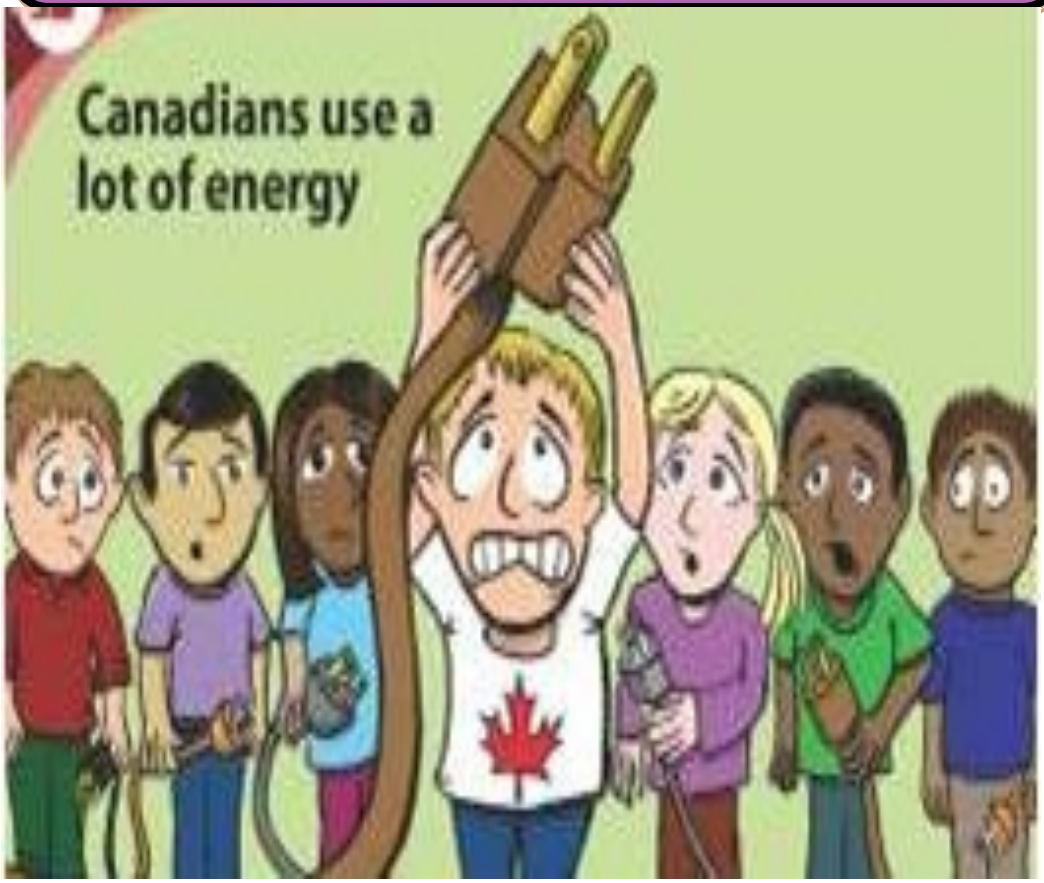
Environmental Footprint–ENERGY



Learning Environment: Indoor (and outdoor)

Prep Time: 10 minutes

Length of Lesson: 1 hr

Key Vocabulary: Renewable, non-renewable energy

Staffing: 1 adult

Materials: All materials can be borrowed from the Georgian Bay Biosphere Reserve 705-774-0978

GRADE	Overall Expectations	Specific Expectations
1	1s1. Assess the role of humans in maintaining a healthy environment.	1s11. Identify personal action that they themselves can take to help maintain a healthy env. for living things.
2	2s1. Assess ways In which humans have an impact upon animals and the places where they live.	2s12. Identify positive and negative impacts that different kinds of human activity have on animals and where they live

Lesson Outline:

TIME	ACTIVITY	GUIDING CONCEPT	MATERIALS NEEDED (from LIAB Resource Box)
	A. What is energy?	What is energy and where does it come from? There are two different sources of energy-renewable and non renewable.	-Images of different sources of energy.
	B. Ranking Appliances	What appliances do we use at home? Which appliances use the most energy?	-list of appliances and watts per hour
	C. Wasting Without Knowing	It is easy to waste energy without knowing it. When we turn on a light it uses energy. We want the energy to make light but it also makes something we don't want, heat. That's wasted energy.	-2 light bulbs: incandescent and CFL -lamp
	D. In Limbo	There are many ways for us to save energy!	-limbo rope -limbo game cards
	E. Count Yourself In: Shrink Your Energy Footprint!	Collectively it is easy to make a BIG difference. Taking action to realize the potential of an individual.	>Environmental Footprint Tree and/ or chart paper and marker
	F. Walk About	Energy is being used everywhere in our community. Is there any "green energy"?	-clipboards

Teacher Information:

Energy is in everything! We use it for everything we do, from playing basketball to baking cookies to sending astronauts to space. Energy comes from nature, and in different forms.

Renewable Energy: comes from sources that can be used again and again, and they will never run out. As a result, they are called sustainable. Examples used in this lesson include energy from sunlight, and wind. Other renewable sources come from the biomass of things like trees or corn, from running water, and from geothermal heat generated deep within the earth.

Sunlight: Photovoltaic (PV) solar cells directly convert sunlight into electricity. The simplest cells are used to operate wristwatches and calculators, and more complicated systems are used to light houses.

Wind: When the wind turns the blades of a windmill, it spins a turbine inside a small generator to produce electricity, just like a big coal power plant. A windmill on a farm can make only a small amount of electricity, enough to power a few farm machines. To make enough electricity to serve lots of people, power companies build "wind farms" with dozens wind turbines.

Non-renewable Energy: comes from sources we are using up and cannot easily replace in a short time. These sources of energy are considered unsustainable. Examples of non-renewable energy sources that are used in this lesson are coal, oil, natural gas, and nuclear power.

Coal: Coal is a non-renewable energy source because it takes millions of years to create. The energy in coal comes from the energy stored in plants that lived hundreds of millions of years ago, when the earth was partly covered with swampy forests. They were buried in swamps and were subjected to intense heat and pressure. Coal miners use giant machines to remove coal from the ground via two methods; surface, or underground mining. The coal is then cleaned to remove dirt, rock, ash, etc. Finally, the coal is sent to a power plant where it is burned to create steam. The steam turns large turbines that create electricity.

Oil: Like coal, oil was formed from the remains of plants and animals that lived millions of years ago. The plants and animals that turn into oil once lived in a marine environment and were covered with layers of mud. To get oil, engineers drill a hole deep into the ground . Above the hole, a structure called a "derrick" is built to house tools and pipes going into the well. When finished, the drilled well will bring oil to the surface.

Information from: "Connecting with Nature: An educational guide for grades four to six" by the David Suzuki Foundation.

In Ontario, 8% of our electricity comes from natural gas or other, 18% comes from coal or oil, 22% comes from hydroelectricity and other renewables, and 52% comes from nuclear energy.

-canadaenergy.ca

Energy Use At Home

The majority of homes in Canada are heated and cooled using non-renewable sources. Home heating in Canada accounts for nearly 60% of the energy used in the home. Appliances and electronics account for about 13% of household energy use.

Refrigerators use the most energy of any home appliance because they are on all the time. Make sure your frig is away from any heat sources (including the sun!) so it doesn't have to compete with the heat.

Is it better to use a **dishwasher** or to wash dishes by hand? It depends on how you use the dishwasher, what kind you buy, and how you wash dishes by hand. If you use a dishwasher, make sure it's full when you run it! Use the air-dry feature or dry the dishes by hand.

An electric **clothes dryer** can generate more than six pounds of greenhouse gases with every load. A clothesline generates zero. Hanging clothes can save the average household about $100 a year in energy costs. If you do use a dryer, keep the lint filter clean for best efficiency.

Get rid of **vampire power**! Many appliances use power even when they are switched off, and some of them use as much power as when they are turned on. Many electrical products need to be unplugged to be completely switched off (eg. Air conditioners, DVD players).

If your family needs to replace any of it's appliances, they should look for the **Energy Star label** to ensure they're buying the most efficient appliance they can afford.

When we're using a lot of electricity at the same time, we create a peak demand period. During peak demand periods the system can fill up and make it hard to meet all of the electrical demands. This can cause blackouts where the system is forced to shut down. This can be hard on nature because of all the additional electricity plants that must be built just to meet peak demand. Check the **Ontario Electricity Time-of-Use Price Periods** to see when is the best time to use energy. http://www.ontarioenergyboard.ca/OEB/Consumers/Electricity/Electricity+Prices

Information from: "Connecting with Nature: An educational guide for grades four to six" by the David Suzuki Foundation.

A. What is Energy?

1. Ask students to discuss where electricity comes from.
2. Using the provided pictures and information, explain to the class how energy is created via wind, solar, oil, and coal. Explain the difference between renewable and non-renewable energy.
3. Ask students, what impact does each source have on nature?

B. Ranking Appliances

1. Ask students to brainstorm to create a list of the electrical appliances used around the home and school.
2. Tell students that we will focus on five appliances; the fridge, clothes dryer, clothes washer, TV, and dishwasher.
3. Ask the students to rank these appliances according to how much energy they think each uses in one hour.
4. Reveal the actual ranking as follows:

Ranking	Appliance	Watts per hour
1	Clothes dryer	1800-5000
2	Dishwasher	1200-2400
3	Fridge	170-750 (but working ALL THE TIME!)
4	Clothes washer	350-500
5	TV	65-170

If students ask, here is a ranking of some other appliances:

Appliance	Watts per hour
Clothes iron	1000-1800
Computer monitor	Asleep:30, awake: 150
Laptop	50
Frig	725 (but they're always on!)
Hair Dryer	1200-1875
Toaster	800-1400
Vacuum	1000-1440

C. Wasting Without Knowing

1. Discuss with the class: it is easy to waste energy without knowing it. When we turn on a light it uses energy. We want the energy to make light but it also makes something we don't want-heat. That's wasted energy.
2. Present two types of light bulbs; incandescent (really old) and the compact fluorescent bulb (a fairly new invention).
3. Screw the incandescent bulb into the lamp and turn it on. Invite one student to time how long it takes for the bulb to get hot by holding their hand slightly away from the bulb. Warn the student ahead of time that it will happen fairly quickly, and not to touch the bulb directly. A second student should be recording the time.
4. Remove the bulb and screw in the CFL bulb. Again, invite a student to time how long it takes for the bulb to get hot. The students should notice that it takes quite a bit longer and that the bulb never gets hot, only warm.
5. Discuss the advantages of each bulb (CFL bulbs do not use much energy and last a great deal longer than incandescent bulbs.) The take-home message is that we can make choices to buy more energy-efficient items for households.

D. In Limbo

1. What are some other ways that we can save energy? Get students to raise ideas.
2. Have students line up in front of a limbo bar. Each turn, have a student select an "energy use" card.
3. As a group, decide whether the bar should be raised or lowered. Raise the bar for an energy efficient use and lower the bar for an inefficient energy use.

E. Count Yourself In!

After each student has gone under the limbo stick, have them sit back at their desks. Make a list of easy ways to save energy at home or school. As a class, pick 5 that are attainable, and use them as goals for the Footprint Tree.

F. Walk About

Take students on a "green energy hunt" to find how much green (renewable) energy is being used in the community. Have students point out any power related items (electrical outlets, street lamps, power lines, etc.) Point out any green energy uses (for example, solar panels, windmills, hybrid vehicles). Challenge them to find other places where green energy could be used.

If there is time, walk around the school and point out exterior gaps, cracks, and damage that could allow cold air to come inside and heated air to go outside.

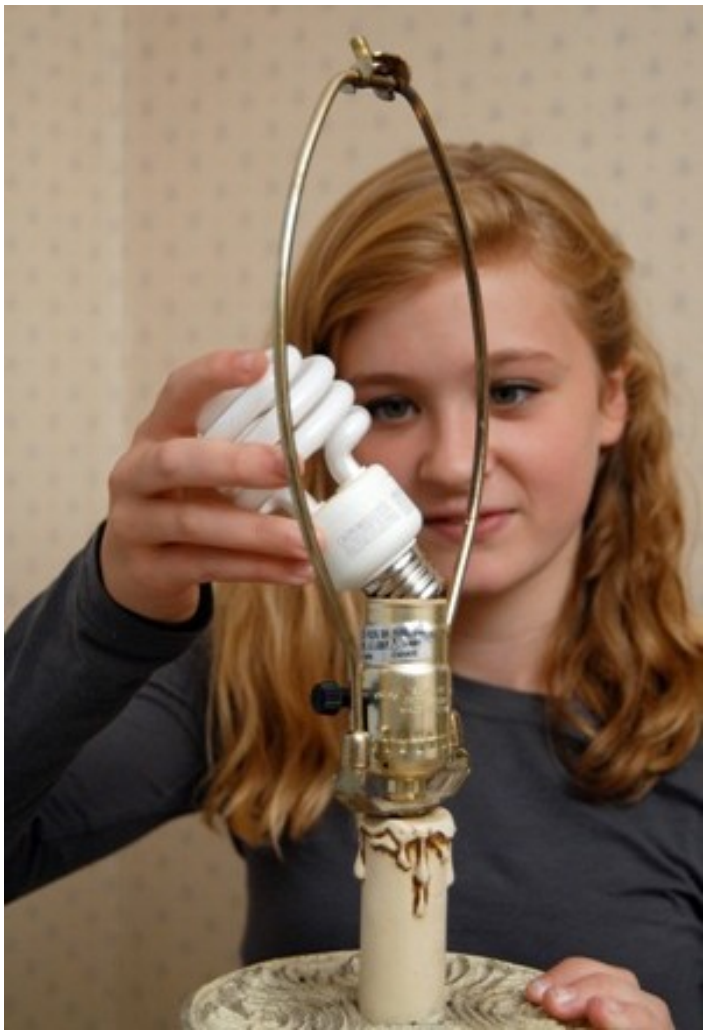
Taking it Further...

Community/Home Engagement

- Ask students to look around at home (or in the breakfast club room at school) and list any appliances with the Energy Star label. Read about how an appliance qualifies for the Energy Star program at davidsuzuki.org/youthandnature/i

Optional Class Activities

- Evaluate your school's energy efficiency. Have the custodian come in and take the class for a walk around the school to discuss the appliances your school uses. Do any of the appliances have the Energy Star label?
- The Hydro One Appliance Calculator can help approximate electricity usage based on minutes, hours, and days. Get students to experiment with the calculator in class. www.hydroone.com/MyHome/SaveEnergy/Tools/calc_main.htm
- Encourage students to design an energy-efficient home of the future. Ask them to consider heating, cooling, appliances, lights, trees, and anything else you can think of.
- Develop a math activity to determine how much energy the school could save by lowering the thermostat by two degrees. Multiply that energy use over a day, week, month, and year. Then discuss how students could wear sweaters to decrease energy consumption.



Many ideas were adapted from the David Suzuki Foundation's *"Connecting with Nature: An educational guide for grades four to six".* A great resource! Ask the Georgian Bay Biosphere Reserve to borrow a copy.