



ALL ABOUT ENERGY PRESENTATION

TEACHER'S NOTES

SLIDE 2 | WHAT IS ENERGY?

Energy, in physics, is the capacity or power for doing work. Energy can exist in various forms. Types of energy include potential, kinetic (movement), thermal (heat), electrical, chemical, nuclear, etc.

Source: <https://www.britannica.com/science/energy>

SLIDE 3 | WHAT IS ENERGY?

Energy heats our homes, fuels our cars, and provides us with electricity. It's a necessary component of human life and comes in many different shapes and sizes. There is energy in the food we eat that our bodies use to keep us warm, give us strength, and help us think clearly. But behind the magic of light switches and gas pedals, this energy has to come from somewhere.

SLIDE 4 | WHERE DOES ENERGY COME FROM?

Energy comes in many forms, including hydroelectricity, natural gas, wind, nuclear, diesel, and solar.

Hydroelectricity is a renewable energy source that uses the power of water. You may have seen hydroelectricity in action through hydroelectric dams on Manitoba rivers.

Natural gas is a naturally occurring fossil fuel. It's burned to generate energy and can be used to cook food on a stove or heat a building.

Wind turbines are giant, clean-energy machines that look like tall, white towers with three long, propeller-like blades on top. In Canada, they are used to capture the movement of wind and turn it into electricity to power homes and schools without causing pollution. Manitoba has two wind farms in St. Joseph and St. Leon, with a combined capacity of 258 megawatts.

Sources:

<https://letstalkscience.ca/educational-resources/backgrounders/generating-electricity-wind-power>

https://www.gov.mb.ca/sd/environment_and_biodiversity/energy/wind/index.html

Nuclear power uses energy from the nucleus of an atom and derives from the periodic element uranium. While nuclear power plants generate radioactive waste, the volume produced is relatively small and is carefully managed to ensure safety and minimize environmental impact.

Source:

<https://world-nuclear.org/information-library/nuclear-fuel-cycle/nuclear-waste/radioactive-waste-management>

Diesel fuel is a thick, oily liquid made from refined crude oil or plants (biomass) that powers large engines in trucks, buses, trains, and boats. Unlike gasoline, diesel engines don't use spark plugs; they compress air until it is very hot to ignite the fuel.

Solar energy comes from the sun and is also a source of renewable energy! Solar panels convert sunlight into electricity without emitting greenhouse gases. Renewable energy sources like solar are being used more and more as we shift toward greener energy solutions.



SLIDE 5 | HOW DOES MANITOBA PRODUCE ITS ENERGY?

In Manitoba, approximately 97% of our electricity comes from renewable hydropower. We use the potential energy of rivers to generate electricity, which is stored and transported to our homes, schools, and offices. The remaining 3% of our electricity comes from wind power. These are very clean sources of energy.

Source: <https://efficiencymb.ca/articles/how-the-average-manitoba-home-uses-energy>

SLIDE 6 | HOW DO WE USE ELECTRICITY AND NATURAL GAS IN OUR HOMES?

We all need electricity to power things like our lights, electronics, and appliances. But this only accounts for about 20% of the energy use in Manitoba homes. The other 80% comes from heating the home and heating water. In fact, 60% of Manitoba homes use natural gas for their main heating source. Natural gas is a fossil fuel. We don't produce our own natural gas in Manitoba — we import most of it from Alberta.

People can also power their homes and businesses with solar energy, which converts energy from the sun into electricity.

Biomass is another source of renewable energy, through which plant materials are converted into electricity.

Source: <https://efficiencymb.ca/articles/how-the-average-manitoba-home-uses-energy>

SLIDE 7 | HOW DOES HYDROPOWER WORK?

Hydropower is a way to generate electricity using little to no emissions. To supply the whole province with electricity, we need a lot of water. To do this, Manitoba Hydro builds large dams to block the flow of water in a river and then funnels the water through the dam to spin large wheels or turbines that drive generators to produce electricity.

<https://www.youtube.com/watch?v=bcekVV9MKTc> (Video from Hydro)

<https://www.youtube.com/watch?v=IYUnbWrdizk> (3:20–3:57 explains the process from Hydro)

SLIDE 8 | HOW DO WE GET ENERGY FROM FOSSIL FUELS?

Although in Manitoba most of our electricity comes from hydrogeneration, fossil fuels produce most of the world's energy. Oil, gas, and coal is burned to generate heat that powers homes, cars, electronics, and factories. Heat generated from burning fossil fuels can be used directly to heat homes, schools, or offices. This energy can also be used to power engines and generate electricity. However, this type of energy generation comes at a high cost.

Fortunately, our province has suitable rivers and lakes to support generating renewable hydroelectricity. Many other places in Canada and around the world rely on natural gas, coal, and nuclear energy to generate their electricity.

SLIDE 9 | WHAT IS THE GREENHOUSE EFFECT?

There are greenhouse gases (GHGs) that exist in our atmosphere — carbon dioxide, methane, nitrous oxides, and water vapour. They are called GHGs because they help trap heat from the sun and give the Earth a nice, comfortable temperature — similar to how a greenhouse works. Without GHGs, the sun's heat would just bounce off the Earth and go back out to space. The ability to trap some of that heat is called the greenhouse effect.



If we didn't have any greenhouse effect, the Earth would be about 33°C colder on average. This would be too cold for the Earth to sustain life. However, due to climate change, too much greenhouse effect is now our problem, as the Earth is now warmer than it should be.

Source: <https://climate.nasa.gov/faq/19/what-is-the-greenhouse-effect>

SLIDE 10 | WHAT HAPPENS WHEN WE BURN FOSSIL FUELS?

Burning oil, coal, and gas to create energy emits a lot of carbon dioxide into the atmosphere. All this added CO² means an increased greenhouse effect, which means more heat getting trapped in the Earth's atmosphere. With more heat being trapped in the Earth's atmosphere, the surface temperature of the Earth begins to rise. This is what we call global warming.

SLIDE 11 | WHY IS GLOBAL WARMING BAD?

When the temperature of the Earth begins to rise, we begin to see negative side effects. Glaciers and ice caps begin to melt, adding more water to the oceans which raises the sea level and threatens to swallow small islands and low-lying lands.

Because of global warming, we also see increased frequency and severity of extreme weather events. These include floods, droughts, wildfires, heat waves, and hurricanes. This change in weather, brought on by global warming, is what we call climate change. Global warming is impacting Manitoba, too. For example, in northern Manitoba, ice is melting earlier and freezing later in the season. This has destroyed polar bears habitats and has made it harder for them to find food.

Source linked here with a short video that sums up the previous few slides.

<https://www.nationalgeographic.com/environment/article/global-warming-effects>

SLIDE 12 | WHAT HAPPENS IF WE DON'T MAKE CHANGES?

Scientists are very worried about the path we are heading down with our emissions. If the Earth warms 1.5°C or more by 2040, they predict the loss of some plants and animals, coastal settlements may disappear, and violent conflict may increase as competition for resources heightens. If global warming hits 5°C, up to 48% of the Earth's species are likely to face extinction.

SLIDE 13 | BUT, WE HAVE AN OPPORTUNITY TO MAKE A CHANGE BY...

Faced with the threat of global warming and climate change, everyone has a responsibility to do what they can to help the planet.

Large companies emit a lot of greenhouse gases. These companies need to start taking sustainability seriously and take responsibility for the damage they are doing to our environment to see the biggest changes. We can encourage this by telling our government to change regulations and make them follow the rules, and we can also be pickier with what products we choose to buy. If we stop buying products that are manufactured by companies with poor environmental records, they may be more likely to change their ways to make sure we still want to buy their products.



One way to make a change immediately is by reducing our energy use. There are many things we can do and choices we can make every day that will result in less energy being used, less GHGs being emitted, and less damage to the environment. Walking, biking, or taking the bus to get places instead of using a personal vehicle is one example. Can you think of others? We'll go more in depth on this topic in the next presentations.

SLIDE 14 | WHAT ARE NEXT ZERO EMISSIONS?

Net zero emissions is about reducing our emissions as much as possible. For those emissions that we can't get rid of, we can "offset" them. If we emit four tonnes of greenhouse gases, we need to also remove four tonnes from the atmosphere. Some examples include planting trees and using carbon capture technology to trap and remove carbon from the atmosphere.

What's the best and fastest way to meet net zero? Don't emit anything! Reducing our emissions means we don't need to remove as much carbon from the atmosphere.

SLIDE 15 | WHAT IS THE BEST WAY TO REACH NET ZERO EMISSIONS?

As mentioned, the best way to lower net emissions, of course, is to not emit anything in the first place. This is where sustainable or renewable energy presents a wonderful opportunity. The less we need to rely on fossil fuels, the less GHG emissions we will create. The less GHG emissions we create, the healthier our planet will be.

Energy can be generated from many sources creating few or zero emissions. And, unlike fossil fuels, most of these sources have an unlimited supply. These sources of energy are called "renewable energy."

At this moment, renewable energy sources are more expensive than fossil fuels. However, the price of renewables is continually coming down and is very close to being competitive with the price of fossil fuels. The best way to have more affordable energy is to be more efficient with the energy that we do use.

SLIDE 16 | ENERGY EFFICIENCY SAVES MONEY AND THE PLANET

Even though hydropower is a relatively sustainable electricity source, building new dams is expensive! So it's important to save electricity wherever we can. Doing less things that require energy is a good place to start (often called conservation). "Energy efficiency" means using less energy to do the same job. A lot of the activities we do everyday waste energy.

Using natural gas efficiently is especially important for reducing GHG emissions and protecting the planet. To use natural gas, we almost always burn it, the less we use, the less we burn.

Class Quest: How else do we use natural gas besides burning?

How we use lights, transportation, heating, cooling, and electronics, and how we manage our waste all have a significant impact on our energy use. It's important we become more efficient with our energy use so we can not only save money on energy bills (energy isn't free), but also reduce our impacts on the environment.

Turning off electronics when they aren't being used, turning off lights when you leave a room, and only running full loads of dishes and laundry are all examples of how we can be more energy efficient.



SLIDE 17 | ENER-GENIUS INVENTIONS

About this activity:

- For this activity, I'll split you up into groups, and your groups will create and pitch your best energy-efficient invention. Your group can imagine an entirely new product or create a more energy-efficient version of an existing product, but there must be a reasonable possibility that it could exist – so powered by magic is not an option!
- Your group can draw your product or create a model to demonstrate it for your presentation. In your presentation, your group needs to explain how your invention can help others reduce their energy use, and why whoever you're selling it to should buy your product. After every group has presented, we'll wrap up with a discussion about what you learned about energy efficiency, and what makes a product more (or less) energy efficient.