

ACTIVITY:

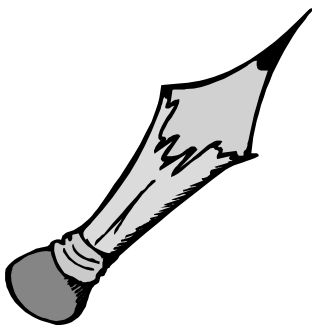
Alternative Energy Technologies in Canada

Discover what you'll be seeing more of
in the next 5 to 10 years!

SUBJECTS & SKILLS DEVELOPMENT:

- ◆ Language ◆ Science & Technology
- * reading skills – independent, aloud or group
- * reading comprehension and strategies
- * respond to written materials, express opinions and thoughts, relate to their own knowledge
- * build vocabulary
- * use of conventional and nonconventional texts and media to locate information
- * understanding different forms and styles of written material
- * plan and carry out a research project
- * investigation of materials that absorb light and heat (e.g. solar power & heat pumps)
- * energy sources, transformation and technology
- * structures and mechanisms – characteristics, forces, motion, design

OBJECTIVES:



- learn about real life examples of renewable energy technologies
- remove the "mystery" of alternative energy technologies and learn the basic ideas behind how they work
- learn new ways of creating/using energy that do not create greenhouse gases
- discover what kinds of alternative technologies can be used in Canada
- discuss the concepts behind the technologies as a group
- set a precedent for technologies sought out by EcoKids in the future

YOU NEED:

- EcoKids Information Sheets on pages 9 - 12.
- access to photocopier
- reading/discussion time



INSTRUCTIONS:

There are four EcoKids Information Sheets, one for each alternative energy technology - Earth Energy Heat Pump, Solar Water Heater, Solar Wall, and Wind Turbine. These are designed for EcoKids to read and work with.

These Information Sheets are designed for EcoKids to read and work with. They discuss and simplify alternative energy technologies down to their most basic concepts without losing the detail of how each one actually works. The Information Sheets aren't meant to give you information on every kind of solar water heater, and the like that is out there. They are meant to explain the basics - that's all.

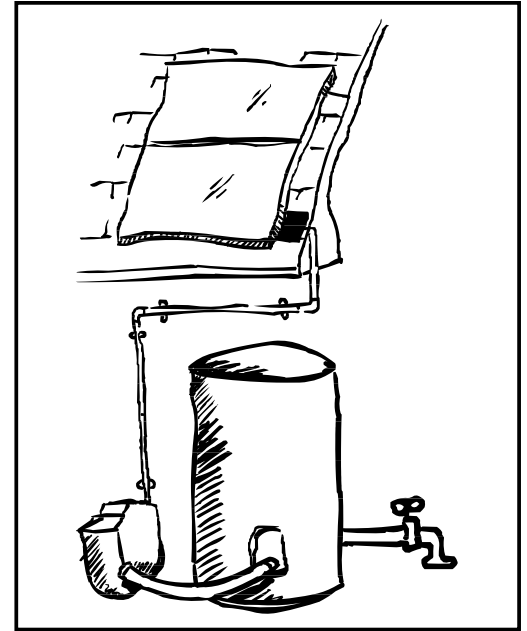
IDEAS:

- You may find that one of these technologies interests you more than the others. If so, make this the target of more discussion or projects.
- If the EcoKids in your club have different interests, divide them into groups by their interests and set common goals for the groups' investigations of the different technologies.
- Recreate this content in another format such as a set of newspaper ads and articles, brochures, or the like.
- If your time is limited, use the sheets for independent reading assignments combined with similar topics you are working on in class. Use the information sheets as **TOOLS**.



SOLAR WATER HEATERS

A solar water heater uses the energy from the sun to heat up water in a tank. It has 3 basic parts: a solar panel on the roof or on the ground, pipes from the panel to the hot water tank, and at least one hot water storage tank with a heat exchanger. Each solar panel is about 3 m² (that's the size of a rectangle 1m x 3m) and 15 cm thick. An average four-person home needs two solar panels and a tank that makes about 225 L of hot water per day. The more water you need heated, the more solar panels and storage tanks you need.



HOW IT WORKS:

- On your roof, two solar panels collect the sun's energy (the colour black is used to absorb a lot of sunlight).
- Small pipes inside the solar panel are filled with fluid (e.g. antifreeze). The fluid picks up the heat from the sun.
- Pipes carry the fluid from the solar panels to pipes around the water tank inside the house. A pump attached to the pipes makes the fluid move from place to place.
- The heat from the fluid is transferred to the water in the storage tank with the help of machines.
- The fluid goes back up to the solar panels to pick up more heat for another trip.

Where you'll see solar water heaters:

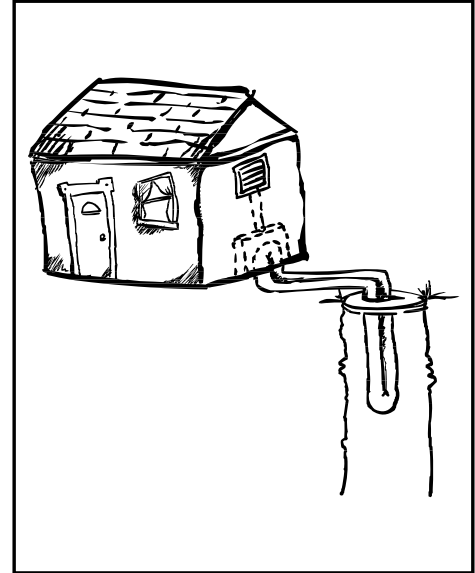
You can buy solar water heaters now. They come in lots of sizes, so homes and big businesses can use them, too. If its pipes have antifreeze in them, the solar water heater can be used all year! But certain kinds of solar water heaters can be used only when the temperature is higher than 3°C, because the fluid in their pipes is water, and it freezes at lower temperatures. In 1998, about 13 000 homes in Canada had solar hot water heaters, most of which were for pools.¹⁵ Camp Queen Elizabeth on Georgian Bay, Ontario, has a solar water heater that is used when the camp is open in the summertime.⁵



EARTH ENERGY HEAT PUMPS



An earth energy heat pump carries heat from one place to another. In the winter, it takes heat from down in the ground and carries the heat into a building to warm air or water. In the summer, an earth energy heat pump takes heat from inside a building and carries the heat down into the ground. It works a lot like your refrigerator or air conditioner.



HOW IT WORKS:

- A big coil of plastic pipe is buried under the ground. It goes from the building into the ground and back. The pipe is filled with a liquid that is very good at carrying heat. The liquid takes heat from the ground and carries it into the building.
- Another set of pipes inside the building also has liquid inside it. This liquid picks up the heat from the liquid in the pipe coming from outside. It's like a relay race with heat. The pipe in the building carries the heat to an appliance that will warm up air or water.
- In the summer, this cycle is reversed.

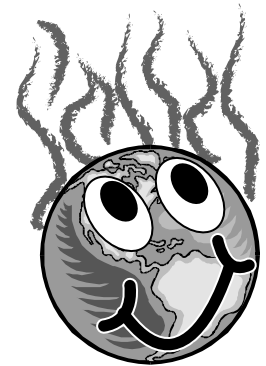
The more heat/cooling you need the longer the pipe you need under the ground.

Where you'll see earth energy heat pumps:

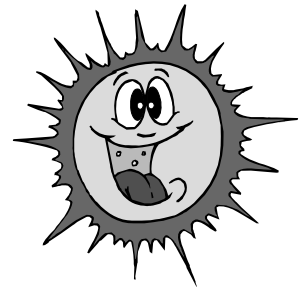
Earth energy heat pumps are good for schools.¹⁶ The heat pumps' pipes can be buried beneath large schoolyards. Check out the "Get Real" activity for a list of schools that already have heat pumps.

Heat pumps are also good for homes, businesses and factories. There were about 30 000 earth energy heat pumps in Canada in 1998.¹⁵ Natural Resources Canada is telling builders and engineers about earth energy heat pumps so they'll start

designing homes, office buildings, schools and entire communities with them. In 1999, 250 homes in Greely, Ontario were built with earth energy heat pumps.³



SOLAR WALLS



HOW IT WORKS:

- Panels of metal are attached to an outdoor wall of a building. An empty space is kept between the metal panels and the wall.
- The metal gets heated by the sun.
- Air from outside is sucked into the empty space between the metal and the wall through thousands of tiny holes about 1mm in diameter in the metal. The space is about 30 cm wide.
- The metal panels heat the air. The warm air rises up to a hole at the top of the wall.
- The warm air goes through the hole and into the building. A fan helps send the warm air through the building.
- In the summer, the wall actually blocks the sun's energy from warming up the building. Warm air gets trapped in the space between the building and the solarwall and is released through holes at the top of the metal panels.
- A computer controls the whole system.
- A solarwall does not replace a building's heating and cooling systems. It reduces the need to turn on those systems, which use "dirty energy" sources, and it reduces the greenhouse gases that they would have created.

A solar wall is made out of metal panels (aluminum or steel), built overtop of an outdoor wall of a building. In cold months, the solar wall is used to make warm air for inside the building. In the summer, it helps keep the building cool. Solarwall® is the official name given to these walls by the company who created them. This technology was created in Canada and is the first solar-powered air heating system.

Where you'll see solarwalls®:

Solarwalls® may be hard to spot because they kind of look like any other wall. They can be used on apartment buildings, industrial plants, warehouses, commercial buildings, and homes in Canada. The Ford Motor Company in Oakville, Ontario has one and so does the Windsor Housing Authority in Windsor, Ontario.¹⁷ Natural Resources Canada has two buildings with solarwalls: one in Prescott, Ontario and one in Varennes, Quebec.¹⁵ The world's biggest solarwall is at the Canadair manufacturing plant in Montreal, Quebec.¹⁷

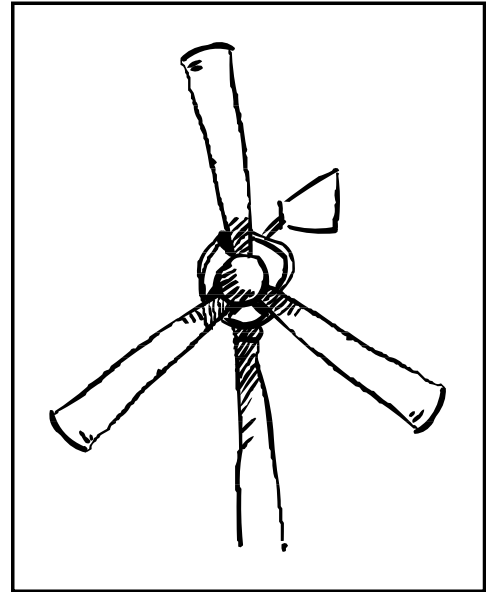


WIND TURBINES

(TO MAKE ELECTRICITY)



A wind turbine has two or three large blades, like an airplane's propeller, that are attached to machinery on top of a tall tower. The blades are made out of strong (but light) materials that won't break in the wind. Wind turbines create electrical energy by turning a generator. Some wind turbines can make enough electricity for a home, a farm, or a small business all on their own. Many wind turbines used together form a wind farm that makes electricity that a power company can send to its customers.



HOW IT WORKS:

- The tower holds the turbine's blades high up where strong winds blow.
- The wind turns the blades.
- The blades spin the rotor.
- The rotor turns gears.
- The gears turn a generator that makes electricity.

Where you'll see wind turbines:

Wind turbines are being built all over Canada. Alberta has many power companies that are starting to use lots of wind turbines to generate "green power." And a new wind farm is being built in southern Alberta. The biggest windfarm in Canada is in Quebec; 133 wind turbines, each with a 48 m diameter rotor on a 55 m tower, generate enough electricity for 10 000 homes.



The east and west coasts of Canada have good winds for turbines, so you should expect to see more turbines if you live in these coastal regions. The Magdalen Islands, along the east coast for example, will have a wind farm very soon.

EcoKids in Tricities, British Columbia, will soon be close to the world's biggest wind farm in the US. If you live in the far north of Canada where many communities use diesel gas generators to make electricity, you should expect to see wind turbines being combined with solar power to make electricity. Aurora College in Inuvik, for example, currently uses wind and solar power.'