



Electricity Conservation & YOU! Elementary

Recipes for Taking Action



ELECTRICITY CONSERVATION & YOU!

OVERVIEW

Everywhere you look the word is out that we need to start to conserve electricity. In this project, your students will explore how they use electricity in their lives, investigate alternative energy options and take a look at the actions they can take to decrease their electricity use at home and at school. They will conduct a school audit to analyze what uses up electricity at school!

Teachers may choose to complete all activities included in Electricity Conservation and You or select those most relevant to their curriculum demands.

LEARNING OBJECTIVES:

For students to:

- Explore and assess renewable and non-renewable sources in meeting our energy needs
- Identify the impacts (societal, environmental, and economic) of our energy use
- Explore the causes and consequences of climate change
- Investigate strategies for reducing/conserving energy use and identify the related benefits
- Develop and carry out an action plan designed to measure and improve electricity use in the school and at home
- Consider other actions they may take either as individuals or as a class to reduce energy consumption

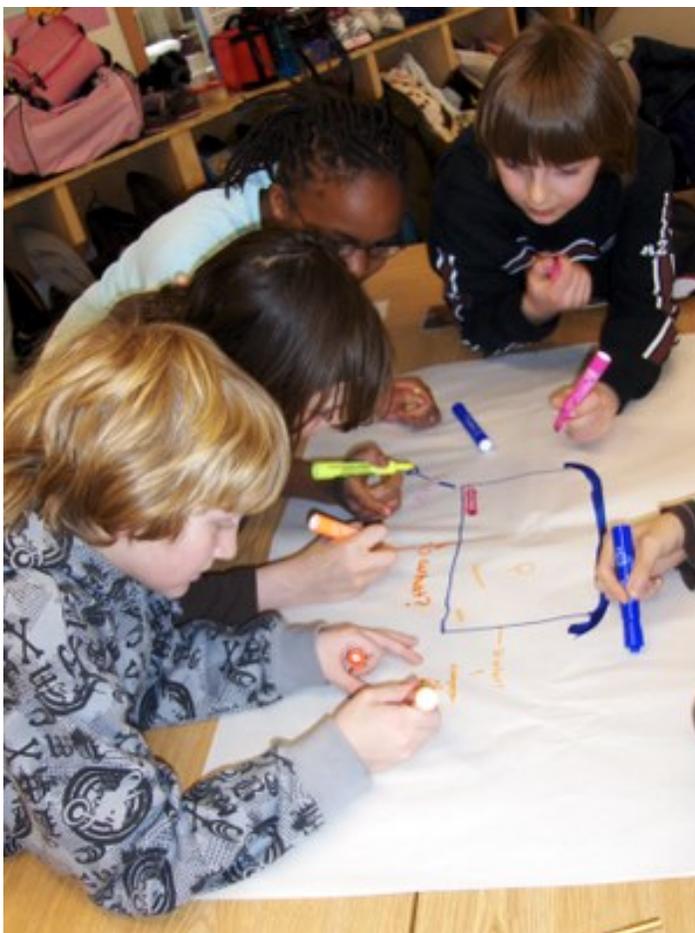


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PLEASE HELP REDUCE THE AMOUNT OF PAPER WE ALL USE BY PRINTING DOUBLE-SIDED OR PRINTING ON PAPER THAT HAS ALREADY BEEN USED ON ONE SIDE. MODEL SUSTAINABLE BEHAVIOUR FOR YOUR STUDENTS; REMEMBER, YOUR ACTIONS SPEAK LOUDER THAN WORDS!

WHY IS THIS PROJECT IMPORTANT?

We use energy every day in our lives. It's easy to forget that when we turn something on, something is being used up and it's costing someone money. We can also easily forget that in many situations, there are downstream costs to produce the electricity we are using and often this is our environment. Electricity demand in Canada is expected to grow at an annual rate of 1 per cent between 2010 and 2035. In order to meet this demand, Canadian producers will increase their generation capacity.

While electricity is the major component in our energy consumption, these activities should lead students to explore other ways in which we consume energy, the cumulative effect of our energy consumption and the steps they might take to reduce this consumption and thereby mitigate the accompanying negative effects.

The sources of future supply will depend on the policy and business decisions made by governments and power producers respectively, but an informed public who recognize the implications of the choices we make can influence those decisions. Individuals and communities can also take direct action.

The goal of this project is to raise student awareness and understanding of the energy options available to us, to assess the merits of those options, and to take action with respect to energy conservation that reflects an enhanced understanding. Students will explore the rationale for conserving electricity so as to realize the following benefits:

1. A reduction in the negative effects of fossil fuel consumption (health problems, climate change/global warming)
2. A decrease in the risks associated with extracting coal, oil and natural gas (habitat destruction, environmental contamination)
3. Cost savings: reducing energy reduces the financial cost associated with consumption and a healthier society saves on medical expenses.
4. A decrease in our dependence on those countries that supply our fossil fuels.

KEY CONSIDERATIONS

The choices we make with respect to how much energy we consume and how our demand will be met has consequences for us as individuals, for other peoples with whom we share the planet, and for the plants and animals that have no voice in those decisions. Some considerations:

- Burning fossil fuels (oil, coal and natural gas) has resulted in more than a 25 percent increase in the amount of carbon dioxide in our atmosphere. Climate scientists predict that if carbon dioxide levels continue to increase, the planet will become warmer in the next century. Projected temperature increases will most likely result in a variety of impacts. In coastal areas, sea-level rise due to the warming of the oceans and the melting of glaciers may lead to the inundation of wetlands, river deltas, and even populated areas. Altered weather patterns may result in more extreme weather events and inland agricultural zones could suffer an increase in the frequency of droughts. See [Fossil Fuels](#).
- Emissions from the burning of fossil fuels also contribute to air pollution known as smog. Smog has been identified as contributing each year to thousands of premature deaths and increased hospital visits in Canada. Respiratory illness, such as asthma, is also increasing. See [The Hidden Cost of Fossil Fuels](#).
- Large-scale hydro-electric projects flood massive amounts of land (upon which many animals, including humans, may be living), disrupt the natural flow of rivers, wash pollutants into the river, disrupt the way of life of the humans living on/near the river, and require the construction of a lot of infrastructure. See [Environmental Impacts of Hydroelectric Power](#).
- Non-renewable energy sources, such as fossil fuels, will eventually dwindle and become too expensive or too environmentally damaging to retrieve.

CURRICULUM LINKS

Electricity Conservation and You is intended to support Middle School teachers in meeting the curriculum outcomes outlined in the chart below.

Curriculum Links

Jurisdiction	Subject /Grade Level	Unit Title
Ontario	Science / Grade 5	Conservation of Energy and Resources
	Science &Technology/ Grade 6	Electricity and Electrical Devices
	Science &Technology/ Grade 7	Heat in the Environment
	Grade 7 Geography	Natural Resources Around The World: Use and Sustainability
Quebec	Science & Technology/ Grade 6	Material World
Saskatchewan	Science / Grade 6	Understanding Electricity
	Science/ Grade 7	Physical Science: Heat and Temperature
Manitoba	Science/ Grade 6	Electricity
Nova Scotia	Science / Grade 6	Physical Science: Electricity
New Brunswick	Science / Grade 6	Physical Science: Electricity
Prince Edward Island	Science / Grade 6	Physical Science: Electricity
Nfld. –Lab.	Science / Grade 6	Physical Science: Electricity
BC	Science / Grade 6	Electricity

Yukon	Science / Grade 6	Electricity
Alberta	Science/ Grade 5 Science/ Grade 7	Mechanism Using Energy Heat and Temperature
North West Territories	Science/ Grade 5 Science/ Grade 7	Energy and Control: Conservation of Energy Heat and Temperature
Nunavut	Science/ Grade 5 Science/ Grade 6 Science/ Grade 7	Energy and Control: Conservation of Energy Energy and Control: Electricity Heat and Temperature

BEFORE YOU BEGIN

Contact LSF one month before project implementation, to register your class for the Electricity Conservation and YOU program. We can lend you the kilowatt meters needed for Section 3, Part A.

PART A: WHERE ENERGY COMES FROM



LEARNING OUTCOMES:

Teachers will use the information students share in the mindmap to assist with the teaching of the *Electricity Conservation and You* activities and to address any misconceptions students have concerning electricity use and electricity conservation.

DESCRIPTION:

As a class, create a large mindmap on the blackboard, whiteboard or large piece of paper under the heading:

Electricity Use in Our Lives

MATERIALS:

- Blackboard/whiteboard or large piece of paper
- Camera (if using blackboard or whiteboard)

RELEVANT TEACHER RESOURCES:

- Mind Mapping Tools for [Students](#) and for [Teachers](#)

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SECTION 1: GETTING READY AND ASKING WHY

PART A: WHERE ENERGY COMES FROM AND HOW AND WHY WE USE IT

Activity: **Mind Map**

1. Teach students how to complete a mindmap using easy every day ideas. For examples and tips, check out page 34 of LSF's [Discover Tech Loop](#).
2. Briefly discuss what using energy means. Encourage students to think about how when we make something, move something, or heat something, we are using a form of energy. Try to use this type of simple clear language so all students can try to understand the abstract idea of energy.
3. Ask students to consider how energy is used in the production and distribution of the food we eat, in making and distributing the clothes we wear, in heating our school and houses, in the means by which we get from A to B, in lighting our homes, and powering our video games and cell phones.
4. Take a picture or keep the paper used for the brainstorm for reference at conclusion of study.
5. Direct younger students to Ontario Power's [Kid's Corner](#) to view the sections "How Electricity Gets into Your Home" and "The History of Electricity."

PART B: ELECTRICITY GENERATION AND ITS CONSEQUENCES



LEARNING OUTCOMES:

Students will consider the ecological, social and economic consequences of electricity generated from various sources and distinguish between renewable and non – renewable sources.

DESCRIPTION:

Students discuss the mix of sources of electricity. They work in groups to identify the amount and source of the energy consumed in each of the Provinces and Territories and the advantages and disadvantages of various energy sources. Students are introduced to types of renewable energy and investigate and report on the benefits associated with their use.

MATERIALS:

- Computer access
- Props to explain (very generally) how each source of electricity 'works' (optional)

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PART B: ELECTRICITY GENERATION AND ITS CONSEQUENCES

Activity: Sources of Electricity

1. Ask students to suggest the different sources of electricity (oil, coal, wind, solar, hydroelectric, natural gas, biomass, etc.).
2. Divide students into groups to report on how a particular source of energy is used to produce the electricity we consume. Teachers may use the video [Energy Sources](#) as a general introduction.
3. Divide the class into groups representative of the Canadian Provinces and Territories. Have each group report on the amount of electricity consumed in each constituency. Post the results and engage students in a discussion of why differences in the rate of consumption may vary among Provinces and Territories. Students can consult Canadian Geographic's [Energy Use in Canada](#) for required information.
4. Working in the same groups, have students report on energy sources of electricity and the relative proportion used in each of the Provinces and Territories and discuss the reasons for the proportions that exist. Students can find the information by viewing [Sources of Energy in Canadian Provinces](#).

Activity: Consequences of Electricity Generation from Different Energy Sources

Working in the same groups, have students begin a tentative discussion of the advantages and disadvantages of each of the energy sources using [the table](#) and Internet resources provided.

Each of the groups may create a poster rather than complete the table. If posters are used, each group will display their posters around the room. Students move from poster to poster, writing questions or comments on sticky notes and stick them to the poster they are critiquing. Students return to their poster and make a short presentation to the class.

PART C: ELECTRICITY USE AND CLIMATE CHANGE



LEARNING OUTCOMES:

Students will learn the basics of climate change, explore some of the links between energy use and climate change and identify actions they may take with respect to energy use to make a difference in the future of planet Earth.

DESCRIPTION:

Students will explore the topic of climate change by creating murals to record their understanding of the what, where and why of climate change; conduct a simple experiment to demonstrate the greenhouse effect; and implement an eco-audit to investigate the potential for energy-saving measures.

RELEVANT TEACHER RESOURCES:

- [Climate Change: Connections & Solutions, Gr. 6-8](#)
- [Climate Change: Creating Solutions for Our Future](#)

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Activity: Evaluating Renewable Energy

Renewable energy sources (geothermal power, tidal power, wind power, hydroelectric power, wave power, solar power, biomass, heat pump, carbon sequestering) have been identified as part of any shift to move from our dependency on fossil fuels and other non-renewable sources.

1. Working in teams, students will research and evaluate the merits of and the challenges represented by each of these renewables, using [the organizer](#).
2. Once the research is complete, as a class, arrange the options according to the principles of [diamond ranking](#), where #1 is the most attractive option and #9 the least attractive
3. **Alternative activities** for exploring the pros and cons of renewable energy include [Rethinking Energy Sources](#) and [Is It Renewable or Non-Renewable Energy?](#)

PART C: ELECTRICITY USE AND CLIMATE CHANGE

The use of fossil fuels to meet our electricity needs is responsible in large part for changes in the earth's climate. Introduce students to the concept of climate change by having them examine its causes and consequences.

Activity: Our Changing Climate

Students will make use of the information and direction in [Our Changing Climate](#) to demonstrate the greenhouse effect and explore its role in climate change.

Activity: The Impact of Climate Change

Using [A Student's Guide to Climate Change](#), investigate the impact of climate change on agriculture, water supply, health, plants, animals and ecosystems, recreation, and coastal areas.

SECTION 2: CONSERVING ELECTRICITY



LEARNING OUTCOMES:

Students will explore their personal energy consumption, identify the benefits of energy conservation and implement a plan to reduce their personal energy use.

DESCRIPTION:

Students will record their daily energy use on a 24 - hour clock, implement an energy reduction plan, and evaluate the challenges involved in realizing the benefits of greater energy efficiency.

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SECTION 2: CONSERVING ELECTRICITY

Having learned of some of the negative effects of our energy use, students may now begin an exploration of how they might conserve electricity and what is being done in this regard.

Activity: Using and Conserving Energy

Using the *Personal Energy Clock Activity*, found on page 50 of the [Sustainable Schools Manual](#), students gather and document information about personal daily energy use and understand how lifestyle choices affect energy use.

Activity: Benefits of Conservation

Working in pairs or in groups, have students complete the table below. See [Benefits of Energy Conservation](#) or [Top 5 Reasons to Be Energy Efficient](#) for relevant information.

BENEFITS OF ELECTRICITY CONSERVATION

Economic Benefits	Social Benefits	Environmental Benefits

PART A: PRE-AUDIT ACTIVITIES



LEARNING OUTCOMES:

Students will identify the benefits of a school energy audit, measure the energy consumed by selected electronic devices, and design the parameters of a school audit.

DESCRIPTION:

Students will develop an audit plan that includes what school rooms will be audited, what items will be audited, and a method of measuring and recording the data collected.

MATERIALS:

- Kilowatt meters
- Several small electric appliances
- Worksheets for each student—side one and two (below)

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SECTION 3: CONDUCTING AN ENERGY AUDIT

PART A: PRE-AUDIT ACTIVITIES

Activity: **Preparing for Audit**

1. Inform students that they are going to conduct an audit of electricity use in their school. Discuss what is meant by an audit (a methodical check-up, an examination, going over something, or a review). Explain that in this energy audit students will conduct a survey on how electricity is being used in their school.
2. Discuss with students why they should undertake an audit of electricity use in their school. Students should understand that if we want to realize the benefits of conserving electricity, we must understand first where and how it is being used in order to identify waste and take steps to conserve.
3. Generate a list of possible items that they would want to audit in terms of their electricity use/abuse. Discuss how they will test the items listed by introducing the concept of kilowatt-hours and kilowatt meters.
4. Carefully review the [Must Do List](#) prior to undertaking school audit.

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Activity: Measuring Electricity of Electrical Devices

Note: Kilowatt meters can be borrowed from LSF (call 1.877.250.8202 or email joanne@lsf-lst.ca), borrowed from many public libraries, or purchased for approximately \$29.95 from [Kador](#) and other online retailers.)

1. To prepare for the school audit have students measure the amount of electricity used by a number of selected electrical devices (laptops, various types of electrical bulbs, printers, etc.). Discuss what is meant by vampire power (power being consumed by appliance when not being used) and why they should include this in their audit.
2. Ask students for examples of units that are used to measure: mass, length, time, etc. Explain that a “watt” is a unit that is used to measure quantities of electricity.
3. Demonstrate how to use the electricity meter and explain the logic required to complete one row of calculations. See [Teacher's Example](#) and [Worksheet](#) for help.
4. Provide students with time to do their own measurements and complete calculations.
5. Use the following questions to guide student reflection on the activity:
 - a. What was the most surprising thing you learned?
 - b. What implications (if any) does this activity have for the way you use electricity?
 - c. What implications (if any) does this activity have for the way your family members use electricity?
 - d. What implications (if any) does this activity have for the way people at school use electricity?



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Activity: Designing the Audit

1. In pairs, ask students to brainstorm two lists:
 - a. All of the things that are used in the school that require electricity.
 - b. All of the things in the school that are sometimes on when they do not need to be on.
2. In pairs, ask students to design a method for conducting an audit of things in the school that are wasting electricity. You may wish to provide some of the prompts below.
 - a. What rooms/places will you visit?
 - b. How will you decide if something is “wasting” electricity?
 - c. What will you look for?
 - d. How will you track the information?
 - e. Should you and your partner do the whole school? Is there a way for the class to share the load?
 - f. At what time of day would it be most important to do the audit?
3. Have two pairs meet to make a foursome and have the students refine their audits based on their shared activities.
4. Collect the audit sheets and provide formative feedback.
5. Here are two sample tools teachers may wish to consider using as a template, based on the above pre-audit activities:

[School Energy Audit](#)

[PowerSave Schools Energy Audit Checklist](#)



PART B: CONDUCTING A SCHOOL AUDIT



LEARNING OUTCOMES:

Students will develop and practice the skills required to undertake an energy audit and to evaluate the data collected.

DESCRIPTION:

Students will cooperate to create an audit procedure, compile the data collected and make recommendations for greater energy efficiency in the school based on their findings.

MATERIALS:

- Kilowatt meters

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PART B: CONDUCTING A SCHOOL AUDIT

Activity: Conducting the Audit and Compiling the Data

1. As a class, create an audit procedure that works for your group (e.g., who will do what room, etc.). Decide on a time/date for conducting the audit. Check that there is enough consistency among the students' methods that the data can be compared (for example, how are the students deciding whether or not something is wasting electricity?).
2. Conduct the audit.
3. Compile the data. Students may wish to determine the KWH price of electricity in their area and estimate the cost related to their finding. If meters are not available, easy to use online calculators can be found [here](#).
4. Students present their audit results, including an explanation of their data collections.
5. Collect students' completed audit for assessment.
6. Individually, ask students to reflect on the following questions:
 - a. How do you feel about the results of your first audit?
 - b. What happened that was consistent with your expectations?
 - c. What happened that surprised you?
 - d. Is it important to you for the school to use less electricity? Why or why not?
 - e. Are there things that you could do at school to save electricity? If yes, what are they? If no, why not?

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Activity: Make Recommendations

1. In pairs, ask students to brainstorm methods that could be used to further reduce electricity use at school. For example, students could:
 - a. Do spot-checks to see who has the lights turned off at recess time, has turned power bars off at night, etc. and:
 - i. Put a congratulatory note on the door of each room that did something well.
 - ii. Read the names of the rooms that did a good job saving electricity on the announcements.
 - iii. Put the names in a special column on the school website.
 - iv. Give electricity-saving classrooms tickets for a draw for a special prize.
 - v. Work with administrators and caretakers to purchase power bars for the classrooms for printers, etc. to avoid the use of “phantom power.”
 - vi. Work with key people in the school to change the power saving settings on the computer so that the computers automatically power down at nighttime.
2. After the brainstorming session, ask students, in pairs, to rate each idea as:
 - a. Probably very effective, probably somewhat effective or probably not effective.
 - b. Probably do-able (but difficult), probably do-able (and easy), or probably not do-able.
3. Create a class list of things that are both “probably effective” and “probably do-able.” Listen to students’ discussions to see if there are opportunities to challenge and/or compliment them on their logic.



PART C: FOLLOW-UP ACTIVITIES



LEARNING OUTCOMES:

Students will develop the understanding and skills required to implement an action plan designed to reduce energy wastage in their school and to evaluate the effectiveness of their plan.

DESCRIPTION:

Students will design and implement a strategy to encourage energy conservation within their school and conduct a second audit to identify the effectiveness of their strategy by comparing the data obtained from the two audits.

MATERIALS:

- Sample audit tools found in the No Idling kit at www.ecoleague.ca (optional)
- Materials from the activities in Part A

RELEVANT TEACHER RESOURCES:

- [The Classroom Energy Diet Challenge](#)

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PART C: FOLLOW-UP ACTIVITIES

Activity: Design and Implement Energy Conservation Measures

1. Tell the students that as a class you will implement some of the ideas to encourage conservation and then repeat the school audit a few weeks/months after you have implemented your ideas.
2. Choose some ideas to implement. Consider using this as an opportunity to teach the consensus method of decision-making. For tools for building consensus, check out LSF's [ESSAP guide](#).
3. In pairs, ask the students to brainstorm ideas to visually represent the amount of electricity waste that they witnessed in the first audit so that it can later be compared to the amount of waste that will be identified in the second audit. Encourage the students to consider visual icons that they associate with the consequences of wasting electricity. Have each pair create this visual "waste meter" and place the waste meters in appropriate places throughout the school.
4. Implement your ideas.

Activity: Conduct a Follow-Up Audit

Ask individual students to reflect on the following questions and then discuss as a class:

1. Are there any changes that you would like to make to the audit process we used last time?
2. What changes can we make that will still allow us to compare the new data to the old data in a meaningful way?
3. What changes should we not make this time so that we can compare the new data to the old data in a meaningful way?
4. Conduct the follow up audit and compile the new data.

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5. Ask students to compare the new data to the data from the first waste audit. Have them reflect on the following questions individually and then discuss them as a class:
 - a. Was there a change in the amount of electricity being wasted? If so, why do you think this happened? If not, why do you think there was no change?
 - b. Your class implemented strategies to encourage people to be careful with the amount of electricity they use. Do you think the strategies were effective? Why or why not?
 - c. What have you learned about trying to change peoples' behaviour?
 - d. If you were going to create new strategies to change peoples' behaviour about something other than saving electricity, what are some things that you think are important to consider?
 - e. What would you like to happen next?



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SECTION 4: TAKING ACTION – ACTION PROJECT IDEAS

We have explored the reasons for reducing our electricity consumption and some of the measures that may be taken to reduce that consumption. Electricity use, however, is part of the larger issue of energy production and consumption, and we are becoming increasingly aware that our practices in this regard are having a major impact on the planet's climate.

The choices we make with respect to how much energy we consume and how our demand will be met have consequences for us as individuals, for other peoples with whom we share the planet, and for the plants and animals that have no voice in those decisions. Below are some suggested actions/activities students might consider as possible responses in providing for their electricity needs while helping to meet the challenges of climate change.

Personal Audit

Ask students to spend five days keeping track of the opportunities that they have to reduce their personal use of electricity. The personal energy audit and action activities found in Falls Brook Centre's [Sustainable Schools Manual](#) (pgs. 49-59) offer excellent suggestions.

Home Audit

Our homes are filled with appliances that use electricity. Students can select one room in their house and use the approach outlined in the school audit to calculate the energy consumption of various appliances in that room, including the "stand by" power, which enables the appliance to be turned on quickly. On completion of the audit, students may make a "What If" list of things they might do to achieve greater efficiency or reduce electrical use and calculate the savings that might be realized.

Relevant Resources: [Home Energy Audit](#), [Middle School Home Energy Audit](#), and [Energy Efficiency in the Home](#).



Community Audit

Students may take action to educate and influence their local community regarding electricity use and the opportunities to adopt more efficient practices. In order to affect change in this regard, students must collect relevant data regarding their community's use of electricity and the perspectives that shape that use. A plan of action that helps student gather the required information through interviews, plot the data gained by the interviews, and effect positive changes at the local level may be found at [Conducting an Electricity Interview](#).

Vampire Power

Experts say that in the average U.S. home, 25 percent of electricity use by home electronics occurs while the products are off [source: [Pogue](#)]. This unused power is called "vampire power." Is this power used for anything? Do electronics manufacturers hate the environment? Are you ready to pick up your stake, take a stab at saving electricity and fight vampire power? Students form a Vampire Slayer Club, the aim of which will be to identify vampire power in their school and/or home and take steps to combat this energy loss that costs consumers billions of dollars worldwide.

Relevant Resources: ["Energy Vampires" are draining your power and money. Here's what to do about it, 'Unplug Me' Activity](#)