SCIENCE SPOTLIGHT

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FUELING WITH RENEWABLES!

GEN ACTION

This project was taken with the financial support of the Government of Canada.

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Fueling with Renewables!

Origin Story:
NON-RENEWABLE AND RENEWABLE ENERGY SOURCES - WHAT ARE THEY?

Have you ever wondered what gas-powered vehicles, furnaces, and factories have in common? They all use **fossil fuels** such as oil, natural gas, and coal - these are all non-renewable energy sources. A **non-renewable energy source** is an energy source that runs out - once consumed, it is not easily replaceable and could take millions of years to replenish. The burning of fossil fuels contributes to global warming because it releases a lot of **carbon dioxide**, a greenhouse gas, that traps heat in our atmosphere.

A **renewable energy source**, on the other hand, is an energy source that can be replaced at the same rate as it is consumed, so it will almost always be available to us naturally. For example, solar panels convert sunlight into usable electricity that can power our homes. Other types of renewable energy include wind, hydroelectric, geothermal, and biomass energies.

Renewables?
DO WE NEED THEM?

Most countries in the world get their energy needs from fossil fuels. The burning of fossil fuels is by far the largest contributor to climate change, responsible for over 75 percent of overall **greenhouse gas emissions** on Earth. This means as we consume more of these non-renewable energies, we also contribute more to environmental pollution. Utilizing renewable energy sources helps reduce greenhouse gases emitted into our environment.

In Canada, over 60 percent of our energy sources are from hydro (or water) generated **electricity**, making us the fourth largest hydroelectric generator in the world. Specifically, in Manitoba, 97 percent of the electricity generated in the province is from renewable hydroelectricity. However, there are still communities in northern Manitoba that rely heavily on **diesel** as their primary energy source. While switching to renewable energy sources is much better for our environment, it is also important to recognize that it comes with **ecological limitations and challenges**. For example, batteries used for solar panels contain toxic elements; hydroelectric systems can be disruptive to ecosystems; and solar panels, hydropower dams, and wind farms cost a lot of money. Unpredictable weather patterns can also hinder construction, transportation access, and availability of resources. On a positive note, engineers and scientists all over the world are continuously finding ways to lessen these negative impacts by combining **two or more renewables** instead of relying on just one single source, and using alternative raw materials that are better for the environment.

Photo courtesy of Manitoba Hydro

Many energy companies are also helping Canadians reduce their fossil fuel consumption. Companies such as **Kisik Clean Energy** and **Efficiency Manitoba**, for example, help bring clean, renewable energy to Manitobans. Kisik Clean Energy focuses on Indigenous renewable projects and helps bring **renewable energy to First Nations** in northern Manitoba, such as their latest project with Sayisi Dene First Nations. They do this by combining wind and solar power to offset 60 percent of diesel energy that is being used by the community. In addition, Kisik Clean Energy is also helping create jobs and assets that provide a source of income for the people in the community. Efficiency Manitoba, on the other hand, focuses on making **energy efficiency upgrades** affordable for Manitobans through their different programs, such as the Solar Rebate Program, which gives Manitobans rebates for installing solar photovoltaic (PV) systems.

There are **sixteen hydroelectric generating stations** in Manitoba that power Manitoba homes and infrastructure. Since 1991, Manitoba's generating stations have also been helping our neighbouring provinces and states avoid nearly 190 million tonnes of carbon dioxide or CO2 emissions. This is equivalent to removing forty million cars from the road! By selling power to the United States, Saskatchewan, and Ontario, Manitoba has earned 11 billion dollars over the last fifty years, which has helped lower Manitobans' electricity bills.

Using renewable energy sources is a key step in **reducing carbon emissions** in the environment. Making our communities eco-friendlier will allow today's society to meet its present energy needs without compromising the needs of future generations.

Time for GENACTION!

Climate Action:
NO ACTION IS TOO SMALL!

As an individual, you can do many things to help reduce carbon emissions in our environment and save electricity such as unplugging devices that are not in use or turning off light switches when you leave your room. **Zaw Aungkyaw** from Efficiency Manitoba is quick to remind us that educating ourselves is important! Learning about how we use energy will help us make a more conscious decision to save energy whenever we can. By changing the way we view things and allowing our small steps to become big, together we can combat climate change!

"WHILE SWITCHING TO RENEWABLE AND GREENER ENERGY SOURCES IS AN IMPORTANT STEP, EACH OF US CAN ALSO MAKE A DIFFERENCE BY USING LESS ENERGY IN THE FIRST PLACE,"
Zaw Aungkyaw

Try This at Home:
DIY SOLAR NIGHT LIGHT!

Are you curious about how solar panels work and would like to see them in action? Try creating your own solar night light using a few simple steps!

You will need:

- one small outdoor solar light with a round top
- one mason jar with lid
- a package of transparent flat gemstones
- hot glue gun

Steps:

1. Fill your mason jar about 1/3 with flat gemstones.
2. Take the lid off the mason jar and remove the centrepiece.
3. Using a hot glue gun, attach the solar light panel to the outer rim of the lid with the solar panel facing up.
4. Insert the light in the jar and secure the lid into the jar using a hot glue gun.
5. Leave the jar outside or near a window during the day to charge.

Take it further: Learn more about topics concerning renewables and climate change! To get started, check out Waterpower Canada and learn about how hydropower electricity is powering Canadian homes and businesses.

MEET OUR LOCAL SCIENCE HERO:

From the furniture industry to Indigenous clean energy... Meet Darrell Brown ICD.D, founder and president of Kisik Clean Energy.

Darrell's passion to bring clean, renewable energy to First Nations communities started at an Indigenous mining conference he attended back in 2013. He understands the need for clean, renewable energy for First Nations communities, most of whom rely heavily on diesel fuel to power their homes and businesses.

How did your interest in Indigenous clean, renewable energy come about?

"I wanted to help the First Nations communities reduce their dependency on diesel and integrate solar energy."

What is the best part of your job?

"Getting to know people in the community and starting to understand what matters to them and developing relationships."

What climate action advice would you give to youth?

"You have to be active and get your voice out there to show that you are a supporter and believer in reducing harmful emissions. Use your voice as a powerful movement toward clean energy."

This Science Spotlight was written based on Kaluthanthrige, Roshani, Athula D. Rajapakse, Craig Lamothe, and Farid Mosallat.2019. "Optimal Sizing and Performance Evaluation of a Hybrid Renewable Energy System for an off-Grid Power System in Northern Canada." Technology and Economics of Smart Grids and Sustainable Energy 4, no. 1: 1-16. https://doi.org/10.1007/s40866-019-0061-5.

Climate Change
Past, Present, and Future

Earth is the only planet in the solar system known to support life. What makes our home so special? Earth has an atmosphere, a layer of gases between our planet and space. Some of these gases, like carbon dioxide, are called **greenhouse gases**. They are crucial parts of our atmosphere; they trap in the heat of the sun, similar to how heat is trapped in a greenhouse, or in a car on a hot day. This process, called the **greenhouse effect**, keeps Earth's temperature warm enough for living things to thrive.

The sun's rays hit our round, tilted planet unevenly. This uneven heating of Earth's surface leads to differences in temperature, which drives weather patterns. We call the patterns in temperature and weather over long periods of time **climate**. Different parts of the world have vastly different climates; it depends on how much heat they receive, as well as what landscape features are nearby. Water, mountains, ocean currents, and forests all impact our climate. In turn, living things around the world have adapted to the climate they live in.

Something, though, is changing. Over the past two hundred years, humans have been burning fossil fuels, such as coal and oil, to make energy to power our daily lives. Fossil fuels are made from decomposed plant matter and microscopic life millions of years old. This matter is full of carbon, and, burning it releases, or emits, billions of tonnes of **carbon dioxide** gas into the atmosphere every year. When too much carbon dioxide is emitted, the delicate balance of greenhouse gases maintaining

Earth's climate is upset. More and more heat is trapped, causing the planet to warm. Weather patterns change, water levels rise, storms get worse.

Climate has changed many times throughout Earth's history, from ice ages to periods much hotter than today. So why is this time any different? Scientists agree on two things. One, temperatures are rising faster than they ever have in documented climate history. Two, this climate change is driven by human activities, due primarily to greenhouse gas emissions.
Climate change is already impacting people's ways of life all over the world. Powerful storms, droughts, forest fires, and floods are threatening people's access to food, water, and safe homes.

The most important step we can take to prevent serious climate change is to reduce greenhouse gas emissions. Incredibly brave and caring people around the world are finding new ways to reduce emissions and make our communities climate resilient every single day. And you can join them! These Science Spotlights are here to help us learn more about climate change and how you can take action.

Our Commitment to the Decolonization of Science

Institutions of GenAction initiative respect and affirm the inherent and Treaty Rights of all Indigenous Peoples across what we now know as Canada. We give thanks to the Indigenous Peoples who care for this land since time immemorial and pay respect to their traditions and ways of knowing. We acknowledge their many contributions to innovations in Science, Technology, Engineering, and Mathematics, past and present, and are committed to deepening engagement and collaborating with Indigenous Peoples as partners in order to advance truth and reconciliation and the decolonization of science.

Climate Change: Past, Present, and Future is based on...Delmotte, Masson, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, et al. 2021. "Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change." Intergovernmental Panel on Climate Change. Cambridge University Press. In Press.