



SCHOOL ENERGY REVIEW

TEACHER'S NOTES

SLIDE 1 | SCHOOL ENERGY REVIEW

Today, we'll be doing a fun hands-on activity called the School Energy Review to learn about how our school uses energy. We'll split into four groups; each group will gather data on a particular energy-consuming aspect of our school and suggest changes to consume less energy. Later, your group will get a chance to present your findings and suggestions to the class.

SLIDE 2 | OVERVIEW

Before we start the activity, I'll talk about Generation E, who provided us with all the resources for the School Energy Review activity, including a borrowed kit with various tools to help us gather data about our school's energy consumption. Then, we'll get into what energy efficiency is and why it's important. We'll discuss how we use energy in our school and how we can save energy. I'll go over the School Energy Review activity and briefly talk about the different energy-consuming groups. They are "Electronics and appliances," "Lighting," "Heating and cooling," and "Water and windows." I'll touch on each topic, and this will give the whole class an idea of what each group will be looking for and learning. Your group will have a worksheet to help you learn about your energy-consuming category and guide you through the data collection. Finally, your group will share what you've learned with the rest of the class.

Note: We strongly recommend that you give your students the opportunity to read their group's worksheets before they start gathering their data.

This will give them a chance to ask you questions before they're sent off to do the activity and to be sure they understand how to properly use the corresponding tools.

SLIDE 3 | WHAT'S GENERATION E?

Generation E is an initiative by Efficiency Manitoba to empower you, the next generation of energy savers. Efficiency Manitoba is an organization dedicated to helping Manitobans save energy, money, and the environment.

The goal of Generation E is to teach young people like you the importance of energy efficiency and protecting the environment, and to ensure you're aware of how using energy has financial and environmental impacts. This will help you make energy-efficient decisions throughout your adult life.

What does the E stand for? It stands for a few things: energy, efficiency, environment, and education. These four words encapsulate the foundation upon which this initiative is built.

SLIDE 4 | WHAT DO YOU KNOW ABOUT SAVING ENERGY AND ENERGY EFFICIENCY?

What do you know about saving energy and energy efficiency?

Note: You could write down their answers on the whiteboard.

SLIDE 5 | WHAT'S ENERGY EFFICIENCY?

What is energy efficiency?

How would you define energy efficiency?

Note: You could write down their answers on the whiteboard.

SLIDE 6 | WHAT'S ENERGY EFFICIENCY?

Being energy efficient doesn't mean doing less things that require energy, although that's a great way to start. Energy efficiency means using less energy to do the same job. A lot of the activities we do every day waste energy. So essentially, when we're using something that's energy efficient, we're wasting less energy.

We want to make sure energy is used to its maximum potential. When we do this, we not only save money, but we also reduce our negative impact on the planet by relying less on fossil fuels like natural gas.

SLIDE 7 | WHAT DO WE NEED ENERGY FOR AT SCHOOL?

We need energy for so many things in our everyday lives. Essentially every aspect of our lives requires energy, but let's focus on schools for the moment. What do we need energy for at school?

Note: You could write down their answers on the whiteboard.

SLIDE 8 | WHAT DO WE NEED ENERGY FOR AT SCHOOL?

Heating and cooling use the most energy in schools. This is one of the reasons some older schools may not have air conditioning.

Lighting doesn't use as much energy as it previously did since schools are switching to LED lighting, which is much more efficient than other types of lighting.

Schools invest a lot in technology and every device uses energy; it all adds up.

Computers, printers, and smart boards are examples of electronics that use energy in schools. Schools also have many appliances like microwaves, coffee makers for the teachers, stoves, and fridges in school cafeterias and in the staff room.

When we wash our hands with hot water, we use energy because it takes energy to heat water.

SLIDE 9 | WHY IMPROVE ENERGY EFFICIENCY IN SCHOOLS?

Why is energy efficiency important?

Why is saving energy important?

Note: You could write down their answers on the whiteboard.

SLIDE 10 | WHY IMPROVE ENERGY EFFICIENCY IN SCHOOLS?

Improving energy efficiency in schools can improve the health of our environment. Natural gas is often used in schools for space heating and for heating water in southern Manitoba. Burning fossil fuels causes greenhouse gas emissions, which contributes to climate change. And climate change leads to lots of negative effects on all of us, including extreme weather events like wildfires, flooding, drought, and intense heatwaves. Therefore, using less energy means we are making a difference for the environment. Fewer emissions, less harm to natural environments, and less extraction of fossil fuels from the ground are all good things for the planet.

Another great reason to improve energy efficiency in the classroom is that it'll save money. And maybe you think — who cares? We don't pay for the energy bill, the government does. That's correct, but the government budgets a certain amount of money for schools each year, and a lot of that money goes towards schools' energy bills. When our winters are as cold as they are, it takes a lot of energy to keep them warm. If we can reduce the amount of money they spend on energy, that money could be spent on more

exciting things like art supplies, music equipment, sports equipment, teacher salaries, and so on. Less money on energy means more money available for fun and helpful stuff.

Even though hydropower is a relatively sustainable electricity source, building new dams and other energy infrastructure is expensive. So, it's important to save electricity wherever we can.

If our school prioritizes energy efficiency and takes concrete actions to become as energy efficient as possible, then other schools in our province and beyond might want to do the same. And other institutions and even private companies might look to what a school is doing and try to do the same. You can share what you learn at school with others, at home and in the community.

Energy literacy is important given that energy demand is projected to continue increasing, and technology has become much more present in our everyday lives. There's also the increased electrification of our society with more electric vehicles and buses, for example.

SLIDE 11 | HOW CAN YOU SAVE ENERGY AT SCHOOL?

Let's brainstorm how we can save energy at school. Think about things that you can easily do to save energy.

Individually, write down some energy-saving ideas you have. I'll give you a few minutes to think about the things you can do to save energy. We already talked about how we use energy at school; now think about the ways you can reduce your energy consumption. How can you reduce your energy consumption with electronics and water? What are some ways to save on space heating and cooling?

Afterwards, I'll ask a few of you to share your ideas with the class.

SLIDE 12 | EASY ENERGY-SAVING TIPS

We came up with a lot of great energy-saving tips. Here are some that we mentioned and some that we didn't.

Take advantage of the sun's natural power. It gives us light, heat, vitamins, and mental health boosts, and it's all for free. Close the blinds during hot, sunny days.

It's no secret that electronics use a lot of electricity. By taking some simple steps, you can reduce the amount of energy they use. An obvious, simple, yet often overlooked energy-saving technique is to make sure to power off all electronics when not in use. Even powered off electronics can still have an internal clock running that draws electricity. Some electronics and small appliances use energy even when they go into standby mode. We call this phantom power. Electronics and appliances that may use phantom power are computers, gaming consoles, printers, and kitchen appliances with built-in clocks or digital displays, like microwaves.

If devices are plugged into a power strip, you can simply turn the power strip off. When electronics aren't in use, putting them on sleep mode will decrease the amount of electricity they're using. You can use smart power strips. They automatically power down connected devices (like printers and monitors) when the main device and primary energy consumer (like a PC) goes into energy-saving mode.

You have the power to help control the energy consumption of the lights around you by ensuring lights are turned off when they're not needed. Is the whole class out for lunch, including the teacher? Turn off the lights. While it's a small action, multiple smaller actions make big changes and form a routine to save energy in other areas of your life beyond school.

When washing your hands, make sure the taps are fully off when you're finished. If you notice a tap is leaking, you can make a difference by letting a teacher or custodian know about it. Those drips can add up if a tap isn't fixed. A leaky tap that drips once per second can waste more than 10,000 litres of water per year.

SLIDE 13 | WHAT CAN MAKE A SCHOOL MORE ENERGY EFFICIENT?

Now we're going to think about what our school can do to save energy. The ideas we come up with will involve investments and would mean our school would need to spend money on energy-efficient products and measures. But it's an investment because the money spent can be saved by a reduction in the school's energy bill. I'm sure our school's administrators would love to hear what you come up with. Let's brainstorm ideas as a class.

Note: If you have extra time, you could split your class into their groups now, or let them brainstorm with the person beside them.

SLIDE 14 | WHAT CAN MAKE A SCHOOL MORE ENERGY EFFICIENT?

Adding insulation in the school walls, for example, is like adding a layer of protection to our school. When it's cold outside, we wear jackets as insulation to protect us from the cold, so it's the same idea for our school.

High-efficiency heating systems are way more efficient than the older, standard-efficiency heating systems. Our school could save a lot of money if it invests in a high-efficiency heating system if one isn't already in place.

LED lights last up to 25 years and use 80% less electricity than traditional incandescent lighting. LED lights are more efficient because they convert much more of the electricity they consume into light. Older types of lighting use a smaller proportion of the electricity they use to illuminate a space, with the rest being wasted as heat.

You may see a blue "ENERGY STAR®" label on some electronics and appliances. ENERGY STAR is an internationally recognized program that labels the most energy-efficient products on the market. This label helps consumers shop for products that can help them save energy and money. If you notice that an appliance has a blue ENERGY STAR label, you can be confident that it's in the top 10 to 30% of its class in energy performance.

SLIDE 15 | ACTIVITY: SCHOOL ENERGY REVIEW

The goal of the School Energy Review activity is to learn how our school consumes energy, what changes our school could make to save energy, and what behaviours could be encouraged to use less energy.

We'll split into four groups:

1. Electronics and appliances
2. Lighting
3. Heating and cooling
4. Water and windows

Your group will review the information on your worksheet, fill out the table with the data you collect, and complete any necessary research. You'll then prepare to present your findings and research to the rest of the class.

Note: This would be a good time to hold up one of the worksheets to show the students.

SLIDE 16 | MEASURING DEVICES

Every group will get at least one tool to use. Make sure to read the instructions carefully in your worksheet on how to use the tool and if there are any safety precautions.

The "Heating and cooling" group will be using the thermometer to measure the temperature of the room. You'll test three places in the room and calculate the average temperatures and compare it to the thermostat in the room. The worksheets have many questions to answer and for the "Heating and cooling" group, one of the questions is "Are there any blocked registers and vents?"

Note: Point out the registers and vents to the students so that they are aware of what to look for.

The "Lighting" group will use the light meter from the kit to measure lighting levels. Lighting levels are measured in lux (metric) and foot-candles (imperial). Different areas of a school require different brightness levels for safety and comfort. For example, a classroom or office has a recommended lux of 300 to 500 lux, whereas a hallway or stairwell only needs 100 to 200 lux.

Energy savings can be found in places that are brighter than they need to be by installing controls such as dimmers.

The “Electronics and appliances” group will use the portable electricity usage monitor from the kit to determine if some electronics and appliances are still using energy, even when they’re turned off or in sleep mode. The electricity meter measures a lot of different things, but for our purposes, we’ll be measuring the amount of power used (which is the wattage). Examples of electronics and appliances you could look for are monitors, printers, televisions, projectors, microwaves, and coffee makers.

The “Water and windows” group will be testing the efficiency of our school’s faucets and showerheads using flow rate (which means how much water comes out of a faucet or showerhead in a particular time period). Using the flow rate bag, you’ll test one faucet in two different bathrooms and one showerhead (if available).

The “Water and windows” group will also be checking to see how many panes of glass each window has using a flashlight and shining it directly at the window. If you see one spot of light, the window has one pane of glass. If you see two spots of light, the window has two panes of glass. If you see three spots of light, the window has three panes of glass.

In the last slides, I’ll briefly give some information related to all the groups, starting with school heating and cooling systems. There’s more information about each category in the worksheets, and your group will be relaying some of that information to the rest of the class during your presentation.

Note: On the slide, there’s a link to a video that shows how to use the flow rate bag. While the bag has all the instructions printed on it, this may be helpful for the “Water and windows” group to watch.

SLIDE 17 | SCHOOL HEATING SYSTEMS

Space heating systems are usually fueled by natural gas or electricity in Manitoba. Our custodian or school administrator might know which type of heating system our school uses, but a lot of schools use hot water boilers or steam boilers.

A hot water boiler heats water to about 70 to 82°C. This hot water is pumped through pipes to heaters in classrooms. As the water gives off heat to warm the rooms, it cools down and goes back to the boiler to be heated again.

There are both medium-efficiency and high-efficiency hot water boilers. Medium-efficiency boilers range from 80 to 90% efficient — that means 80 to 90% of the energy used to power the boiler is converted into usable heat. High-efficiency hot water boilers range from 90 to 99% efficient.

A steam boiler heats water to boiling (100°C) to create pressurized steam. The steam is transported to individual heating units in classrooms and other rooms. It then changes back to water and travels back through pipes by gravity to the boiler to be used again. Steam boilers are considered low efficiency, meaning they use quite a bit of energy. They range from 60 to 80% efficient and are most often found in older schools.

Note: If possible, before presenting this information to the students, ask a school custodian or your administration what type of heating and cooling system your school has.

SLIDE 18 | SCHOOL COOLING SYSTEMS

Older schools don’t usually have cooling systems. Instead, they rely on opening windows as needed on warmer days. Some schools may have added individual room cooling units through a window to cool each classroom. Newer schools typically have a central cooling plant. A large air conditioning unit (or chiller) is usually located on the school’s roof. It contributes to cooling air distributed throughout the school to maintain a comfortable indoor temperature.

SLIDE 19 | HEATING AND COOLING CONTROLS

A thermostat is used to tell the heating and cooling system what temperature you'd like your space to be and how much heating or cooling to provide. Heating or cooling a space more than necessary wastes energy. It's possible that your classroom may have a manual thermostat or no thermostat within the room. This could mean the temperature is controlled elsewhere or not at all.

Most newer schools have centralized digital control systems that can be scheduled. This means when people leave for the day, the temperature can be lowered in the winter. On the hottest days when people are around, it can be programmed to cool things off. This is a great way to save energy because when it's done manually, it can easily be forgotten or not prioritized. But remember that comfort matters, too. We don't want to save a lot of energy on a cold day, only to be shivering and wearing gloves in class.

SLIDE 20 | ELECTRONICS AND APPLIANCES

A good place to start with electronics and appliances would be checking for the blue ENERGY STAR logo. It'll be interesting to see how many of the electronics and appliances in the school are ENERGY STAR certified.

Wattage is a measurement for the amount of power used by an electrical device to function. You can usually find the wattage on the back or bottom of the appliance or electronic.

The wattage listed on an appliance or electronic is the maximum power it could draw, not the power it always draws. A lot of appliances have a range of settings like low to high that can impact how much power is used. For example, a fan that's used at the highest setting will use more power than a fan that's used on the lowest setting.

As mentioned earlier, unplugging appliances and electronics when you're not using them, and preventing phantom power when possible, will help you save energy.

SLIDE 21 | LIGHTING TYPES

Some lights use less electricity and are more efficient than others. A lot of schools have switched to LED lights, which are the most energy-efficient option. It can be hard to tell a type of light just by looking at it, but you might still see some older types of lights that haven't been changed yet. If you think you spot any of these older lights during your review, make a note of them because upgrading them could save energy.

LEDs last 25 times longer and are up to 80% more efficient than incandescent lights. They are cool to touch, but don't test this by touching the lights! Incandescent, compact fluorescent (CFL), and halogen lights are used in places that don't need to be very bright, like hallways, bathrooms, and closets. Incandescent and halogen lights waste a lot of energy by producing heat, while CFLs are more efficient (though less efficient than LEDs) but have small amounts of mercury.

Fluorescent tubes were the most common types of lights used in schools before LEDs. They give off bright and even light but sometimes flicker or buzz. They're more efficient than incandescent bulbs but still use more energy than LEDs. High-intensity discharge (HID) lamps are used in gyms and give off bright white light. They take some time to reach full brightness when you turn them on.

SLIDE 22 | LIGHTING CONTROLS

Using lighting controls is a great way to save even more energy. There are a few common lighting controls found throughout schools.

Dimmers allow you to adjust how bright the light is, saving energy when full brightness isn't needed. You may have dimmers on some light switches at home.

Occupancy sensors turn lights on automatically when movement is detected and off when a space is unoccupied. Vacancy sensors require you to manually turn the lights on but will automatically turn them off when no movement is detected.

Both occupancy and vacancy sensors are usually set to turn off lights after a space is unoccupied for 20 minutes, so don't assume there aren't sensors if the lights remain on immediately after you leave the room.

Daylight sensors dim and brighten lighting based on how much natural daylight is available. They can look very similar to occupancy sensors. One way to check if a room has daylight sensors is to check if the lights that are closer to windows seem dimmer than the rest of the lights.

Rooms may be divided into different lighting zones, where separate areas have independent switches. This allows you to only turn on lights in areas where it's needed instead of the entire room.

SLIDE 23 | HOT WATER

When you're washing your hands or taking a shower, you're often using warm or hot water. This means a water heater, which is powered by electricity or natural gas, needs to go to work.

Low-flow faucet aerators and low-flow showerheads are devices that help reduce the amount of water used while maintaining water pressure. An energy-efficient showerhead uses about 6.8 litres per minute, whereas an older showerhead can use up to 15 to 20 litres per minute. An energy-efficient bathroom faucet uses about 4.5 litres per minute, which is about half the amount a standard faucet uses.

SLIDE 24 | WINDOWS

High-performance windows help save energy by keeping heat inside in the winter and out during summer, while maximizing natural light. Windows can be single pane, dual pane, or triple pane. More panes of glass mean the window has more layers of insulation. That's why triple pane windows are the best for energy efficiency.

Older windows are often poorly insulated and not airtight, letting in air leaks. This makes the building less comfortable and forces the heating and cooling system to work harder. You can use the back of your hand to feel for any air leaks. Move your hand along the sides of the window. If you feel air on your hand, that means there's an air leak. If you don't feel air, then the window is likely airtight.

SLIDE 25 | QUESTIONS OR COMMENTS?

Does anyone have any questions or comments about the School Energy Review?

SLIDE 26 | LET'S GET STARTED!

Note: Split the class into four equally-sized groups and assign their research topic. Have each group grab the corresponding worksheets and measuring devices from the kit.

Either discuss which rooms they will review if they'll need special permission to enter them, or allow them to choose within their group. Make sure they know to read the worksheet before starting the activity, and give them a timeline for their review.