



# ***Teachers' Guide***

## ACKNOWLEDGEMENTS

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*Electricity* was produced by Inside Education to provide teachers with information and ready-to-use lessons on electricity in Alberta (Grades 4-9). The activities contained in this guide are linked to the *Electricity* poster. This is the third poster in a series addressing Canada's energy needs. The first poster in the series was *Petroleum*, and the second, *Oil Sands*. Copies of all posters and guides are available to teachers by contacting:



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Inside Education has operated since 1985 as a non-profit education society with a focus on environment-economy topics and concerns. Inside Education exists as a centre for environmental education facilitating relevant, bias-balanced, quality learning that empowers educators and other leaders to achieve a healthy, productive community.

This teaching resource is supported with funding from:

**Government  
of Alberta** ■

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**TEACHER'S GUIDE**

The following list of websites were referenced in the creation of this resource. Dates shown indicate site date at the time the information was accessed.

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Natural Resources Canada. (July 21, 2004) Government of Canada. [www.nrcan.gc.ca](http://www.nrcan.gc.ca)

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York University. Your Energy Footprint.

[http://resources.yesican-science.ca/energy\\_flow/energy\\_menu.html](http://resources.yesican-science.ca/energy_flow/energy_menu.html)

**Electricity tour of Alberta — Information****Websites**

[www.waterforlife.gov.ab.ca/html/infobook/info10.html](http://www.waterforlife.gov.ab.ca/html/infobook/info10.html)

[www.greatcanadianrivers.com/rivers/north\\_saskatchewan/recreation-home.html](http://www.greatcanadianrivers.com/rivers/north_saskatchewan/recreation-home.html)

[energysolutionsalberta.com/default.asp?V\\_DOC\\_ID=944&V\\_LANG\\_ID=5](http://energysolutionsalberta.com/default.asp?V_DOC_ID=944&V_LANG_ID=5)

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[www.eere.energy.gov/windandhydro](http://www.eere.energy.gov/windandhydro)

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[www.worldenergy.org/wec-geis/edc/countries/Canada.asp](http://www.worldenergy.org/wec-geis/edc/countries/Canada.asp)

[www.epcor.ca](http://www.epcor.ca)

[www.ceaa-acee.gc.ca/010/0003/0019/pn040128\\_e.htm](http://www.ceaa-acee.gc.ca/010/0003/0019/pn040128_e.htm)

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Pembina Institute for Appropriate Development. Alberta Solutions: Practical and Effective Alberta Actions to Address Climate Change. 1999.

## ELECTRICITY RESOURCES

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### General

[www.sciencetech.technomuses.ca/english/schoolzone/index\\_e.htm](http://www.sciencetech.technomuses.ca/english/schoolzone/index_e.htm) — The Canadian Science and Technology Museum provides background information about electricity, conductors, insulators, and other electricity related topics.

[www.neb-one.gc.ca/energy/elprice\\_e.htm](http://www.neb-one.gc.ca/energy/elprice_e.htm) — National Energy Board provides information about electricity pricing and regulation in Canada.

[www.epcor.ca/Communities/Alberta/Education/Learning+Zone/Activity+Sheets/Energy/](http://www.epcor.ca/Communities/Alberta/Education/Learning+Zone/Activity+Sheets/Energy/) — Epcor Energy Group has several resources related to energy education including metre reading activities and energy conservation ideas.

[www.enmax.com/Power/Safety+Awareness+From+ENMAX/Programs+for+Teachers/About+Electrical+Safety+World.htm](http://www.enmax.com/Power/Safety+Awareness+From+ENMAX/Programs+for+Teachers/About+Electrical+Safety+World.htm) — Enmax Electrical Safety World explains what electricity is, where it comes from, the dangers of electricity, and provides home safety checklists and electrical safety games. A downloadable teacher's guide is available.

[www.electricityforum.com](http://www.electricityforum.com) — The Electricity Forum provides an excellent reference website about electricity topics ranging from what electricity is to careers in energy.

[www.bchydro.com/education](http://www.bchydro.com/education) — BC Hydro provides resources on energy, electricity and teaching modules for grades K-12. *\*\*Please note that these resources are based on the BC curriculum.*

### Energy

[www.canadianenergy.ca/silos/ET-CanEn01.asp](http://www.canadianenergy.ca/silos/ET-CanEn01.asp) — The Canadian Centre for Energy is the primary energy resource site in Canada. The site includes information on energy types, energy news and energy education. Teaching resources are supplied as well as access to the Energy Literacy Series developed by SEEDS.

### Non-Renewable Energy

[www.coal.ca/class.htm](http://www.coal.ca/class.htm) — Maintained by the Coal Association of Canada, this site included quick facts about coal in Alberta and four modules about how coal is mined, transported and used.

[www.cna.ca](http://www.cna.ca) — The Canadian Nuclear Association provides information on the nuclear industry and nuclear energy in Canada.

### Renewable Energy

[www.re-energy.ca](http://www.re-energy.ca) — Produced by Pembina Institute for Appropriate Development, this site features renewable energy such as solar electricity, solar heat wind energy, water power, biomass and other clean technologies. There is background information, lesson plans and activity ideas.

[www.fwee.org/TG/curriculum.html](http://www.fwee.org/TG/curriculum.html) — **Nature of Water Power**, this website is maintained by the Foundation for Water and Energy Education and Investigates the water cycle, describes water as an energy source and investigates how dams and reservoirs affect the environment.

[www.renewables.ca/main/main.php](http://www.renewables.ca/main/main.php) — Developed by the Canadian Association for Renewable Energies, this site contains news articles about renewable energy in Canada.

[www.canren.gc.ca/default\\_en.asp](http://www.canren.gc.ca/default_en.asp) — The Canadian Renewable Energy Network provides information on bioenergy, earth energy, hydroelectric energy, solar energy and wind energy. The site also leads to an interactive map that leads students through different types of renewable energy at [www.canren.gc.ca/school/map/english/map\\_e.html](http://www.canren.gc.ca/school/map/english/map_e.html)

[www.canwea.ca](http://www.canwea.ca) — The Canadian Wind Energy Association provides publications and other resources on wind energy.

[www.lsf-1st.ca/en/teachers](http://www.lsf-1st.ca/en/teachers) — Learning for a Sustainable Future provides background information, lesson plans and activities about energy and natural resources, product and consumer trends and climate change.

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## Introduction

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### *Why an educational resource on electricity?*

Electricity is an integral part of our modern lives. But,

- Where does it come from?
- How is it produced and delivered to us?
- What are the science-technology-society-environment (STSE) connections related to its prevalent use in our society?
- What does the future hold?

## About the Poster

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The front (closed view) provides a look at the most common sources of electricity in Canada today. Defined at its edges by a provincial border, major generation sources are visible, as well as other uses on the same land base. Once open, the poster shows the integration of electricity into society with the STSE connections — science, technology, society and environment —and other issues. In addition, diagrams depicting a closer look at the sources of electricity (including extraction and processing, creation of waste products) are shown. On the back of the poster, a step-by-step schematic of the generation, transmission and distribution of electricity is illustrated. A home is also depicted with individuals making “bright” and “not-so-bright” energy and electricity decisions for further understanding and discussion.

### ELECTRICITY KIT RESOURCE CD

In order to minimize our ‘footprint’ and to reduce the amount of paper being used, the *Electricity* kit includes a resource CD with supplementary materials. It is here that you will find the worksheets identified in the various activities, a PDF copy of the poster and additional background information on electricity. Should you misplace this CD, PDF copies of all of the work sheets are available at [www.insideeducation.ca](http://www.insideeducation.ca), the Inside Education website.

### ELECTRICITY ACTIVITIES FOR STUDENTS

In this guide, we have attempted to address the fact that not all students learn best during the traditional lecture-style lesson format. The examination of electricity allows for much flexibility and creativity. Presentation of information and curriculum objectives can occur with an eye to multiple intelligences and differing student strengths.

### ELECTRICITY CONNECTIONS - ALBERTA CURRICULUM

The *Electricity* poster and teaching resource is designed to provide support for Alberta teachers as they address the curriculum requirements listed on page 1. The chart outlines the curriculum objectives met by the *Electricity* poster and each activity in the pages that follow have the curriculum connection identified. The new program of studies for elementary Social Studies is included.

# ALBERTA CURRICULUM OBJECTIVES

## Social Studies

### Grade Four

a) Current – *Topic A: Alberta – Its Geography and People*

b) New – *General Outcome 4.1 – Alberta – A Sense of the Land*

Students will:

- 4.1.1 value Alberta's physical geography and natural environment
- 4.1.2 critically examine the physical geography of Alberta by exploring and reflecting upon the following questions and issues:
  - Where is Alberta located in relation to the other provinces and territories of Canada?
  - What are the major geographical and natural vegetation regions, landforms and bodies of water in Alberta (e.g., prairie region, forests, rivers, hoodoos, Rocky Mountains, oil sands)?
  - What are the significant natural resources in Alberta and where are they located (e.g., mineral deposits, coal, natural gas and oil, forests)?
- 4.1.4 analyze how Albertans interact with their environment by exploring and reflecting upon the following questions and issues:
  - In what ways do the physical geography and natural resources of a region determine the establishment of communities?
  - How are natural resources used by Albertans (i.e., agriculture, oil and natural gas, forests, coal)?
  - How do Albertans deal with competing demands on land use in Alberta (e.g., conservation, solar and wind power, recreation, agriculture, oil exploration, forestry)?

### Grade Five

a) Current – *Topic A: Canada, Its Geography and People; Topic B: Physical Geography of Canada*

b) New – *General Outcome 5.1 – Physical Geography of Canada*

Students will:

- 5.1.1 value Canada's physical geography and natural environment
- 5.1.3 analyze how people in Canada interact with the environment by exploring and reflecting upon the following questions and issues:
  - In what ways do natural resources and the physical geography of a region determine the establishment of communities?
  - How are natural resources used, exchanged and conserved in Canada?

### Grade 8

a) Current - *Topic A: Geography of Canada and the United States*

- How are patterns of life in Canada and the United States influenced by human and physical geography?
- To what extent should we consider physical environment when we develop our resources?

b) New – N/A

## Science

### Grade Five

*Topic A: Electricity and Magnetism*

Students will:

- Recognize and appreciate dangers involved in using electricity.
- Recognize that the amount of electricity we use in our homes is measured in kilowatt hours.
- Demonstrate that a continuous loop of conducting material is needed for an uninterrupted flow of current in a circuit.
- Draw and interpret, with guidance, circuit diagrams that include symbols for switches, power sources, resistors, lights and motors.

*Topic B: Mechanisms Using Electricity*

Students will:

- Identify example applications of electrical devices in the school and home environment, and classify the kinds of uses.
- Design and construct circuits that operate lights and other electrical devices.
- Demonstrate different ways of lighting two lights from a single power source and compare the results.
- Demonstrate different ways of using two batteries to light a bulb and compare the results.
- Given a design task and appropriate materials, invent and construct an electrical device that meets the task requirements.

### Grade 7

*Topic C: Heat and Temperature*

Students will:

- Identify and evaluate different sources of heat and the environmental impacts of their use (e.g., identify advantages and disadvantages of fossil fuel use; compare the use of renewable and nonrenewable sources in different applications).
- Identify positive and negative consequences of energy use, and describe examples of energy conservation in their home or community.
- Defend a given position on an issue, based on findings (e.g., defend the use of a particular renewable or nonrenewable source of heat energy in a particular application).
- Appreciate that scientific understanding evolves from the interaction of ideas involving people with different views and backgrounds (e.g., recognize that science and technology develop in response to global concerns, as well as to local needs; consider more than one factor or perspective when making decisions on STS issues).
- Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment (e.g., recognize the distinction between renewable and nonrenewable resources and the implications this has for responsible action; objectively identify potential conflicts between responding to human wants and needs and protecting the environment).

### Grade 9

*Topic D: Electrical Principles and Technologies*

Students will:

- Identify describe and interpret examples of mechanical, chemical, thermal (heat) and electrical energy.
- Investigate and describe evidence of energy transfer and transformation (e.g., mechanical energy transformed into electrical energy, electrical energy transferred through power grids, chemical energy converted to electrical energy and then to light energy in a flashlight, thermal energy converted to electrical energy in a thermocouple).
- Investigate and describe techniques for reducing waste of energy in common household devices (e.g., using more efficient forms of lighting, reducing overuse of appliances as in "over drying" of clothes).
- Describe and discuss the societal and environmental implications of the use of electrical energy.
- identify and evaluate alternative sources of electrical energy, including oil, gas, coal, biomass, wind, waves and batteries (e.g., identify renewable and nonrenewable sources for generating electricity).
- describe the by-products of electrical generation and their impacts on the environment (e.g., identify by-products and potential impacts of coal-fired electricity generation).
- identify example uses of electrical technologies, and evaluate technologies in terms of benefits and impacts (e.g., identify benefits and issues related to the use of electrical technologies for storing and transmitting personal information).
- identify concerns regarding conservation of energy resources, and evaluate means for improving the sustainability of energy use.
- Demonstrate sensitivity and responsibility in pursuing a balance between the needs of humans and a sustainable environment (e.g., objectively identify potential conflicts between responding to human wants and needs and protecting the environment).

<b>Insulators</b>	A substance that does not carry an electrical charge (i.e. rubber).
<b>Ions</b>	Charged atoms that have an imbalance of charges creating either a positive (more protons than electrons) or negative (more electrons than protons) atom.
<b>Kilowatt Hour (KWh)</b>	Measurement of energy equal to one kilowatt per hour. This is the measurement most commonly used for electrical billing purposes.
<b>Natural Gas</b>	A gaseous fossil fuel formed from the remains of plants and animals. It's burned to create electricity.
<b>Neutron</b>	A subatomic particle with no charge located in the nucleus of an atom.
<b>Non-renewable Energy</b>	Energy that comes from natural resources that are not naturally replaced within our lifetime (e.g. fossil fuels).
<b>Nuclear Energy</b>	Energy created by the splitting (fission) of uranium atoms.
<b>Nucleus</b>	The positively charged central region of an atom.
<b>Oil</b>	A liquid fossil fuel formed from the remains of plants and animals. It is burned to create electricity.
<b>Open Circuit</b>	An incomplete circuit; the flow of an electrical current is broken.
<b>Petroleum</b>	A naturally occurring mixture of hydrocarbons in the gaseous, liquid or solid state.
<b>Photovoltaic Cell (Solar)</b>	A device made of silicon that converts sunlight into an electrical current.
<b>Power Plant</b>	Facility that converts mechanical, chemical or fission energy into electrical energy.
<b>Proton</b>	A positively charged subatomic particle located in the nucleus of an atom.
<b>Reclamation</b>	Returning an area of land to a state similar or better than its previous state.
<b>Renewable Energy</b>	Energy that has the ability to naturally replenish itself because it is continuously being produced (e.g. solar, wind, water).
<b>Resistance</b>	The opposition to the flow of an electrical charge. Materials with low resistance make good conductors and materials with high resistance make good insulators.
<b>Solar Power</b>	Converting energy from the sun into electricity using photovoltaic cells or solar thermal systems.
<b>Static Electricity</b>	An imbalance of charges without a continuous circuit to travel, as in lightning.
<b>Step-up Transformer</b>	A device that increases voltage and current.
<b>Step-down Transformer</b>	A device that decreases voltage and current.
<b>Tidal Power</b>	Power generated from the force of tides.
<b>Turbine</b>	A machine with rotating blades that can be turned by the flow of steam, water or wind to create mechanical power.
<b>Voltage</b>	The amount of electrical potential in an object measured in volts.
<b>Watt</b>	A unit used to measure electrical power. It was named after James Watt, 1819.

## GLOSSARY

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<b>Alternating Current (AC)</b>	An electrical current that reverses direction repeatedly.
<b>Atom</b>	The smallest particle of matter, containing a nucleus of neutrons and protons with orbiting electrons.
<b>Attraction</b>	The process by which opposite charges are drawn to each other.
<b>Battery</b>	Connected cells that produce a direct current by converting chemical energy to electrical energy.
<b>Biomass Energy</b>	Organic material that is burned to convert chemical energy to electrical energy.
<b>Circuit</b>	Conductors or a system of conductors that electric current flows through.
<b>Closed Circuit</b>	A pathway through which an electrical current can flow. Includes an energy source (i.e. battery or generator), devices that use electricity (i.e. lamps and MP3 players) and the conducting wires.
<b>Coal</b>	A solid fossil fuel formed from the remains of plants about 300 million years ago. It is burned to create electricity.
<b>Co-generation</b>	The production of two types of energy (heat and electricity) from one source in such a way that both are usable rather than one being wasted.
<b>Conductors</b>	A substance that easily carries electrical charge (i.e. copper).
<b>Current</b>	The flow of electricity that passes a point in a second.
<b>Direct Current (DC)</b>	An electrical current that flows in one direction only.
<b>Electrical Potential</b>	The size of electrical charge in a given object.
<b>Electricity</b>	A form of energy created by the flow of electrons.
<b>Electron</b>	A negatively charged subatomic particle that travels on an orbit outside of the nucleus of an atom.
<b>Energy</b>	The ability to do work.
<b>Energy Efficiency</b>	The amount of energy needed to perform a function.
<b>Energy Source</b>	Primary sources that provide power to be converted from mechanical, chemical or fission energy into electrical energy.
<b>Fossil Fuel</b>	Fuels formed from the remains of plants and animals buried under the earth's crust, hardened and compressed over millions of years. They gradually changed to petroleum, coal, and natural gas.
<b>Fuel Cell</b>	A device that produces electricity by converting chemical energy from a fuel and oxidant into electric and heat energy. It is similar to a battery, but it does not store energy.
<b>Generator</b>	A rotating machine connected to the turbine that converts mechanical energy into electrical energy.
<b>Geothermal Energy</b>	Energy produced from hot water or steam trapped beneath the surface of the earth.
<b>Grid</b>	The electrical utility transmission and distribution network.
<b>Hydroelectric Power</b>	The generation of electric power from moving water, such as rushing water at dams and waterfalls.

The following represents a “brainstorming” of classroom activities using the *Electricity* poster. These are simply a starting point, as you will be able to come up with many more ideas! The list is included to ‘jump-start’ the process and get you thinking about all the possible uses of this poster.

**A. You’ve Got the Power to Conserve Energy!**

Using the large residence on the back of the *Electricity* poster, have the students note the various actions items that are using, saving, and wasting electricity.

- Make a list of 5 items/actions that are conserving electricity.  
(*Using low energy light bulbs, fluorescent bulbs instead of incandescent, turning off lights, computers, and computer peripherals when not in use, recycling*)
- Make a list of 5 items/actions that are wasting electricity or could be using electricity more effectively.  
(*Inefficient lamps and bulbs, ceiling fan on when not necessary, unplugging makeup mirror, hair dryer, curling iron, appliances — toaster, mixer, coffee maker and grinder, can opener, kettle — when not in use.*)
- Offer suggestions on how electricity could be conserved in the bathroom.  
(*Lower hot water use with low-flow shower head; take short showers instead of baths; use high-efficiency light fixtures.*)

**B. Power for the People**

On the front of the poster there are small, purple boxes located beside certain settlements. Find the settlement that is the most similar to the one you live in. Have students pick two of the purple boxes and identify the possible electricity needs of the community. What energy source is closest to the community? (*Hint: Is the community you picked close to a wind turbine or the oil sands? If not, what energy source is it near?*) Looking at the environment, what would be some things that could affect the community’s electricity consumption? (*Hint: How would needs change depending on the climate or whether you live in a town or city?*)

**C. Safety First!**

Draw students’ attention to the boy getting ‘zapped’ in the top right-hand corner of the inside of the poster. Discuss what sorts of activities would be unsafe at home when dealing with electricity. Have students sketch a picture showing UNSAFE electrical use. Collect all the pictures and place them in a bag or box. Have each student pick from the bag/box and describe what is unsafe and how the activity could be changed so that it is safe. What are the appropriate actions to take? Have students share ways that they are ‘electricity safe’.

**D. It’s Hot, It’s Cold...**

Using the *Electricity* poster, ask the students to find and compare scenes showing different seasons or weather and discuss how this affects electricity consumption. How are we affected in Canada?

**E. Energy Employment**

Many people in Canada and around the world work with electricity both directly and indirectly. Using the poster, what are some jobs that people have that involve electricity? Do you believe these careers will change in 30 years? What predictions can you make about how they may change and why?

**F. Conservation Campaign**

Draw students’ attention to the *conservation billboards* on the front of the poster. Discuss the theme of each billboard and point out that the billboards all have a slogan about electricity conservation or safety. If you were to begin an electricity conservation campaign at your school and you wanted to remind people to shut off the lights and computers when they left the room, what kind of a slogan might you put around the light switch to encourage them?

**Brainstorm other ‘slogans’ and consider having your students create their own billboards to be displayed around the hallways of your school.**

**G. Electricity – What’s my Line?**

Divide the class into small groups and provide each group with a copy of the *Electricity* poster. Have each group come up with a sound or catchy word that relates to electricity. For example, “Zap!” This will be their team name and ‘buzzer’. Read the following riddles and award points to the first group that correctly comes up with the answer and finds the corresponding numbered lightning bolt on the poster. Groups can indicate that they have the answer by shouting out their electricity word or sound. *Note: the solution, the location on the poster (inside or outside) and the corresponding lightning bolt are provided at the end of the riddle.*

1. I provide the ‘juice’ to play your MP3s, a chemical reaction fuels me. What am I? *Battery (Inside, 21)*
2. Hydrogen and oxygen together create water, a chemical process most know well. The process makes electricity, not in a battery but a fuel \_\_\_\_\_ *Cell (Inside, 18)*
3. I am spun by wind, steam or water. I turn the wire coil of a generator. What am I? *Turbine (Inside, 5b)*
4. I am often called Nature’s Electricity. Thunder and rain like to accompany me. What am I? *Lightning (Inside, 1)*
5. Flick on the switch and see me glow. I come in fluorescent and incandescent, just so you know! What am I? *Light bulb (Inside, 16)*
6. I am the high wires that electricity flows through. Make sure not to touch me for I will ZAP you! What am I? *Transmission line (Inside, 5d)*
7. Electricity goes through me for a voltage reduction, making it safe for your household functions. What am I? (Hint: I have the same name as a popular toy) *Transformer (Inside, 5e or 5f)*
8. I’m part of the circuit of electricity. In your walls and ceiling is where I will be. What am I? *Wire (Inside, 19)*
9. I can be found in sand or deep under the ground. Once refined I do many things including helping get you around. What am I? *Oil (Inside, 2e)*
10. Splish, splash waves crash. Around and around the turbine goes, creating the electricity flow. What am I? *Tidal power (Inside, 20)*
11. I can be sweet or sour in my gaseous state. I’m the cleanest burning fossil fuel, at any rate. What am I? *Natural Gas (Inside, 2f)*
12. I am Ontario’s main energy source. Uranium atoms splitting apart with great force. My radioactive waste is buried of course. What am I? *Nuclear power (Inside, 2a or 4)*
13. I am a solid black fuel formed from plant fossilization. I am the main source of Alberta’s power generation. What am I? *Coal (Inside, 2d)*
14. Biomass is created by burning this type of waste. Creating renewable energy used all over the place. What am I? *Wood, plant, agricultural or forest waste (Inside, 2c)*
15. My energy comes from a star far away. PV cells capture my heat in the day. What am I? *Solar power (Inside, 11)*
16. My blades turn around as the wind blows, resulting in electricity flow. What am I? *Wind Turbine (Inside, 13)*
17. Rivers and waterfalls are nice to see, but also forms of energy. The water’s pressure moves the turbines creating electricity. What am I? *Hydroelectric (or ‘Hydro power’) - (Inside, 7 or 8)*
18. Heat from the earth can be very intense, creating geysers and hot springs with lots of steam. If we can capture the steam and use it to turn a turbine, this source becomes part of the renewable energy “team”. What am I? *Geothermal (Inside, 14)*

The question bank provides a list of questions relating directly to the *Electricity* poster. The questions can be used for a group or individual activity.

1. Look at the pie chart on the front of the poster showing the main ways electricity is presently made in Canada.
  - How much electricity is generated with coal? (18%) With hydro? (59%) With renewable sources? (62%) With non-renewable sources? (28%)
  - How do you expect these percentages will change in 10 years? How do you think these percentages will change in 100 years? Why?
2. Name 4 kinds of recreation activities occurring on the poster. (*Kite flying, snowmobiling, hiking, boating, sailing, ice fishing, bird watching, camping*)
  - How many of them involve using electricity?
3. Using the poster, find three ways that water is used in the process of generating electricity.
  - Hydro — (water) pressure to spin the turbine, connected to generator to make electricity;
  - Coal, oil, natural gas — burning the fossil fuels heats water, generates steam pressure, spins a turbine, connected to generator to make electricity
  - Tidal — at high tide water is trapped in a reservoir, at low tide water it is released, turning turbines.
4. Look at the graph on the front of the poster showing how much electricity has been generated in Canada over the past 4 decades,
  - Has it increased or decreased? (*Increased*)
  - What was the approximate amount of electricity generated in 1971? (*150 GWh*) 2001? (*500 GWh*)
5. Find the border crossing(s) on the poster — this is where an exchange of materials occurs between nations.
  - Start discussion by asking students if electricity crosses borders or always stays in the same town, city, province or country in which it is generated. (*Electricity trade is often cross-border to optimize the use of generating resources for consumers and those who generate electricity. For example, when linked across borders, the diversity of systems, climates, and demand allows for more efficient power flow.*)
6. Across Canada, a variety of different resources are used to make electricity. Using the map on the inside left corner of the poster, compare Alberta and Ontario. Compare British Columbia and Manitoba. Compare the Northwest Territories and Nova Scotia. What are the similarities/differences and why? (*Availability, environmental, social, and economic factors all determine the electricity sources that will be used in a specific geographic region.*)
7. Looking at the poster, find ways in which electricity is transmitted once it is made/generated. (*Through transmission lines; both underground on cables or above ground along wires hung on wooden or steel transmission towers and poles.*)
8. On the poster, locate the layout schematic showing the flow of electricity with high-voltage transmission lines, substations to light industry, a large steel company, a petrochemical plant with waste heat, an aluminium smelter, a “typical” city, and a co-generation facility saving electricity by using the “waste” heat generated during processing.
  - Do different sectors of society require varying amounts of electricity to complete their work? (*Certainly, and generally, industry uses the most electricity to process and manufacture goods and materials for consumers.*)

3. In Alberta, for every 100 kWh of electricity, approximately 98 kg of carbon dioxide is produced. In order to determine the amount of carbon dioxide each household produces per year, divide the kWh of electricity consumed per year by 100 and then multiply by 98.

E.g. Electricity Consumption per year: 4704 kWh

$$\frac{4704 \text{ kWh}}{100 \text{ kWh}} = 47.04$$

$$47.04 \times 98 \text{ kg} = 4609.92 \text{ kg}$$

4609.92 kg of carbon dioxide are released when 4704 kWh of electricity are consumed.

4. Have students compare this weight to their own weight. For example, if a student weighs 54 kg, the amount of CO<sub>2</sub> produced is equivalent to 85 students who weigh 54 kg.

E.g. Student weight: 54 kg

$$\frac{4609.92 \text{ kg}}{54 \text{ kg}} = 85$$

5. Discuss the effects of carbon dioxide, greenhouse gases and global warming.
- Why is it important to be aware of our consumption patterns?
  - What are things that students can do in their daily lives to reduce the production of carbon dioxide?

### Extension Activities

- A. Calculate the amount of carbon dioxide that is produced by the school. How could this be reduced? As a class, plan a CO<sub>2</sub> Challenge Day where students try to reduce energy consumption.
- B. Using the pie charts on the inside of the poster and a map of Canada, have students come up with reasons why different provinces would rely on different sources of energy. Would this have an effect on the amount of CO<sub>2</sub> produced? Consider the following questions:
- Which provinces are located close to major water courses (especially large rivers)?
  - What are the major natural resources in each of the provinces?
- C. Have students investigate their home appliances.
- How many watts do different household appliances use?
  - What is the difference in wattage between appliances that have an Energy Star rating and those that do not?
  - Develop an inventory of appliances that students use and how much they use them per week. Using the wattage ratings from appliances and the cost of electricity in your area, have students figure out how much it costs to use these appliances per week.

**H. Electric Math — Answer Key**

The following math questions contain item names from the *Electricity* poster. Your task is to find the items on the inside part of the poster, fill in the appropriate number and solve the problem! From the *Electricity* resource CD print the “Electric Math” worksheet and distribute to your students.

1. Hydroelectric dam  $\times 8 =$  \_\_\_\_\_  
*Answer:*  $7 \times 8 = 56$

2. Wind Turbine - \_\_\_\_\_ = LRT power line  
*Answer:*  $13 - 1 = 12$

3. Residential Electrical Panel  $\times 8 =$  \_\_\_\_\_  
*Answer:*  $6 \times 8 = 48$

4.  $7 \times$  \_\_\_\_\_ = Battery and Simple Circuit  
*Answer:*  $7 \times 3 = 21$

5. Household Light Bulb -  $4 + 6 =$  \_\_\_\_\_  
*Answer:*  $16 - 4 + 6 = 14$

6.  $45 \div$  Electric Switch Diagram = \_\_\_\_\_  
*Answer:*  $45 \div 15 = 3$

7. Power generation using uranium as a fuel source  $+ 9 -$  \_\_\_\_\_ = 7  
*Answer:*  $4$  (nuclear power plant)  $+ 9 - 6 = 7$

8. Our most common artificial lighting source  $\times$  biomass power generation = \_\_\_\_\_  
*Answer:*  $16$  (light bulb)  $\times 3 = 48$

9.  $(35 + 6) -$  Equipment used to collect energy from the sun. (*hint: not on the house*) = \_\_\_\_\_  
*Answer:*  $(35 + 6) - 11$  (solar power cell panel) = **30**

10.  $(16 +$  \_\_\_\_\_  $) \div 3 =$  Tidal Power Generation  
*Answer:*  $(16 + 44) \div 3 = 20$

11. (Biomass Power Generation + Hydro Electric Dam)  $\times 11 + 13 =$  \_\_\_\_\_  
*Answer:*  $(3 + 7) \times 11 + 13 = 123$

12.  $9 \times$  (Hydro turbine + 6) = \_\_\_\_\_  
*Answer:*  $9 \times (8 + 6) = 126$

13.  $7 \times 3 -$  \_\_\_\_\_ = 13

A riddle!! I have blades, but they are not sharp.  
 They spin in circles when the wind blows.  
 An electric generator at my base,  
 And into the grid my electricity goes!

*Answer:*  $7 \times 3 - 8 = 13$

*Teacher Note:  
 Print the handout for  
 this activity from the  
 CD provided.*

# ELECTRICITY TOUR OF ALBERTA

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**Time:** 2 class periods

## Alberta Curriculum Connection

- Grade 4 Social Studies (Current): *Alberta – Its Geography and People*
- Grade 4 Social Studies (New): *Alberta: A Sense of the Land*
- Grade 5 Social Studies (Current): *Canada – Its Geography and People; Physical Geography in Canada*
- Grade 5 Social Studies (New): *Physical Geography of Canada*
- Grade 8 Social Studies: *Geography of Canada and the United States*

## Rationale

This activity will introduce students to the energy resources in Alberta that are used to create electricity.

## Objectives

- Students will discover where the energy resources used to generate electricity are located in Alberta.
- Students will be introduced to new electricity innovations and technologies in Alberta.
- Students will have the opportunity to further research Alberta's energy resources.

## Materials

- Poster paper
- Handout "Electricity Tour of Alberta - Facts and Map"
- *Electricity* poster

*Teacher Note:  
Print the handout for  
this activity from the  
CD provided.*

## Introduction

Alberta is rich with energy sources. The province has some of the largest oil sand reserves in the world, has enough coal to last for 1205 years at our current mining rate and produces more electricity from wind than any other province in Canada. By taking the "Electricity Tour of Alberta" students will have the opportunity to explore the abundance of energy sources found just outside their backdoor.

## Activity

1. Teacher Preparation – from the Resource CD provided in the *Electricity* kit, print off and copy the "Electricity Tour of Alberta - Facts and Map" and distribute to students.
2. Using the *Electricity* poster as a guide, discuss which energy sources students think are used to create electricity in Alberta. (The only sources that are not produced in Alberta are nuclear and tidal.) Do they know of places in Alberta where these resources are found or used?
3. Develop a bulletin board display or have students develop individual posters featuring a map of Alberta in the middle with the title: *The Electricity Tour of Alberta*.
4. Place the "electricity facts" listed on the activity handout around the bulletin board or poster. Develop a symbol for each of the electricity facts and mark each location on the map using the symbol. (See sample included on CD.)
5. Have students research 10 additional Alberta electricity facts to include on the poster/bulletin board.

**Time:** 1 period

### **Alberta Curriculum Connections**

- Grade 4 Social Studies (Current): *Alberta – Its Geography and People*
- Grade 4 Social Studies (New): *Alberta: A Sense of the Land*
- Grade 5 Social Studies (Current): *Canada – Its Geography and People; Physical Geography in Canada*
- Grade 5 Social Studies (New): *Physical Geography of Canada*
- Grade 5 Science: *Electricity and Magnetism*
- Grade 7 Science: *Heat and Temperature*
- Grade 9 Science: *Electrical Principles and Technologies*

### **Materials**

One copy of a home monthly electrical bill per student

### **Rationale**

This activity will help students understand how their electrical consumption patterns can have an effect on CO<sub>2</sub> emissions. This will be done through an investigation of household electrical consumption patterns and the amount of carbon dioxide produced from this.

### **Objectives**

- Students will calculate the amount of carbon dioxide that their family produces through electrical consumption.
- Students will link their energy consumption to the natural environment.

### **Background Information**

The earth has its own temperature regulation system - the “greenhouse effect”. The greenhouse effect is the natural warming of the earth’s atmosphere caused by gases that trap the sun’s heat near the earth’s surface. These gases include carbon dioxide (CO<sub>2</sub>), water vapour and ozone. The greenhouse effect is necessary to support life, without it the earth would be too cold.

Many human activities release carbon dioxide and when the amount of greenhouse gases changes, it can have a significant impact. As the concentrations of these gases increase, they intensify the natural greenhouse effect — the earth becomes too efficient at trapping heat. The warming of the earth caused by this seems to be resulting in changes in naturally occurring weather patterns.

The burning of fossil fuels to create electricity is a major contributor to greenhouse gas emissions. To produce electricity both coal and petroleum are burned, releasing carbon dioxide, the leading gas contributing to the greenhouse effect.

### **Activity**

1. Students will need to bring in an electrical bill from their home or be provided with a copy of an electrical bill. Discuss the terms watt and kilowatt hours.
  - Watt (W): a unit used to measure amounts of electrical energy used. One watt is a very small amount of electricity.
  - Kilowatt (kW): one kilowatt is equal to 1000 watts.
  - Kilowatt hour (kWh): a unit used to measure how much energy is required or used by 1000 watts working for one hour. The average household uses 55 kWh per month for their television.
2. Use the graph on the electricity bill to estimate the kWh used each month. Add the monthly totals together to get an approximate number of kWh of electricity consumed in the past year. Alternatively, students can take the monthly total and multiple it by twelve to get a rough annual total.

**Activity***Part A*

1. Explain to students that they will have the opportunity to compare the light bulbs through experiments. As a class, brainstorm ways that the light bulbs may be compared. (E.g. Amount of heat released, the time each light bulb lasts, amount of light energy emitted, cost of each light bulb.)
2. Divide students into groups of four or five. Distribute one fluorescent light bulb, one incandescent light bulb, a lamp and the student worksheet to each group. Students will need approximately 30 minutes to compare the light bulbs.
3. Have students list their questions and predictions about the light bulbs focusing on how they might be able to tell which bulb is more efficient and how each light bulb works. Have groups develop experiments to test their predictions.
4. Provide each group with the opportunity to present their results to the class. Discuss how the questions, predictions and experiments that each group generated were similar/different. Was there a consensus as to which light bulb was the most efficient or were their various opinions? Would different light bulbs be more appropriate for different areas?

*Part B*

5. Read the background information with students. Find the pictures of the incandescent and fluorescent light bulbs on the poster. Have each group compare this information with the information that they were able to generate through their scientific inquiry.
6. Distribute the light bulb boxes to the students. Have them record any further information that they are able to determine from the packaging, background information and the poster.
7. Have each group evaluate their original predictions.
  - a. Were they accurate?
  - b. Was there anything that you did not consider in your predictions that you should have?
  - c. Which light bulb do you now think is the most effective and why?

**Extension Activities**

- A. Calculate the cost per watt of each bulb. Compare the cost per year to use each bulb. Compare the price of each bulb. Which bulb would be less expensive in terms of original cost and energy costs? Present the results on a poster.
- B. Have students evaluate school or home lighting. What types of lights are used? Would there be a more efficient option? How much energy would be saved by using these more energy efficient options?

**Time:** 3 class periods for research and development, 1 class period for sharing and presentation

## Alberta Curriculum Connections

- Grade 4 Social Studies (Current): *Alberta – Its Geography and People*
- Grade 4 Social Studies (New): *Alberta: A Sense of the Land*
- Grade 5 Social Studies (Current): *Canada – Its Geography and People; Physical Geography in Canada*
- Grade 5 Social Studies (New): *Physical Geography of Canada*
- Grade 7 Science: *Heat and Temperature*
- Grade 8 Social Studies (Current): *Geography of Canada and the United States*
- Grade 9 Science: *Electrical Principles and Technologies*

## Rationale

This activity will introduce students to the energy resources that are used to create electricity and how electricity is generated from them.

## Objectives

- Students will identify sources of energy and describe the mechanism of electricity generation from these sources.
- Students will recognize the sources as renewable or non-renewable.
- Students will understand the economic, social and environmental impacts of these sources.
- Students will describe the sources of energy uses in Alberta and in Canada.

## Materials

- The *Electricity* poster
- Resources from the *Electricity* kit – including the Resource CD
- Access to library and computers with internet connection
- Grading rubric – printed from the Resources CD
- Poster paper

*Teacher Note:  
Print the handout for  
this activity from the  
CD provided.*

## Activity

1. Teacher Preparation – from the Resource CD provided in the *Electricity* kit, print off a copy of the ‘grading Rubric’ and distribute to all students.
2. There are eight different energy sources for electricity production portrayed on the *Electricity* poster. Have the class study the poster and list what these sources are.  
**Sources:** Geothermal, Coal, Natural Gas/Cogeneration, Nuclear, Solar, Water, Biomass, Wind
3. The class will be divided into eight groups of 3-4 students. Each group will choose one of the above sources to research. Areas of research should include:
  - What is this energy source and where does it come from?
  - Is this energy source renewable or non-renewable?
  - Where is this source used in Alberta? In Canada?
  - How is this source used to make electricity? Describe the process.
  - What are the benefits and challenges related to this energy source? Investigate the environmental, economic and/or social costs and benefits of your source.*Alternative: have the class come up with significant questions to research and design the rubric based on what they think is important information.*
4. Each group will demonstrate their knowledge in one of the following forms:
  - poster
  - research paper
  - magazine or newspaper article
  - multi-media or power point presentation
  - 3-D model or any other format that is discussed and approved by the teacher

## WHAT DOES IT TAKE TO MAKE ELECTRICITY? *continued*

Make sure that everyone in your group agrees on the presentation format. The projects will be displayed in the class for all students upon completion.

- Once the topic and presentation form has been chosen, groups must develop a work outline for the project. The outline should detail what everyone in the group is going to contribute. An example follows:

Date: \_\_\_\_\_  
Group: \_\_\_\_\_  
Topic: \_\_\_\_\_

### **Research:**

- Where does this energy source come from? Is it renewable or non-renewable (explain)? Where is it used in Canada and Alberta? *Student name*
- How is electricity produced from this energy source? *Student name*
- What are the benefits and challenges related to this energy source (environmental, economic, social)?  
*Student name*

### **Project:**

Students may continue on in the area that they have been working, collecting pictures and writing about their own area, or divide up the task list another way. For example:

Poster –

Student #1 – collects pictures and labels

Student #2 – prints out information required for the poster as collected from other students' research

Student #3 – title, placement and finishing details

Students will receive a copy of the work outline with the grading rubric before their research commences (on Resources CD). Both will be handed in at the completion of the project and will be required for evaluation.

- Provide at least two work periods for research. Suggested materials are included in the *Electricity* kit in hard copy and on the CD provided. Also refer students to the list of websites in this guide (page 19).
- Provide at least one work period for putting the project together.
- Once the projects are complete, they will be displayed. Each group will do a short presentation to share their research. Students will be taking notes about each of the energy sources based on the information provided.
- A work outline, evaluation rubric and peer evaluation are available on the Resources CD as aids for student assessment of this project.

### **Extension Activities**

- Give students time to read and review their notes about different energy sources. Have them write a journal response to the question: "If you could choose what energy source your power comes from, which source would you choose and why?". Encourage students to be attentive to the potential arguments against wide-spread use of their chosen energy source as well. Remind students that there is no perfect electricity source. (*Hint: Students may find it hard to find the "cons" of solar energy. In Canada we do not receive enough direct sunlight to make it a practical source.*)
- Set up a class debate about the use of renewable versus non-renewable electricity sources.

**Time:** 2 classes

### Alberta Curriculum Connections

- Grade 4 Social Studies (Current): *Alberta – Its Geography and People*
- Grade 4 Social Studies (New): *Alberta – A Sense of the Land*
- Grade 5 Social Studies (Current): *Canada – Its Geography and People; Physical Geography in Canada*
- Grade 5 Social Studies (New): *Physical Geography of Canada*
- Grade 5 Science: *Electricity and Magnetism*;
- Grade 9 Science: *Electrical Principles and Technologies*

### Rationale

Students will have the opportunity to use scientific inquiry to compare incandescent and fluorescent light bulbs.

### Objectives

- Students will be able to identify incandescent and fluorescent light bulbs.
- Students will understand the difference in the way that the two types of bulbs create light.
- Students will research the differences in the two types of bulbs from scientific, economical and environmental perspectives.

### Materials

- A variety of fluorescent and incandescent light bulbs - one of each per group (Bulbs will need to be purchased)
- Lamps to test the bulbs
- *Electricity* poster
- Student worksheet (from Resource CD)
- Thermometers
- Light meters

*Teacher Note:  
Print the handout for  
this activity from the CD  
provided.*

### Background Information

Most household lights use one of two main types of bulbs—incandescent or compact fluorescent bulbs. Incandescent bulbs are the traditional rounded bulb-shaped light that students may be more familiar with. Of the two types these are much less expensive. Compact fluorescent bulbs are usually ‘oddly’ shaped in comparison to incandescent bulbs, and are generally speaking, significantly more expensive.

Fluorescent lights use significantly less energy than incandescent light bulbs because there is little energy lost in the form of heat. A 15-watt fluorescent light bulb provides the same amount of light as a 60-watt incandescent light bulb while using only a quarter of the heat. In addition, a fluorescent light will last eight to ten times longer than an incandescent.

This activity will test the effectiveness and efficiency of these two types of common lights.

### CAUTION

Be careful when handling electrical equipment. Unplug lamps before changing bulbs, do not touch exposed electrical circuits and allow hot bulbs to cool down before touching them.

# ELECTROMAGNETIC!

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**Time:** 1 class

## Alberta Curriculum Connections

- Grade 5 Science: *Electricity and Magnetism*
- Grade 9 Science: *Electrical Principles and Technologies*

## Rationale

Students will be introduced to the relationship between electricity and magnetism by building an electromagnet.

## Objectives

- Students will investigate the properties that make a strong electromagnet.
- Students will be introduced to the relationship between electricity and magnetism.

## Materials

- D-Cell batteries (2 per group)
- #22 insulated copper wire/ wire with enamel coating (*can be purchased at a local hardware store or Radio Shack*)
- Paper clips
- Nails (iron)
- Tin foil
- Electrical tape

## Background Information

Many modern devices and appliances including electric motors, computers, telephones, doorbells and televisions use electromagnets. Magnetism is an attraction between particles with an electrical charge. This attraction creates fields of force known as magnetic fields. When a metal core, such as iron, is placed inside of a coil of wire that is carrying an electrical current an electromagnet is formed. The strength of the magnet depends on the strength of the electrical current. The magnetic field exists only as long as the electrical current flows.

## Activity

1. Discuss the relationship between magnetism and electricity. Tell students that they will have the opportunity to develop a magnet using electricity. Distribute materials to each group.
2. Provide students with the following instructions.  
How to Build an Electromagnet:
  - a. Leaving extra wire at each end, wrap the wire tightly around the nail in loops.
  - b. Attach one end of the wire to each end of the battery and tape it in place with electrical tape.
  - c. Touch the end of the nail to a paper clip – the nail should be able to pick up the paper clip.
    - How many paper clips are you able to pick up?
    - Experiment with the following to see the maximum number of paper clips that you can pick up with a magnet:
      - a. Wrap more/ less coils around the nail
      - b. Change the tightness of the coils
      - c. Use different sizes of nails
      - d. Wrap tin foil around the magnet before wrapping the wire around
      - e. Join 2 batteries together (do not use more than 2 batteries)
    - Disconnect the wires from the battery. Are you still able to pick up paper clips?
3. Discuss as a class how many paper clips students were able to pick up and what the best strategies were for increasing the magnetism of the nail.

**Time:** 2 class periods

### Alberta Curriculum Connections

- Grade 4 Social Studies (Current): *Alberta – Its Geography and People*
- Grade 4 Social Studies (New): *Alberta: A Sense of the Land*
- Grade 5 Social Studies (Current): *Canada – Its Geography and People; Physical Geography in Canada*
- Grade 5 Social Studies (New): *Physical Geography of Canada*
- Grade 5 Science: *Mechanisms Using Electricity*
- Grade 7 Science: *Heat and Temperature*
- Grade 8 Social Studies: *Geography of Canada and the United States*
- Grade 9 Science: *Electrical Principles and Technologies*

### Rationale

This activity will provide students with the opportunity to see how they use electricity in their life through an investigation of electrical appliances.

### Objectives

- Students will generate a list of the electrical appliances used at home.
- Students will compare their use of electrical appliances to that of another generation.
- Students will consider their role in energy use and energy conservation.

### Materials

- Overhead sheets and pens or poster paper
- Handout “They Lived Without Televisions - Student Worksheet” (Printed from the Resources CD)
- Optional: *Electricity* poster

*Teacher Note:  
Print the handout for  
this activity from the CD  
provided.*

### Introduction

The number of household electrical appliances that we use today is substantially greater than what our grandparents and even parents grew up with. Over the past 100 years most of the appliances that we now take for granted were first introduced onto the market. The following list shows when some of these appliances were first available to consumers:

- 1904 - Electric washing machines (However, it wasn't until 1951 that washing machines with the ability to spin clothes were produced.)
- 1908 - Electric vacuum cleaner
- 1916 - Home refrigerator (The \$900 price tag made it more expensive than a good car!)
- 1969 - Home computer (Much larger than what we have now and much more expensive — \$10,600!)
- 1981 - IBM PC
- 1985 - Cell phones in cars (Great big ones that always had to be plugged in!)

In Canada, approximately 40% of the all energy consumed is for residential use — to operate these appliances and the assorted ‘gadgets’ that go along with them. The energy comes from the sun and our natural resources — both renewable and non-renewable. Although it is nice to enjoy the luxuries of our modern day appliances it is also important to conserve our energy resources.

### Activity

1. Introduce the concept of electrical appliances, what they are and how this market has expanded throughout the past century. Some possible discussion questions are:
  - How many appliances do you have in your house?
  - How many appliances do you think your parents had? How about your grandparents?
  - What new appliances have been introduced in your lifetime?
  - What types of new electrical appliances do you think might be introduced in the next 50 years?

2. Divide the class into seven groups and allocate each group a section of a house:

- Bedrooms
- Kitchen
- Yard and furnace room
- Family room / TV room / living room
- Bathroom / laundry room
- Home office
- Garage and workshop

*Teacher Note:  
Print the handout for  
this activity from the  
CD provided.*

Each group will be responsible for brainstorming all of the electrical appliances in a section of a house. Explain to students that the lists should be as extensive as possible. Even items like electric toothbrushes and waffle makers should be included. It does not matter whether the students have the items in their own homes. Students should use the house picture on the back of the *Electricity* poster to help them come up with ideas. Allow 10-15 minutes for brainstorming.

3. Provide each group with an overhead transparency and pens or poster paper and felt pens to record their ideas.
4. Have each group present their lists, using the overhead or displaying their poster paper. Meanwhile, the rest of the class should be copying the list onto their worksheet. After each group has presented their work, allow their classmates to add to the list — all students should have a complete list of appliances for all areas of the house. Give the class a few minutes to review their lists individually and add a few more appliances of their own.
5. From the Resource CD (included in the *Electricity* kit) print off a copy of the handout “They Lived Without Televisions - Student Worksheet”. Duplicate and distribute one or more copies to each student. Students may need more than one copy as the lists can be fairly extensive.

As a homework assignment, students will complete the handout “They Lived Without Televisions - Student Worksheet “ following the directions at the top of the page.

7. At the start of the following class discuss the results of the survey.
- How many more appliances did you have than the adult you questioned?
  - Consider the increase in household electrical appliances. How do you think this would effect home energy consumption?
  - Were there any appliances that you found at your house that were not already on the list?
  - What appliance would you have the hardest time living without?
  - What appliances do you have in your house that may not be necessary?
  - Why do people want so many appliances?
  - Do you think that it is important to consider the conservation of resources when buying and using appliances? Why or why not?
  - What negative impacts does the use of appliances have on the environment?

8. Now read the following scenario to the class:

*The federal government has developed new regulations that limit the amount of electricity Canadians can use. Under the new regulations, people will only be allowed to own and use no more than 10 electrical items in their homes. Heating and lighting do not have to be included in the 10 items.*

- a. Students must choose 10 items they feel they could not live without and rank them from 1 to 10 (1 being the most important, 10 being the least important). Students must be prepared to defend their choices.

b. Discuss the results:

- Which items are regarded as most important?
- Which part of the house were the most important items in?
- Why were they more important?

**Extension Activities**

A. Have students write a journal entry on the following scenario:

*Energy shortages are being faced in parts of Canada and the United States. Imagine that the electricity in your community is down for a full week. You have NO POWER! Describe the week. How would your week be different? What would you do? How would you feel when the power went on?*

B. Brainstorm a list of responsible electricity use and electricity saving measures which students follow at home and at school. Challenge students to be particularly “Electricity Smart” for a week. At the end of the week, discuss success stories and why some activities may have been more difficult than others.

C. Individually or in groups, have students come up with solutions for the following issue:

*Many of the resources we rely on for electricity come from non-renewable energy sources. If the demand for electrical appliances continues to increase and the availability of our non-renewable resources decreases how can we meet the energy needs and the wants of the consumers?*



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*printed January 2010*