



Little Brown Myotis

Arctic Energy Inspiration

The little brown myotis, also known as the **little brown bat**, is the most common bat in the NWT! It likes to hibernate here and lives in colonies in buildings, tree hollows, under bark, in rock crevices and caves. When a little brown myotis is looking for a place to live, it looks for somewhere that's very energy efficient – a small space that is well sealed. Learn more about energy-efficient bat houses

 [Bob's Bat Cave](#)

 SMART Board / Promixa Ready

 Northern Resources

Gr.6 Energy Costs

ARCTIC ENERGY

OBJECTIVE Students will determine where and how they use energy of all types. Students will be challenged to develop ideas for how to reduce costs.

Energy costs in the Northwest Territories are often higher than in other parts of Canada because of the remote locations of communities and the colder climate. It is important for people across the Northwest Territories to reduce how much energy they use in order to reduce their energy costs. Once students understand how much energy they use, they can begin to make choices to consume less energy, benefitting their families and the environment!

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CURRICULUM Links



The activities and resources in this document are intended to tie in with grade 6 science and technology curriculum *Electricity*, as well as the Dene Kede and Inuuqatigiit curriculum relating to the land. You can find specific learning outcomes for each of these by following the links below.

Dene Kede and Inuuqatigiit curriculum contain a lot of useful advice about bringing northern culture, language and traditional knowledge into the classroom. In culture-based education, teachers are expected to offer students the opportunity to extend learning experiences necessary in K–12 skills. Teachers are to involve students in key experiences, both on the land and in school. In addition, culture-based education is enhanced with the involvement of Elders. ECE has developed a resource to provide valuable information about inviting Elders to contribute to lessons and related activities. Interview templates are included as well as practical advice about compensation (see **Teacher’s Resources**). Here are some examples of where the lessons in this resource connect with these different curricula. Some suggestions for making connections have been included in the lesson plans, too.

Grade 6: Science & Technology

General Learning Outcome

Identify uses of electricity in the home and community and evaluate the impact of these uses on both our quality of life and the environment.

Specific Learning Outcomes

Describe conditions that could affect the consumption of electrical energy in the home and at school.

Develop a plan for reducing electricity consumption at home or at school and assess how this change could affect the economy (e.g., jobs) and our use of natural resources.

Compare using tables and charts the cost of electricity in various NWT communities and their mode of generating electricity.

Connected Lessons

Lesson 2 – What is the Cost of Electricity?

CURRICULUM Links



Dene Kede - Land

General Learning Outcomes

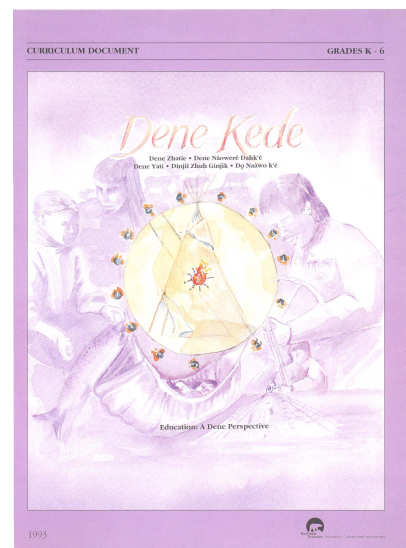
With the aid of the Dene Language, students can explore the following thematic units: Fire, Water and Rivers, Trees, Sun, Camping, Geography and Land Use, The Arrival of Non-Dene.

Specific Cultural Expectations

Students will understand the importance and meaning of their relationship to the land.

Connected Lesson

**Lesson 1 -
Community Energy Profile**



Innuqatigiit - Land

General Objectives

The following is a list of thematic units with relevant connections between Innuqatigiit and Energy Costs

Key Themes

Land, Water, Sky, Weather and
Weather Predicting

Connected Lessons

**Lesson 1 -
Community Energy Profile**



TEACHER'S Resources



Videos

Energy 101: Electrical Generation (5:18)

<http://www.youtube.com/watch?v=2oVb6hlQSg>

What's a Watt? (2:01)

https://www.youtube.com/watch?v=1_KjuGNzxc

Energy Efficiency Today: NWT Climate Change (14:09)

<http://vimeo.com/21820397>

Arctic Energy Alliance Library of Videos

<http://aea.nt.ca/research/research-5>

Handouts and Websites

Community Energy Profiles from Arctic Energy Alliance

<http://aea.nt.ca/communities>

Energy Management Initiatives Comic Book

<http://aea.nt.ca/research/research-4>

Energy and the Environment Activity Book

<http://www.nrcan.gc.ca/energy/efficiency/kidsclub/7811>

Energy Saving Tips

<http://www.ntpc.com/smart-energy/how-to-save-energy/top-tips-to-save-energy>

Cost of Electricity Lesson Plan

<https://www.consumersenergy.com/uploadedFiles/Kids/The%20Cost%20of%20Electricity.pdf>

Paths to Renewable Resources

<http://www.anorthernvision.ca/documents/RenewableEnergyInventoryEN.pdf>

Ontario Power Authority Kids' Corner

<http://kids.saveonenergy.ca/en/index.html>

Green Learning COOL 2.0 Education Database Energy Lesson Plans and resources

<http://cool.greenlearning.ca/database/?search=go&Keywords=energy&TypeID=&CatID=&SubjectID=&YearID=&GradeID=&StateID=&LanguageID=>

A Handbook of Power Smart energy Efficiency Learning Resources

http://www.edu.gov.mb.ca/k12/tech/imym/6/resources/pemp_2005.pdf

Energy Hog teacher and student resource guide

<http://energyhog.org/adult/resources/>

Energy Lesson plans from the US Government

<http://energy.gov/eere/education/k-12-lesson-plans-activities>

Government of the Yukon Easy Tip Sheets

http://www.energy.gov.yk.ca/energy_efficiency.html

Nunavut

<http://www.energy.gov.nu.ca/en/home.aspx>

On the Frontlines of Climate Change: What's really happening in the Northwest Territories

<http://sen.parl.gc.ca/nsibbeston/Final%20for%20WEB%20or%20Email.pdf>

LESSON Plans



Lesson 1: Investigating your Community's Energy Profile

1 class period. Introduces the concept of energy.

Energy: the ability to do work. “Muscle power” is energy from the food (fuel) our bodies consume and convert to the muscular ability of our bodies to do work. We often replace our own bodies’ energy with other forms of energy: fossil fuels to drive engines, electricity to power appliances, etc. Ultimately, all energy — whether fossil fuels, renewable energies (like wind and solar) and the foods (animal and plant) that fuel our bodies — comes from the Sun.

To get started:

- Create a table with three headings: Transport, Heat and Services. As a class, brainstorm a list of things that require energy under the three headings. *What requires energy? What type of energy does it require?* Gasoline, muscle power... Colour code the types of energy that require electricity.
- Draw a light bulb on chart paper or the white board. Ask the students to share all their words and ideas related to electricity.
- Then ask, *where does the electricity that powers your community come from?*

In the Northwest Territories, three main energy sources generate **electricity: natural gas, diesel fuel** and **hydroelectricity** (“hydro”) resources.

If your community is one of the 8 in the Great Slave Lake area, it uses hydroelectricity; Norman Wells uses natural gas and the remaining 24 communities use diesel. Out of the total electrical energy consumption in NWT communities, hydro makes up 74%, diesel makes up 17% and natural gas 9%.

? Community energy profiles show energy use in each community in the NWT. Using your community’s energy profile ([download free copies here](#)) investigate the following questions:

1. *Where does your community get its electricity from?*
2. *How much of your community’s energy needs is used for electricity?*
3. *What are the biggest uses of electricity in your community?*
4. *What are some ways you could reduce how much electricity is being used?*
5. *Why would you want to reduce your electricity use?*

▶ Electricity Generation (5:30)

This video about electrical generation will help solidify students’ understanding of how different systems transform energy into electricity.

LESSON Plans



Lesson 2: What is the Cost of Electricity?

2 class periods.

Energy plays a very important role in our everyday lives. Because electricity is available to us as the flip of a switch, we often don't pay much attention to where it comes from, or how much it costs. Energy not only costs us money to use, but energy costs the environment in many ways. The energy that powers our homes and schools is heavily supplied by fossil fuels, such as oil, gas and diesel. These release greenhouse gases into the atmosphere, which cause climate change, transforming habitats, like the little brown bat's, at an alarming rate.

Climate Witnesses (2:15)

Watch this video featuring Inuit voices talking about the effects climate change has had on Canada's North.

All sources of electricity generating energy affect the environment in some way. For **non-renewable** sources, like burning diesel fuel and natural gas, we can calculate greenhouse gas production to determine the cost to the environment (greenhouse gas production).

- *What are some impacts on the environment of renewable energy sources, like hydro-electric wood (biomass), solar and wind-generated electricity?* Hydroelectric power plants can harm fish and their habitats, wind turbines can disrupt birds and bats and their flight paths and large scale solar power plants take up a lot of space. Wood haresting can impact wildlife and fish habitat, wood pellet production requires a great deal ??
- *How do negative impacts of renewable energy production compare to negative impacts of non-renewable energy production?*

Greenhouse Gas Emissions Table

Electricity Type	1 kWh results in ____ grams of GHG emissions
Hydro-generated electricity	0 grams of emissions (as water is a renewable resource)
Wind generated electricity	0 grams of emissions (as wind is a renewable resource)
Solar generated electricity	0 grams of emissions (as solar is a renewable resource)
Natural gas generated electricity	380 grams/kWh
Diesel-generated electricity	795 grams/kWh

Teachers: Challenge your students to consider full cost accounting for all the methods of electricity generation. Water may be a renewable resource, but there is a cost to developing a hydro-electric plant.

LESSON Plans



Electrical consumption of appliances is stated in kilowatt-hours (kWh). Most electrical devices list electrical consumption in Watts. Examine an appliance in the class and locate its electrical consumption information in Watts. A kilowatt (kW) is one thousand (kilo) watts and a kilowatt-hour (kWh) is the standard measure of electricity usage measured as one kilowatt of power supplied to, or taken from, an electric circuit steadily for one hour. To figure out how much the appliances in your home cost you every year, fill out the **Energy Use at Your House** charts on the following pages using these steps:

1. Fill in how many Watts the appliance uses. Use an example from the **common appliances table** or do a survey of the equipment and machines in your classroom (computer, printer, projector, etc.); look on the back of the appliance, the watts are usually stated as a number with a W.
2. Estimate how many hours that appliance is used in a day.
3. Calculate the electricity consumed in a day in kWh (multiply the watts by how many hours used and divide by 1,000).
4. Determine the cost of energy in dollars per kWh by using the **Fuel Costs Library chart** and finding your community.
5. Next, calculate the daily cost by multiplying the electricity consumed by the energy price.
6. Calculate the monthly and annual costs.

What is a **subsidy**? [Find out more about subsidies here](#)

The subsidized rate is applied up to 600 kWh in the summer (April 1st – Aug. 31st) and up to 1000 kWh in the winter (Sept. 1st – March 31st) but once you are over that, you pay the unsubsidized rate.

Try doing the chart again with the ‘over the subsidy’ to get the true costs of electricity in our homes. Does it make a big impact?



Connect with Arctic Energy Alliance!

Contact with staff at the Yellowknife office (phone; 867-920-3333, 101-5102 51st Street) for information on classroom visits and neat equipment they can share to help track energy consumption and identify energy efficient appliances.



Check out a [table](#) from the Northwest Territories Power Corporation to discover how much energy common appliances consume or view the Arctic Energy Alliance’s [library of fuel costs](#).



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Energy Use at Your House

Name
Date



(Example is using the subsidized rate of \$0.26/kWh)

A B C D E F G H I

Appliance	Time Used Hours/wk	Watts	Total Watts (A x B)	kWh / wk (D % 1000)	\$ per kWh	Weekly Cost	GHG/kWh	grams of GHGs/week
Oven	4	3060	12,240	12.24	\$0.26	\$3.18	0	0
J Totals								

Home Energy Use Chart Instructions:

- Choose 5 major appliances.
- Estimate how many hours per week (on average) this appliance is used.
- Write in the number of watts used per hour of operation.
- Multiply "B" times "C" to find the total watts per week.
- Divide by 1,000 to get the kilowatt hours per week.
- Check the "Fuel Costs Library" for the cost for a kWh in Yellowknife.
- Multiply "E" times "F" to get the cost per week.
- Using the "GHG's" per Kilowatt-hour table (below) write in the number of grams of Green House Gases (GHG) per kWh for your type of energy generation. For example – Yellowknife uses "0" but Aklavik and many other small communities use 795 grams/kWh!
- Multiply (E) by (H) to get the total grams of Green House Gas Emissions for using that appliance each week.
- Total columns A, B, C, E, F, G and I.

This resource is available as a free download from WWF-Canada Schools for a Living Planet. Visit schools.wwf.ca.



Name

Date

Energy Use at Your House (Un-subsidized)

(Example is using “Over the Subsidy Rate – of \$0.51” (e.g. Akavik) plus Greenhouse Gas Emissions (GHG). Only diesel communities will see a big difference!)

A B C D E F G H I

Appliance	Time Used Hours/wk	Watts	Total Watts (A x B)	kWh / wk (D % 1000)	\$ per kWh	Weekly Cost	GHG/kWh	grams of GHGs/week
Oven	4	3060	12,240	12.24	\$0.51	\$6.24	795	9,730.80
J Totals								

This resource is available as a free download from WWF-Canada Schools for a Living Planet. Visit schools.wwf.ca.

LESSON Plans



Lesson 3: Vampire Power and Energy Hogs

30 minutes.

Vampire power (also known as phantom power) is a term used to describe how appliances “leak” electricity while they are still plugged into an outlet, even if they’re not turned on. Approximately 10% of energy in Canadian homes is wasted through vampire power.

Watch one of these videos to introduce the concept of vampire power:

▶ [Vampire Power Awareness from iGo \(2:30\)](#)

▶ [GOOD: Vampire Energy \(3:30\)](#)

As a class, make a list of the appliances in your homes that use vampire power. *Did any of the top vampire power appliances make your list?* Plasma TVs, video game systems, laptops, DVD players and cellphone chargers. *Could you unplug these items when they are not in use?* Find out how to stop the leak [here](#).

Energy Hogs

Use the resources in this site to take the Energy Hog Challenge which is a set of classroom activities that guide students through lessons about different sources of energy, how we use energy at home and how to bus energy hogs!

- Play Energy Hog Tag
- Get your Energy Hog certification
- Complete the Energy Hog Scavenger Hunt Assessment Opportunity

Watch the following video and use the Energy Saving Chart handout to assess understanding on different ways that you can save energy at home and at school. Kick-start a class discussion using students’ ideas.

▶ [Energy, Let’s Save It! \(3:30\)](#)



Little Brown Bat © Jesika Reimer

Energy Saving Chart

Name.....

Date.....



Using what you've learned, list some ways to save energy at home.

Appliance

Cost per week

Annual Cost (Multiply by 52 weeks)

Ways to Reduce Cost

Oven

\$3.18

\$165.36

Plan ahead, cook more than one thing at a time (maximize use)

WILD Ideas



© East Three Elementary

Territorial Farmers Association

Make butter with the butter churning kit.

Arctic Energy Alliance

Use Arctic Energy Alliance's energy tester on different types of light bulbs (incandescent, CFL, LED) to see the difference in energy usage and waste heat.

Make reminder signs for the school and put them up

Have your class label the vampire power appliances around your school or classroom with pictures of little brown bat pictures to remind students and staff to unplug appliances not in use.

Before and after

Ask students to get a utility bill for one month in their house. Make the next month an “energy efficient” one and get students to ask their families to try and reduce their energy consumption. Check out the results on next month's utility bill. Students present the results and their energy-reducing strategies to the class.

How to Read your Utility Bill

“Conservation Rate is the higher cost of power you are using over the GNWT subsidy”. Use this opportunity from NTPC to talk about vocabulary use here.

School Waste Audit

The Waste Reduction Week Canada website offers a **great energy** audit template to conduct an energy audit of your school. Determine what can be done to reduce the costs of energy.

Energy Efficient Characters

Have your students create a class theatre production based around the Energy Start characters.

URLS



Some hyperlinks have been embedded throughout the **Energy Costs** resource. If a link appears to be broken, try visiting the homepage or keying in the URL as it's written below.

Energy-efficient bat houses

<http://www.thebatcave.ca/page19/page19.html>

Your community's energy profile

<http://aea.nt.ca/communities>

Inuit voices video

<https://www.youtube.com/watch?v=9-sIXi0ijlY>

Northwest Territories Power Corporation table

<http://www.ntpc.com/smart-energy/how-to-save-energy>

Northwest Territories Power Corporation - subsidies

<https://www.ntpc.com/smart-energy/how-to-save-energy/gnwt-energy-rebates>

Arctic Energy Alliance library of fuel costs

<http://aea.nt.ca/research/research-2>

Vampire appliances

<https://www.dosomething.org/tipsandtools/top-5-energy-sucking-vampire-appliances>

Energy audit template

http://www.wrwcanada.com/uploads/File/WRW2012/School_Waste_Audit.pdf

Territorial Farmers Association classroom teacher resources

<http://www.farmnwt.com>

Arctic Energy Alliance Contact for classroom support

<http://aea.nt.ca/about-us>



ECOLOGY NORTH



WWF is Canada's largest international conservation organization, working to build a future where people live in harmony with nature. The Schools for a Living Planet program empowers educators and students of all ages with the tools they need to lead us into a sustainable future. Schools for a Living Planet is grounded in the principles that make WWF a global success - including strong science and a focus on solutions.

Ecology North is a charitable, non-profit organization that has engaged Northerners in hands-on learning opportunities in the Northwest Territories since 1971. Our mission is to bring people and knowledge together for a healthy Northern environment. Education, public engagement and youth involvement are integral to all of our program streams that include climate change adaptation, watershed protection planning, waste reduction, food sustainability and alternative energy promotion.

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