

Energy Conservation and Efficiency

High School Science Curriculum

For Students

Instructions:

Given the advantages and challenges associated with generating electricity from natural resources, and how Alberta’s and Canada’s energy future could look, it is important to consider our use of these resources. Follow the instructions to work through the following set of activities and questions.

Part 1: Energy Efficiency vs Energy Conservation

One way to look at energy use is in terms of **energy efficiency** and **energy conservation**.

The following table describes the difference between energy conservation and energy efficiency and provides a few examples of each. Follow the links to learn more about them and do your own research.

| Energy Efficiency = utilizing technologies that require less energy to perform similar functions | Energy Conservation = using less energy by changing habits and behaviors |
|--------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------|
| Electric vehicles | Riding a bike or taking transit instead of driving a vehicle |
| Net Zero Homes | Programming your thermostat to lower temperatures overnight or when you’re not at home |
| LED Lighting | Replacing incandescent lights with LED lights in your home |
| Energy Star Appliances | Do full loads of dishes or laundry |

1. Why are the technologies in the energy efficiency column considered more “energy efficient?”

2. How are the behaviors in the energy conservation column associated with the technologies in the energy efficiency column?

Part 2: MyHeat

Let’s consider energy efficiency and conservation in the context of our homes and personal lives!

1. Go to  **MyHEAT** and select your community. Don’t see it there? Choose a community near you, or a community you’re familiar with.

2. If you’re able to find your home, take a look! If you are unable to find your home, pick any home.
 - What is the heat loss rating of your home?
 - Does your home waste more or less heat than the average home in your **community**?
 - Does your home waste more or less heat than the average home in your **city**?

3. Compare two communities of choice.
 - What similarities and/or differences do you notice?
 - Is there a city or community where there appears to be more heat escaping from homes than the other?
 - If so, why do you think that is?

4. Click on the “explore my home” button for your home (or any home). Take a look at the aerial photo of your home and use the “show roof” button to figure out where heat is escaping from your home.
 - Why would your house (or any house) have varying colours?
 - What do the “hot spots” and “cool spots” represent?
 - What does heat loss from homes have to do with energy efficiency and conservation?

Use the space below for answering the questions or jotting down notes!

Part 3: Home Energy Audit

To evaluate the energy efficiency of your home, conduct your very own [home energy audit](#). To do this, you will need a few things. If you don't have all these things on hand, that's ok! Just do what you can with what you have.

- Infrared Thermometer
- Stopwatch or timer
- Bucket or large bowl
- Liquid Measuring cup
- Food coloring
- Energy Meter

The audit:

Use this table for recording what you find!

| Category/Location | Things to check | Notes: |
|------------------------|------------------------------------------------------------------------------------------------------------|--------|
| Windows/Doors | How many windows are in your home? | |
| | How many panes of glass are there? | |
| | Do you feel any drafts? | |
| | Do you have any screen doors? | |
| | Are there any noticeable gaps between the door and window frames? | |
| Appliances | How many electrical outlets are in your home? | |
| | How many outlets are currently in use? | |
| | Are there any powerbars plugged in to electrical outlets? | |
| | If you have an energy meter, use it to test several appliances. Record the readings. | |
| Lighting | What kind of lightbulbs do you have throughout your home (hint: see figure 1.) | |
| Heating/Cooling | If you have an infrared thermometer, check the temperature of several rooms in your house. Record the room | |

| | | |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| | locations and temperatures and if there's any significant changes. | |
| Shower Head/Sink tap | <p>Grab a sibling or parent to help you out and measure the flow rate of your shower or a sink tap! One person places the bucket underneath the tap and the other person starts a timer. Collect all the water coming out of the tap for ten seconds. After the ten seconds, measure the amount of water in litres with the measuring cup. Multiply the amount of water (in litres) by 6 to give you a flow rate per minute. What is the flow rate per minute from your shower?</p> | |
| Toilet | <p>Test for leaks in your toilet!</p> <p>Remove the tank lid and flush the toilet. After the tank ball drops and the tank refills, add a couple drops of dark food coloring.</p> <p>Wait a minimum of 20 minutes without flushing the toilet.</p> <p>After 20 minutes, look in the toilet bowl. Do you see any color?</p> | |



| | | | | | |
|--------------------|---------------------------------|----------------------------------|--------------|-------------------|----------------------------------|
| Incandescent bulbs | Compact Fluorescent (CFL) bulbs | Light emitting diode (LED) bulbs | Halogen bulb | Fluorescent tubes | Light emitting diode (LED) tubes |
| 60 watts | 13 watts | 8 watts | 50 watts | 32 watts | 16 watts |
| 800 Lumens | 800 Lumens | 800 Lumens | 1200 Lumens | 2800 Lumens | 2000 Lumens |
| 1000 hours | 3000 hours | 25,000 hours | 2000 hours | 20,000 hours | 50,000 hours |

Figure 1.

Based on the results of your home energy audit, name two (or more) actions you could take to improve the energy efficiency of your home.

- 1)
- 2)
- 3)
- 4)

Part 4: Energy Conservation Habits Inventory

Fill out the chart below by putting an “X” in the “already doing” or “could do” column next to each energy efficiency opportunity. At the bottom of the table, add three additional energy efficiency opportunities that you currently do, or could do, in your daily life. Then, tally the number of Xs in each column for a grand total.

| Energy Efficiency Opportunity | Already doing | Could do |
|-------------------------------------------|---------------|----------|
| Use LED light bulbs | | |
| Turn off the lights when we leave a room | | |
| Unplug electrical devices when not in use | | |

| | | |
|-------------------------------------------------------------------------------------------|--|--|
| Wash clothes in cold water | | |
| Keep the thermostat turned down at night and when no one is home, around 16°-18° Celsius. | | |
| Only run the clothes dryer when it is full. | | |
| Hang clothes to dry. | | |
| Keep showers under 5 minutes. | | |
| Only run the dishwasher when it is full. | | |
| Use a backyard compost or city composting program. | | |
| Collect and recycle recyclables (paper, plastics, deposit containers). | | |
| Only charge electronics when necessary. | | |
| | | |
| | | |
| | | |
| Grand Total | | |

References:

1. Part 3: Home Energy Audit was adapted from the City of Edmonton's [Home Energy Toolkit Manual](#).
2. <https://www.energy.gov/energysaver/home-energy-audits/do-it-yourself-home-energy-audits>