the refrigerator – then grab it and quickly close the door.
- When possible, bake two things in the oven at once.

1–30 points: Keep it up! What a good start! Your actions can add up and save energy.

31–69 points: Making a difference! What a positive attitude you have! Change is good!

70 or more: Excellent job! You set a good example to other kids. What a leader!

How green is your kitchen?

Food is our energy. We need a constant flow of it to keep our bodies working and to help us grow. But food can be an energy drain. Plants draw free energy from the sun to grow but, after that, it comes at a price.

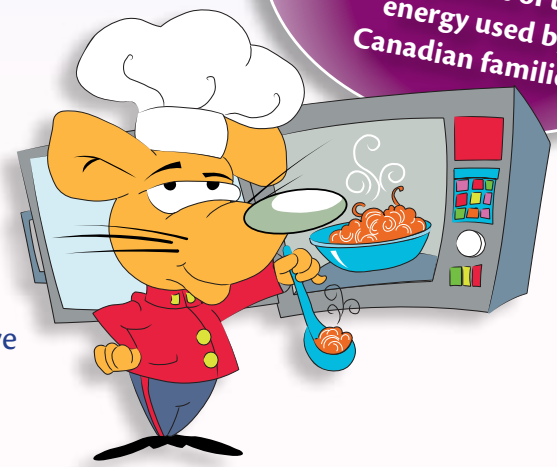
Farmers use energy and fertilizers to grow their crops.

Much of our food is shipped long distances.

Food processing and packaging uses lots of energy.

Fun fact!

Refrigerators use about 11 percent of the energy used by Canadian families.



What can we do?

Now that you have talked about all the energy used to produce and get food to your home, use this chart to see how green your family's kitchen is. There are ways for you and your family to make food choices that use less energy. Give yourself one point in the daily box for each activity that you complete. Record additional points for repeating activities. For example, if you use the microwave to reheat food three times in one day, give yourself three points in the daily box.

My "green kitchen" behaviour	Mon	Tue	Wed	Thu	Fri	Sat	Sun
I used the microwave to reheat.							
I ate more raw fruits and vegetables.							
My family tried to buy produce that was grown locally when it is in season.							
I decided what I wanted before opening the refrigerator and then closed the door right away.							
I brought my lunch in reusable containers.							
I used a composter.							
We used our own reuseable grocery bags when we bought groceries.							
My family tried to buy products with less packaging.							
My total							
Class total							

9. Teaching notes — Matching exercise

Water

Instructions

Fresh, clean water is essential to life. Students are asked to think about water in a global sense and to consider their daily water use in this context. They will gain a better understanding of our dependence on water and why it is important to conserve.

Key points

The Earth is essentially a closed system. It neither gains nor loses water – its water continually moves around, through and above the Earth. Water alternates among three states – water vapour or steam, liquid water and ice.

Like all other life forms, we need water every day to survive. But, as our society has evolved, the ways we use and depend on water have multiplied. It is a source of recreation at waterslides, pools and skating rinks, and essential to many industries, from energy generation to food processing and computer manufacturing.

The water we use in towns and cities is typically drawn from nearby lakes and rivers. The less water we use, the less energy is needed to pump, treat, distribute and return it to its source.

Answer key

Water vapour is a gas. It is commonly known as steam.

Thanks to the water cycle, the same water is continually recycled all around the globe.

In Canada, 30 percent of the water we use at home is for flushing the toilet.

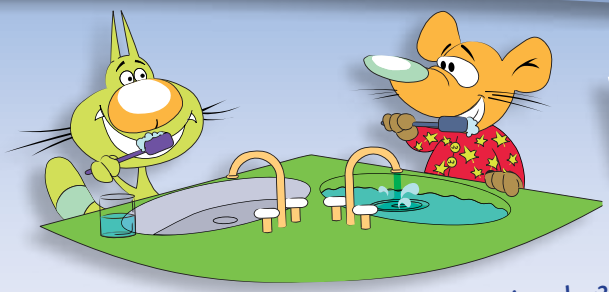
If I brush my teeth with the tap running, I use 10 litres of water a day.

The chemical description of water is H_2O.

More than 50 percent of the water used on lawns and gardens runs off and evaporates.

If I take a five-minute shower instead of a bath, I can use about 50 percent less water.

9. Learning activity – Matching exercise

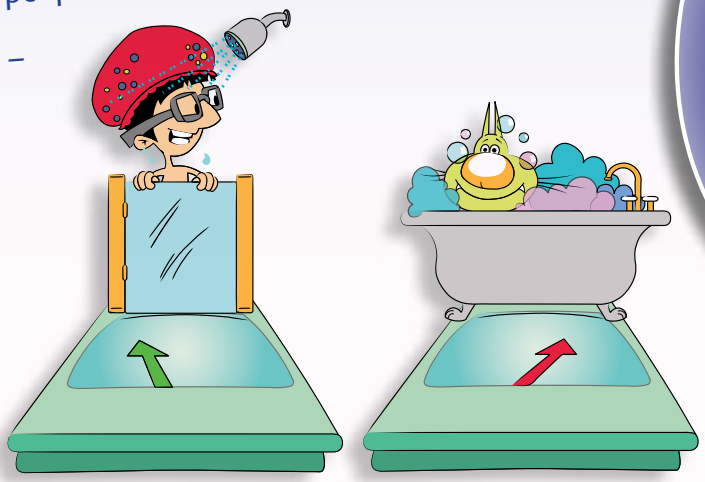


Water

Look at water – what could be simpler? It is colourless, odourless and (usually) tasteless. But water is more complicated than it first appears. It is one of our most important natural resources and is vital for all life on Earth.

Where there is water, there is life. Where water is scarce, living things – plants, animals, birds and people – struggle to survive.

By being careful with water – using only what we need – we can help ensure all the forms of life around us get the fresh water they need to thrive.



Fun fact!

Typically, less than 1 percent of the treated drinking water produced by utilities is consumed by people. Most is used for lawns, showers, tubs and toilets, etc.

Are you thirsty for knowledge?

Try matching the water facts on the left to the correct answer and find out if you're an expert about water!

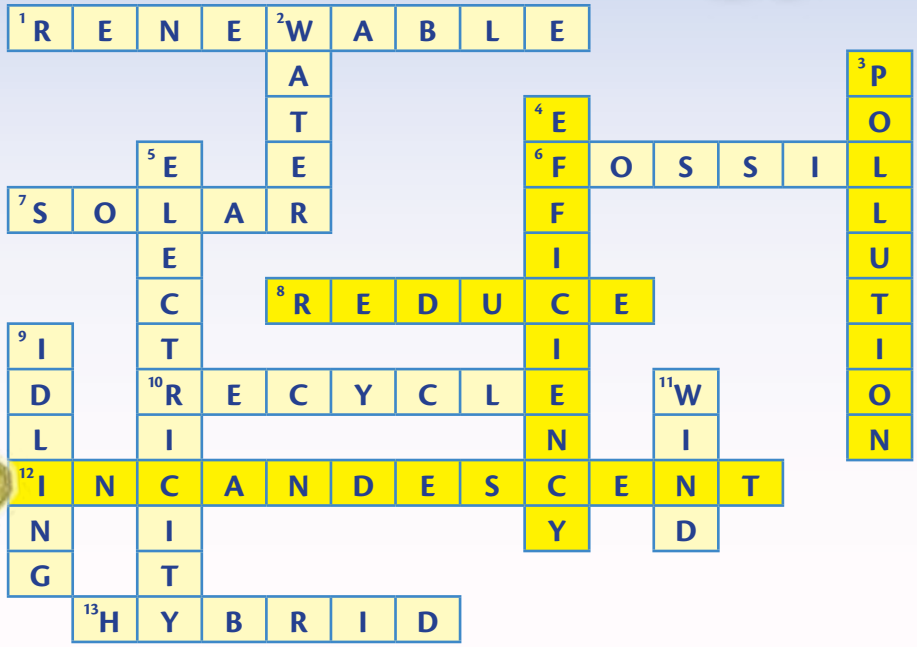
Facts	Answers
Water vapour is a gas. It is commonly known as _____.	**50 percent**
Thanks to the water cycle, the same water is continually _____ all around the globe.	**10 litres**
In Canada, _____ of the water we use at home is to flush the toilet.	**30 percent**
The chemical description of water is _____.	**steam**
If I brush my teeth with the tap running, I use _____ of water.	**recycled**
More than _____ of the water used on lawns and gardens is wasted – it runs off or evaporates.	**H_2O**
If I take a five-minute shower instead of a bath, I can use about _____ less water.	**50 percent**

To finish with energy

Instructions

Read the story below, explaining the highlighted words to your students. Afterwards, have them complete the crossword as a quick and fun test of their knowledge of the energy terms used in the story. The brave ones can try to find the words for the shaded definitions.

Answer key



Simon's "Green" Day

Dring! Dring! Simon's alarm clock wakes him up. It is a sunny day, and he is full of energy. He opens his curtains to let the **solar** energy light up his room. After breakfast, he fills a reusable bottle with **water** and hops in his Dad's **hybrid** car.

"Hurray! We are going to play soccer."

As they get to the field, Simon sees an **idling** car. "Dad, did you know this car is creating **pollution**? We learned in school that it's what happens when you burn **fossil** fuels, like gas."

"I know son, it's very bad for the environment."

Suddenly, the **wind** picks up and blows really hard. "Dad, did you know that you can use the wind to make electricity? My teacher says it's called a **renewable** source of energy. Know why?"

"Is it because there will always be more wind, son?"

"Dad, you're a good student!"

As the rain starts, Simon and his Dad head back home. Since he can't play outside, Simon helps his dad replace the **incandescent** light bulbs in the house with compact fluorescent lamps.

"Dad! Energy **efficiency** can save you money and help the environment!"

"Well of course, son! This is why Mom always tries to **reduce** our use of **electricity**."

"I'm bored!" Simon says.

"Well, why you don't go clean your room? I'm sure you have some toys that you can **recycle**."

"Can Sam come over after?"

"Sure he can."

10. Learning activity – Crossword

To finish with energy

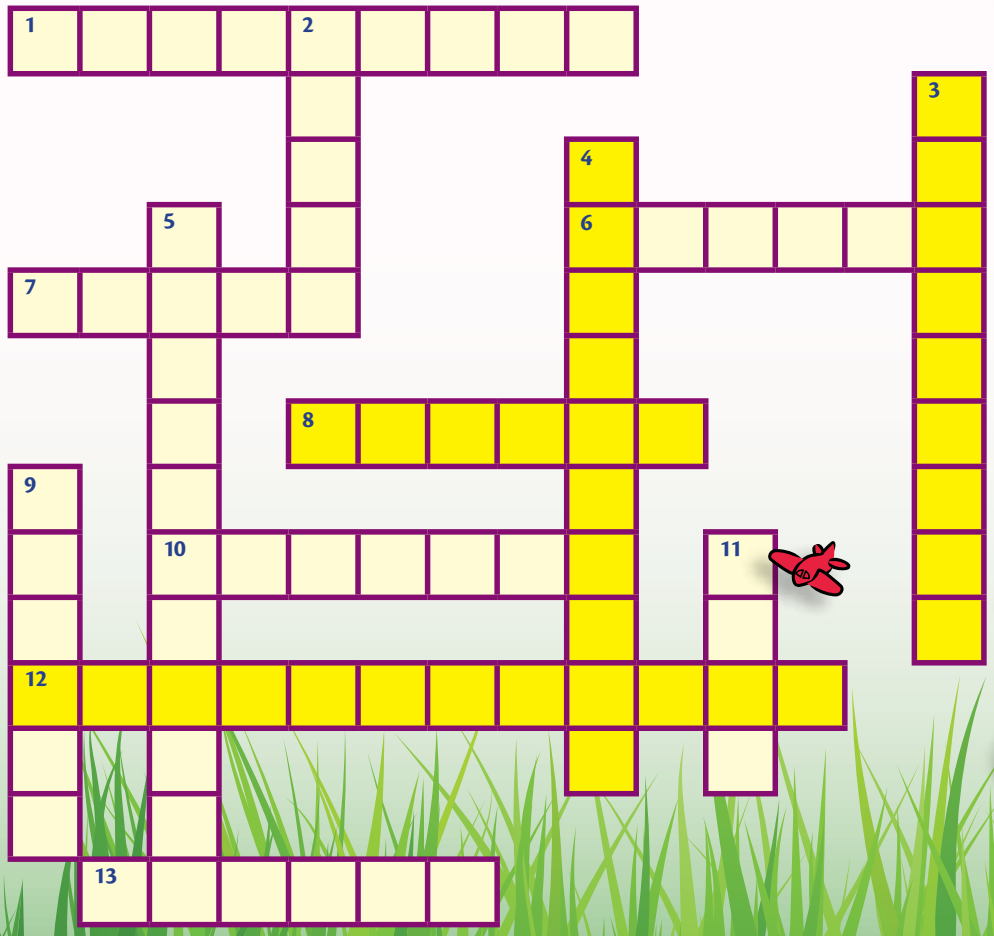
You have just heard all about Simon's day and learned many energy-related terms. Use your new energy vocabulary to solve the puzzle. Want more of a challenge? Try to find the words for the shaded definitions!

Across

1. Source of energy that is free and will last forever
6. Name we give fuels that took billions of years to form underground
7. Energy from the sun
8. You can help _____ by only buying things you really need.
10. Taking an old item and making a new product out of it
12. The oldest type of light bulb
13. Type of car that runs on two or more fuel sources

Down

2. We drink it every day.
3. Name we give smoke and gases that come from burning fuels for energy
4. Energy _____ saves our Earth's resources and reduces energy costs.
5. It powers our computers and much more.
9. Leaving the car engine running when you are not moving
11. Air in motion



Fun fact!

Did you know?

A heavy layer of dust on a light bulb can block up to half of the light.

An automatic dishwasher uses less hot water than doing dishes by hand – just make sure it's full when you start it!

Glossary of terms

biomass energy (renewable energy)
Biomass energy is made from plant material and animal waste, which are always available. They are burned to produce heat or converted to fuel such as ethanol.

climate change
Climate change is the long term change in weather over a specific region. It includes changes in temperature, wind patterns and amounts of precipitation. It is occurring because the Earth's average temperature is increasing.

ecological footprint
The ecological footprint measures the amount of resources we need and use everyday to support our lifestyle. It describes the human impact on Earth. Our ecological footprint is measured according to our activities in five main categories: food, energy, waste, water and transportation.

energy conservation
Energy conservation is about adopting new behaviours that result in using less energy. Turning the lights off when you leave a room and recycling are ways of conserving energy.

energy efficiency
Energy efficiency is about using technologies such as appliances, equipment or lighting that use less energy to perform the same function. Good examples of such technologies are hybrid vehicles, which use less gas and high efficiency appliances, which consume less water and energy.

fossil fuels
Fossil fuels are made of decomposed plants and animals that lived millions of years ago, even before the dinosaurs! Their bodies were buried in layers of the earth and over a long, long period of time became coal, natural gas and oil.

geothermal energy (renewable energy)
"Geo" means "from the earth" and "thermal" means "heat," so geothermal energy uses heat from the Earth. Even when the surface of the Earth warms up in summer and freezes in winter, the ground below the frost line maintains the same temperature. So during winter, water pipes underground absorb the heat from the ground, and heat pumps transfer it to a building above. The reverse happens in summer. The water pipes absorb the coolness of the ground, and the pumps then transfer it to the building.

global warming
Global warming means that the average temperature on Earth is getting significantly warmer. An increase in greenhouse gases in the atmosphere is causing more heat to be trapped, which makes the Earth warmer. This warming has serious impacts, such as melting the polar ice, raising sea levels and increasing incidents of severe weather.

greenhouse gases
Greenhouse gases (GHG), such as water vapour, methane, ozone, nitrous oxide and, especially, carbon dioxide are part of the atmosphere, and they are responsible for trapping the heat and keeping the Earth's temperature

constant. Human activity such as burning fossil fuels produces too many GHGs, such as carbon dioxide, which upsets the natural balance and results in too much heat being retained.

hybrid vehicle

Hybrid vehicles are a new technology that can help reduce the production of greenhouse gases. "Hybrid" means that the vehicle uses two sources of power. Most hybrid cars are powered by gasoline and electricity – they use gasoline and a battery. By switching between those sources, the hybrid uses less gas, produces fewer emissions and increases efficiency.

hydro-electricity (renewable energy)

"Hydro"-electricity means water-generated electricity. More than 60 percent of electricity used in Canada is created that way. Moving water is moving energy. It is very powerful and can drive a turbine to generate electricity. (Think Niagara Falls!) Have you experienced the energy of moving water in a waterfall, a river or the ocean?

non-renewable energy

Today, we still get our energy from non-renewable energy sources, such as oil, natural gas and coal. We often refer those as fossil fuels because they took billions of years to form underground from the remains (fossils) of dead animals and plants. After we use them all up, they can't be replaced, which is why they are called non-renewable.

photovoltaic cells

A photovoltaic cell, also called a PV or solar cell, converts sunlight energy directly into electrical energy. Photovoltaic systems produce clean, reliable electricity without consuming fossil fuels. They are used to provide power for watches and highway signs, and for the electrical needs of space stations and households.

renewable energy

Renewable energy comes from sources that are freely available (such as sunshine) or are replenished naturally (like rivers) or can be replenished (like biomass crops) about as quickly as we use them. The main types of renewable energy are biomass, geothermal, hydro-electricity, solar and wind.

solar energy (renewable energy)

The sun is our ultimate source of energy. It continuously radiates the light that supports life on Earth. We can take advantage of solar energy in two main ways. Passive solar energy means doing something as simple as opening the curtains in your bedroom in winter to heat the room. Active solar energy typically means using solar panels to make electricity. Solar panels have photovoltaic cells – a fancy word that means using light (photo) to create power (volts). A solar-powered calculator is a common example of this.

wind energy (renewable energy)

Wind is energy on the move. Humans have used windmills – towers with propellers, blades or sails – for almost 2000 years to capture this free, clean, renewable energy. A turbine is the machine that turns the wind (flowing air) into electricity. Windmills today are often grouped together on wind farms.

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