Community Energy Planning Learning Materials

Lac La Ronge Indian Band

Contents

The Purpose of These Learning Materials

This document was created to share background information that:

- supports readers in understanding the Community Energy Plan.
- provides a reference when doing community engagement and education activities.

These educational materials have been organized so readers can read through the entire document to increase their background knowledge or refer to the Table of Contents to find specific subjects they would like more information about. Definitions and Frequently Asked Questions (FAQs) are included at the end of the educational materials.

1.0 The Changing Climate

Earth's climate has constantly been changing. In fact, Earth's climate has previously experienced periods both hotter and cooler than the extremes experienced today. However, over the last century, it has gotten hotter faster than ever before.

What explains this rapid warming?

A lot of human activities release gases into the atmosphere. These gases in Earth's atmosphere trap the Sun's heat, creating a "greenhouse effect." This is why these gases are known as greenhouse gases (GHGs).

It is commonly understood that activities such as operating industrial factories and driving gas-powered vehicles are significant sources of GHGs. However, what may not be immediately obvious is that we also emit GHGs when we use electricity to keep lights on in our homes, watch television, and run the dishwasher. This is because the electricity Saskatchewan communities use is mostly created by burning fossil fuels such as coal, oil, and natural gas, which generates mass amounts of greenhouse gas emissions.

Impacts of a Changing Climate

Canada's climate is already changing, evidenced by rising sea levels, melting mountain glaciers, changes in plants' blooming times, and more extreme weather events (i.e., increased intensity and amount of precipitation, storms, droughts, and heat waves). These changes can have significant ecological, social, and economic consequences. For example, shifting seasons could disrupt plant and animal life cycles; increased wildfires and droughts pose a threat to public safety and property; and more frequent and intense storms could overwhelm drainage systems and lead to flooding.

Preparing for and adapting to climate change requires that we understand how the climate is changing and what the impacts of those changes are. Climate and weather measurements, known as climate indicators, help us to do this by showing how the climate in the community is predicted to change in the future.

Table 1 summarizes the observed (recent past) and predicted changes to each indicator for all six Lac La Ronge Communities, as provided by the online interactive tool, the "Climate Atlas of Canada."[1] Lac La Ronge, Hall Lake, Sucker River, Stanley Mission, and Grandmothers Bay are all located in the same study area of the Climate Atlas and thus have the same climate indicator predictions, while Little Red River is in a separate study area, as reflected in the communities' grouping in **Table 1.**

[1] https://climateatlas.ca/find-local-data

Table 1: Climate indicators for the region surrounding Lac La Ronge and their predicted changes[2]

Climate Indicator	Little Red River		Lac La Ronge, Hall Lake, Sucker River, Stanley Mission, and Grandmothers Bay		What this change means
	Recent Past (1976-2005)	Predicted (2021-2050)	Recent Past (1976-2005)	Predicted (2021-2050)	
Mean annual temperatures (°C)	0.7°C	1.3°C (+0.6°C)	-0.1°C	2.2°C (+2.3°C)	The mean annual temperature is predicted to increase.
Very Hot Days	6 days above +30°C	15 days above +30°C (+150%)	3 days above +30°C	10 days above +30°C (+233%)	Extreme heat events will become more common.
Very Cold Days	23 days below -30°C	13 days below -30°C (-43.5%)	28 days below -30°C	16 days below -30°C (-42.8%)	Communities will experience shorter periods of cold weather or less severe cold.
Annual Precipitation (mm)	422 mm	453 mm (+7%)	460 mm	495 mm (+8%)	The annual precipitation in the community is predicted to increase.

Based on the projections in **Table 1**, the following section outlines the projected seasonal climate changes and the associated impacts on Lac La Ronge.

[2] Prairie Climate Centre (2019). Climate Atlas of Canada, version 2 (July 10, 2019). https://climateatlas.ca

Winter

Lac La Ronge will notice warmer winter months. While the benefit is that mild temperatures may reduce the need for frequent and/or intense use of home heating, warmer winters will also have local consequences. With higher temperatures, Lac La Ronge may see more rain or sleet rather than snow, creating more icy conditions and impacting equipment maintenance needs, road safety, etc. Additionally, winter rain events can speed up snow melt, which could change when and how much snowpack melting occurs in the spring. This impacts the communities' overland flood risk and the availability of water to meet their needs.

Spring

Lac La Ronge can expect to see increased spring precipitation. More frequent and/or intense rain will increase the risk of localized flooding as water bodies and the soil become oversaturated.

Summer

Lac La Ronge will notice more summer days with extreme heat conditions. These conditions will significantly impact vulnerable members of the community, such as Elders and young people, who are at greater risk of heat stroke. The increase in temperatures may also lead to higher energy bills as fans and portable air conditioning units are used to keep comfortable at home. This will be exacerbated for homes and buildings, which could be more energy efficient. Furthermore, higher temperatures will lead to drier conditions, which increase the risks of wildfires and droughts.

Fall

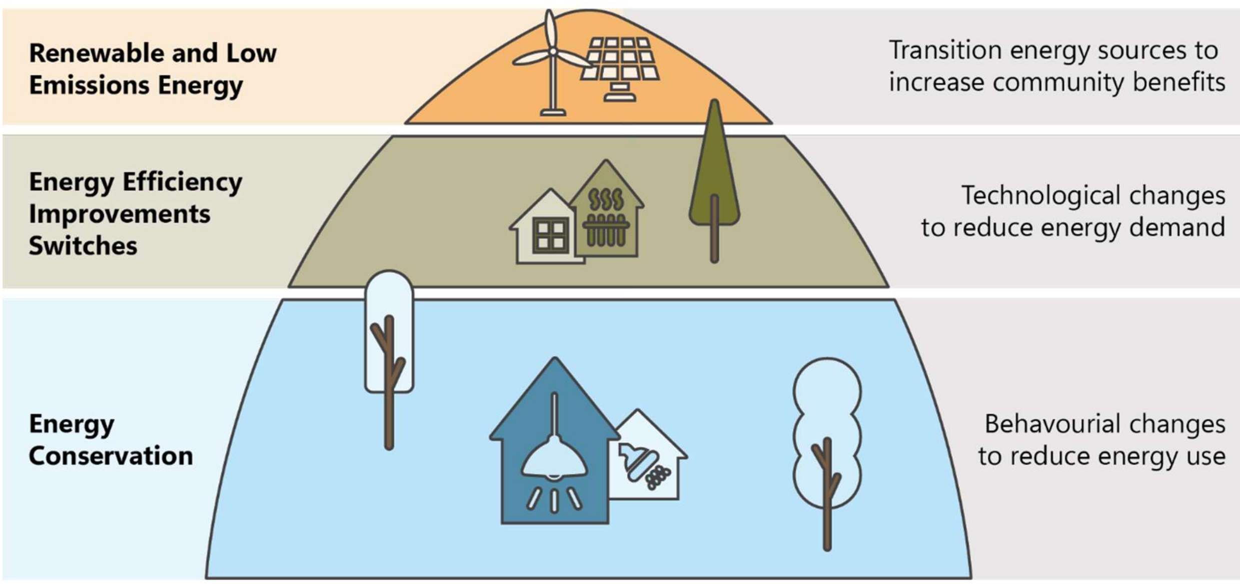
Lac La Ronge will also see warmer conditions in the fall. As a result, community members may delay the need to turn on heating systems in homes and buildings. Additionally, warmer fall temperatures may extend the growing season for plants and medicines.

2.0 Actions that Improve the Energy System

This section will define key terms and go further in-depth into the types of energy actions that this plan recommends – conservation, efficiency, and energy generation.

Like the three prioritized principles of waste management – the "3 Rs": Reduce, Reuse, and Recycle – reducing our emissions from energy use also has three principles - the "CERs": Conservation, Efficiency, and Renewables (**Figure 1**). The pyramid below illustrates how we should approach reducing our reliance on fossil-fuel-sourced energy.

Figure 1: Energy Use Principles



Energy Conservation

Energy conservation involves adjusting your behaviours and habits to use less energy. Energy conservation may also be referred to as demand-side management, as it focuses on reducing the overall energy demand in our homes and places of work. Much of energy conservation is related to changing energy-wasting behaviours to energy-saving behaviours. In many cases, changing our energy-related behaviours can be challenging. Many energy-wasting behaviours may have become habits over time, and some energy-saving behaviours might take more time and effort to adopt than previous habits. However, some energy-saving behaviours can be relatively easy and require minor changes to our everyday habits. A list of energy conservation behaviours is outlined below and described in detail in the following sections.

1. Layer Up First
2. Check Your Furnace
3. Keep Your Heat Close
4. Move Air
5. Cool with Water
6. Block the Hot Sun
7. Only Light the Places You Need
8. Use Less Light
9. If It's Broken, Fix It
10. Flush and Wash Efficiently
11. Wash Less and Colder
12. Air Dry
13. Bake with Energy in Mind
14. Use Small Electric Appliances for Small Meals
15. Only Boil the Water You Need
16. Skip the (Handwashed) Dishes
17. Check How Your Fridge and Freezer are Running
18. Unplug
19. Smart Plugs
20. Less Devices, Less Energy

Heating

Heating our home keeps us comfortable, but home heating costs can add up – about 22% of household electricity spending can be from keeping your home at a comfortable temperature.[3] However, you can make some small and big changes to cut costs.

1. **Layer Up First**

Sometimes, it's tempting to turn up the thermostat when you are feeling chilly, but first, try to put on a warm sweater or warm socks before you turn up the temperature. Changing your home's temperature by just a few degrees can make a big difference. For every degree Celsius you lower your thermostat for an eight-hour period, you can save up to 2% on your heating costs.[4] At times, your house does not need to be kept as warm – for example, while you are asleep or when you leave – consider dropping the thermostat down to 16°C. When you are awake and doing housework, cooking, or just relaxing, bring your thermostat to a more comfortable temperature, depending on how much you are moving around (18-21°C). If you have a programmable thermostat in your house, you can program it to the above temperatures so the thermostat can do the work for you while saving you energy costs.

2. **Check Your Furnace**

Maintaining your heating system can make it more efficient and reduce operating costs. You can ensure your furnace works at peak efficiency by keeping it clean, lubricated, and adjusted with annual maintenance. Cleaning or replacing your furnace filter every two months is also a good idea. A dirty filter reduces airflow in the furnace and requires it to run longer to heat your home.

About 20% of the heated air that is moved through the duct system in a typical house is lost because of leaks, perforations, and improperly connected ducts.[5] As a result, it can be difficult to keep your house warm, regardless of how the thermostat is set. You can work to seal some of these leaks by checking the areas around air vents and grilles, duct connections, floor joists and the heating unit. If you find leaks, clean the surface and seal them with duct or foil tape and then insulate them with vinyl or foil backing facing outward.[6] Ensure air grilles and heating vents are clear of furniture, rugs, and curtains so the warm air can circulate freely.

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[3] SaskPower. (2023). Power Savings and Programs – Heating and Cooling https://www.saskpower.com/Power-Savings-and-Programs/Home/Power-Savings-and-Tips/Heating-and-Cooling

[4] SaskPower. (2023). Power Savings and Programs – Heating and Cooling https://www.saskpower.com/Power-Savings-and-Programs/Home/Power-Savings-and-Tips/Heating-and-Cooling

[5] Energy Star. (2009). A Guide to Energy-Efficient Heating and Cooling. https://www.energystar.gov/sites/default/files/asset/document/HeatingCoolingGuide%20FINAL_9-4-09_0.pdf

[6] BC Hydro. (2023). Energy Savings-Electric baseboard heaters. https://www.bchydro.com/powersmart/residential/tips-technologies/baseboard-heaters.html

3. **Keep Your Heat Close**

If you use a wood stove to heat your house, ensure the damper is closed so warm air does not escape through the chimney. It is also a good practice to make sure the damper fits properly, so it closes well.

Warm air rises, so if you have a ceiling fan, you can run it in winter to help bring warm air back down. Make sure it is set to rotate clockwise at a low speed so the gentle updraft can redistribute the warm air that has accumulated near the ceiling.

Your windows can lose a lot of heat, but you can strategically use your curtains or blinds to help reduce heat loss. Open the blinds or curtains in the morning and during the day to let that sunshine warm your home naturally. However, once the Sun goes down, those windows are no longer helping to heat, so the curtains or blinds can be closed to help prevent heat loss.

Cooling

Indoor temperatures can reach uncomfortable levels in the summer. While air conditioners offer quick solutions, they also use a lot of energy. Other home cooling strategies may offer similar relief at a lower cost.

4. **Move Air**

- When the outside temperature is cooler than your house, place a fan at a downstairs window and position it to draw the cooler air in while placing another fan in an upstairs window to draw the warm air from the room and push it out the window.
    - If you live in a single-level home, you can create a cross-breeze by placing one fan by a window on the shady side of the house to draw cool air in while placing another fan across the room next to another window to push that warm air out.
- Place a fan near the window during the cool morning or evening hours to draw the cooler outside air into your home.
- At night, position a fan facing you for a more comfortable sleep.

5. **Cool with Water**

- Mist water or apply cool cloths to your skin on hot days. As the water evaporates, it draws heat from the body and cools the skin.
- Freeze water bottles to enjoy fresh, cold water all day.

6. **Block the Hot Sun**

- Open and close your blinds during strategic times to block out sunshine and heat.
    - **East-facing windows:** Close these curtains/blinds before you go to bed so they can help block out the morning sun.
    - **West-facing windows:** Close these curtains/blinds during the late afternoon and early evening to block out the sun.
    - **South-facing windows:** Keep these windows and blinds closed during the day to help stop the sun from heating the house.

If air conditioning is still required, you can close off vents and doors to rooms you are not using to ensure you only cool the areas that need it.

Lastly, if the strategies listed above are not possible and/or if you do not have air conditioning at home, you can look for heat relief by spending the day elsewhere that has one, like a friend or family member's house, the library, or a restaurant.

Lighting

Changing the way we use lighting – both indoor and outdoor – can be very simple and cost-effective and often just requires some practice.

7. **Only Light the Places You Need**

When a space is not in use, it's easy to recognize that any light on is unnecessary. At times, overhead lights can be replaced by daylight through a window – remember, sunlight is free – smaller desk lights, or even the light of a candle. The lighting level could also be lowered if the light switch has a dimmer function.

8. **Use Less Light**

When possible, prioritize using more energy-efficient lightbulbs, such as Light-Emitting Diode (LED) light bulbs. These lightbulbs typically use significantly less energy. Additionally, lighting controls, timers, or occupancy sensors can automate lighting conservation behaviours by helping you turn off lights when not in use.

All these recommendations can be considered for indoor and outdoor spaces and include holiday lights.

Water

Changing water usage can also help save on energy costs.

9. **If It's Broken, Fix It**

Hot water leaks in taps and faucets add up, and fixing the leaks can actually save you up to $9 per year in energy costs.[7] To get on top of leaks early, take note of any drips in your faucets and get them fixed as soon as possible to limit water waste.

10. **Flush and Wash Efficiently**

Your bathroom offers the most potential water-use-related energy savings. You can install low-flow toilets to reduce the amount of water your toilet uses, or you can simply place a large jar filled with water in the toilet tank. The jar will take up space that would otherwise fill with water with each flush, reducing the amount of water used. Changing your shower habits can also change your energy bill. Taking shorter – less than 5 minutes – or colder showers can reduce the energy needed to heat water.

Laundry

Washers and dryers use a significant amount of energy. However, minor changes in laundry routines can provide considerable energy savings.

11. **Wash Less and Colder**

Washing full loads of laundry in cold water means less energy is needed to create hot water and cuts back on the number of times you run your washer and dryer.

12. **Air Dry**

You can skip using the dryer altogether by hanging clothes to dry outside during summer and inside during the cold winter months. If you still need to use the dryer, consider throwing a dry towel in with wet laundry to reduce the drying time.

[7] BCHydro. (2019). Hot water tips, from the tank to the tap. https://www.bchydro.com/news/conservation/2019/hot-water-tips.html.html

Kitchen

Your kitchen appliances can use a lot of energy, but some tips can help reduce energy use.

13. **Bake with Energy in Mind**

When cooking with your oven, use the "convection" feature. This will turn on the oven fan to circulate heat, so you can cook in a shorter amount of time. An oven can lose up to 20% of its heat every time it's opened.[8] Instead of opening the oven, turn on the oven light to see how your food is cooking. When it comes time to clean your oven, try to use the "self-clean" function right after you have used the oven so it is already hot and, therefore, does not need as much power to heat it to the cleaning temperature.

14. **Use Small Electric Appliances for Small Meals**

Smaller appliances like microwaves, toaster ovens, slow cookers, air fryers, or pressure cookers can often do the same job in less time while using less energy. For example, a microwave can be 50% more efficient at heating your leftovers than your oven[2] and electric kettles boil water using 50% less electricity than their stovetop counterparts.[9] Better yet, selecting an ENERGY STAR® certified model of that appliance can significantly impact energy savings.

15. **Only Boil the Water You Need**

When you need to boil water, only boil as much as you need. Then, energy is not wasted heating water you will not be using.

16. **Skip the (Handwashed) Dishes**

Good news! Washing dishes by hand is less efficient than the dishwasher as it uses more water. However, to maximize your dishwasher's energy efficiency, wait until you have a full load to reduce the number of times you use the dishwasher. By running full loads, you can save $15 per year.[3] You can also set your dishwasher to the "energy-saver" setting to let the dishes air dry.

[8] SaskPower. (2023). Power Savings and Programs: Appliances
https://www.saskpower.com/Power-Savings-and-Programs/Home/Power-Savings-and-Tips/Appliances

[9] BCHydro. (2023). Power smart: Small cooking appliances
https://www.bchydro.com/powersmart/residential/tips-technologies/small-cooking-appliances.html

17. **Check How Your Fridge and Freezer are Running**

Unlike your other kitchen appliances, your fridge and freezer run 24 hours a day, seven days a week. That is why it is important to make sure they are working well. To make sure these appliances are only using the energy they need, you can:

- Make sure the temperature inside your fridge is set between 20°C and 30°C and your freezer is set between -15°C and -18°C. Having the temperatures in the right range means your food is kept cold without wasting power to over-cool or freezer-burn your food.
- Position your fridge to lower its energy use. Ensure it sits at least 5-to-7 cm (2-to-3") from the wall. This helps air move freely around the fridge, letting heat escape, so the cooling system doesn't have to work as hard to keep the fridge cool.
- Keep your fridge and freezer as full as possible. Your fridge and freezer are the most efficient when full, but not overcrowded. Your fridge and freezer don't have to work as hard if the cool air can easily circulate around your food. On the other hand, when your fridge is quite empty, it has to work hard to keep all that air cool. To help it work less, add a few containers full of cold water inside to help take up more space and keep things cold.
- Keep your freezer's coils ice-free. Ice buildup makes the compressor run longer to keep things cold. Removing the buildup can save an average of 10% of a freezer's energy use in a year.[10] If you notice ice building up on your freezer's coils, it's best to unplug the unit while carefully cleaning the coils – just make sure you plug it back in after!

Electronics

Household electronics can account for 19% of your home's energy costs.[11] This includes the ones you are not even using! These electronics use what is called "phantom power," which can add up.

18. **Unplug**

While some electronics (e.g., microwaves) work better when they remain plugged in, others, such as gaming systems, can be turned off when not in use. A power bar can help manage your entertainment, computer, and gaming systems' phantom power use. Turn off the whole power bar to stop your devices from drawing power when you aren't using them. You can also use a power bar as a charging station for your portable electronics. You can simply shut off the power bar when not in use rather than unplugging all your charge cords.

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[10] BCHydro (2023). Power smart: Refrigerators and freezers https://www.bchydro.com/powersmart/residential/tips-technologies/fridges-freezers.html

[11] SaskPower. (2023). Power savings and programs: Electronics https://www.saskpower.com/Power-Savings-and-Programs/Home/Power-Savings-and-Tips/Electronics

19. **Smart Plugs**

Smart plugs can also help maximize energy savings by allowing you to control what you have plugged in through an app on your smartphone. For example, if you leave the house and forget to turn something off, you can turn it off through the app on your phone. Some smart plugs even let you create schedules for the plugs to ensure your charge cords or gaming devices are not drawing energy when they are not in use (e.g., while you are at work or sleeping).

20. **Less Devices, Less Energy**

A good way to reduce the amount of energy you use is to reduce the number of electronics you buy! To do this, you can:

- **Reduce:** Reduce the amount of electronics you buy to reduce the number of items requiring electricity in your home and reduce the number of items that eventually get landfilled.
- **Reuse:** If you do need a device, look for options to borrow it from a friend, family member, or community resource. Or maybe friends or family are done with their phone and could give it to you to reuse, so you don't have to buy a new one.

Energy Efficiency – Improvements and Switches

Energy efficiency refers to technological solutions that reduce our energy use. Simply put, energy efficiency means using less energy to get the same job done. Less energy used can lower energy costs, reduce emissions, and improve operational performance. In addition to cost savings, efficiency upgrades can increase the value of buildings and other assets.

Some energy efficiency actions are simple, such as those discussed in the section above (e.g., installing LED lightbulbs or low-flow water aerators). Others require more significant changes to a building's systems, equipment, and infrastructure to increase energy efficiency, improve functionality, and decrease operating costs. A list of energy efficiency improvements and switches is below and will be detailed further in the next sections.

1. Select Efficient Space Heating and Cooling Systems
2. Keep Outdoor Air Out and Indoor Air In
3. Insulate Your Home
4. Install Better Windows
5. Heat Water Efficiently
6. Reduce the Flow
7. Use Efficient Light
8. Use Efficient Electric Appliances
9. Use Efficient Laundry Machines
10. Reduce Your Vehicle's Emissions

Heating and Cooling

The following improvements can help heat and cool a building more efficiently.

1. Select Efficient Space Heating and Cooling Systems

There are many types of heating and cooling systems that work in different ways. The most common systems for the communities of Lac La Ronge Indian Band include:

- **Furnaces** use a combustion chamber or heating element to heat a heat exchanger, which then gets distributed through a blower fan circulating the warm air through the system of ducts to various rooms in the building.
- **Boilers** use their combustion to heat water or steam, which is then circulated throughout the building through a system of pipes, radiators, or baseboard heaters.
- **Electric space heaters and baseboard heaters** convert electrical energy into heat through the resistance of an electrical conductor.
- **Wood stoves** burn wood pellets or cords to radiate heat throughout a space.

A more recent system available is air and ground source heat pumps. Heat pumps use electricity to transfer the heat from the outside air or ground to a building. They can be reversed in the summer to transfer heat inside the building to the outside.

Upgrading your space heating and cooling systems to heat pumps or ENERGY STAR® models can create noticeable long-term savings on your utility bills and reduce energy bills. Considerations when selecting a heating and cooling system include:

1. **Fuel availability:** Many communities have limited access to different types of heating fuels. Lac La Ronge is one of two communities in the Band that has been gasified, enabling the use of natural gas, electricity, propane deliveries, and wood to heat their buildings.
2. **System reliability:** Most systems use electricity to generate or distribute heat throughout buildings. This means that when the power goes out, the heat goes out, regardless of if electricity is the heating energy source. Many community members have backup wood stoves or generators in their homes to keep warm during power outages. As communities transition to heat pumps and other electrically-fueled heating systems, there is a higher peak demand on the grid. These peaks can cause grid instability, leading to power outages and increasing the need for backup heat.
3. **System serviceability**: There are limited service organizations that can service new technologies like heat pumps and high-efficiency heating systems, especially in remote communities. This should be considered when selecting a heating system.

4. **Climate:** Lac La Ronge is in climate Zone 7, which is considered a "very cold" zone and requires a heating system that can work at -34°C. Cold climate air-source heat pumps are capable of operating down to -30°C, so a backup heating system like a wood stove or electric heater would be required on the coldest days. It is important to note that as temperatures increase, heat pumps will be able to operate more often and rely on backup heat sources less often.

Heating and cooling system upgrades work best when paired with an already well-insulated home fitted with other heat-related energy-saving measures.

2. Keep Outdoor Air Out and Indoor Air In

Any air that infiltrates into your home (e.g., through cracks around windows, doors, and walls) needs to be heated in the winter and cooled in the summer. Air sealing is a quick solution to reduce drafts, prevent air leakage, improve energy efficiency, and enhance indoor comfort.

You can significantly reduce your energy consumption by inspecting walls, ductwork, windows, and doors for air leaks, gaps or cracks exposed to the outside and sealing these with caulk or weatherstripping tape. There are also professionals who analyze an entire home or building to identify gaps or seams that let air escape from a home and use several sealant techniques to prevent further energy loss.

3. Insulate Your Home

Improving insulation in your home's attic, wall, floor, basement, and crawlspace is one of the most impactful retrofit actions you can implement, as it greatly improves indoor comfort. How well a material insulates is measured by an "R-value," where "R" stands for thermal resistance. Insulation with a high R-value indicates better insulating – meaning that it will do a better job of keeping you warm in the winter and cool in the summer, thereby reducing the need for heating systems or air conditioning. Attic and ceiling insulation is one of the most accessible insulation offerings, as it is relatively easy to access this space for installation compared to other insulation efforts, which would require extensive alterations to the home structure.

4. Install Better Windows

Like insulation, the windows you install can also help you reduce energy usage and costs. Energy-efficient windows keep warm air inside the home during the winter and cool air inside the home during the summer. The glazing, frame, and spacer all impact a window's effective conductance, or "U-value." Energy-efficient windows typically have double- or triple-glazing, inert insulating gases, and insulated frames.

Replacing a home's windows with ENERGY STAR® certified windows can greatly improve your home's heating and cooling performance. ENERGY STAR® windows are covered with a barely visible coating, which blocks UV rays and heat from the sun more effectively than regular windows, contributing to a more energy-efficient home. Window replacements are particularly impactful when combined with weather stripping to further reduce energy usage and create energy efficiency.

Water

5. Heat Water Efficiently

Another way to reduce energy consumption is to upgrade your hot water heating system, which accounts for roughly 17% of the energy used in the average Canadian home.[12] Newer water heating systems typically have higher energy efficiency ratings, meaning they use less energy per unit of water heated.

6. Reduce the Flow

You can also save energy by changing how you use water. Installing low-flow water aerators in all your faucets is an easy way to reduce water use. These simply screw onto your faucet, and the tiny screens inside work to add air to the stream coming out of the faucet. This helps reduce the amount of water that comes out of the faucet, which means less hot water is used. Using less hot water means less energy is used to heat it. Low-flow water aerators can be used in all your faucets, including your tub and shower. Using a low-flow aerator in your kitchen faucet alone can save you up to $28 per year![13]

Lighting

7. Use Efficient Light

If an incandescent lightbulb needs to be replaced, switching to a highly efficient and long-lasting Light-Emitting Diode (LED) light bulb could generate significant energy savings. LED lightbulbs are more energy efficient than incandescent light bulbs, are longer-lasting, require less energy consumption, and are more cost-effective long-term. This type of retrofit is one of the most accessible and easy options, as you can find LED lightbulbs at most stores and install them yourself!

[12] Natural Resources Canada. (2022). Energy Efficiency for Products: Water heaters. Webpage. Retrieved from: https://natural-resources.canada.ca/energy-efficiency/products/water-heaters/13735
[13] Natural Resources Canada. (2023). Televisions. Webpage Retrieved from: https://natural-resources.canada.ca/energy-efficiency/products/electronics/televisions/14043

Kitchen

8. Use Efficient Electric Appliances

When small household appliances such as coffee brewers, air purifiers, televisions, laptops, and kitchen appliances, among many others, need to be replaced, switching to an ENERGY STAR® certified model of that appliance can significantly impact energy savings. For example, an ENERGY STAR® certified TV uses 25% less energy, on average, than its standard counterpart.[14] Efficient small appliances can significantly reduce energy usage and bills without compromising the appliance's performance. It is important to always purchase the appropriate size of the appliance depending on the users' needs, as larger appliances require more energy and cost more to operate compared to smaller models. Ensure that appliances are kept clean to improve the product lifespan and reduce unnecessary maintenance costs.

Laundry

9. Use Efficient Laundry Machines

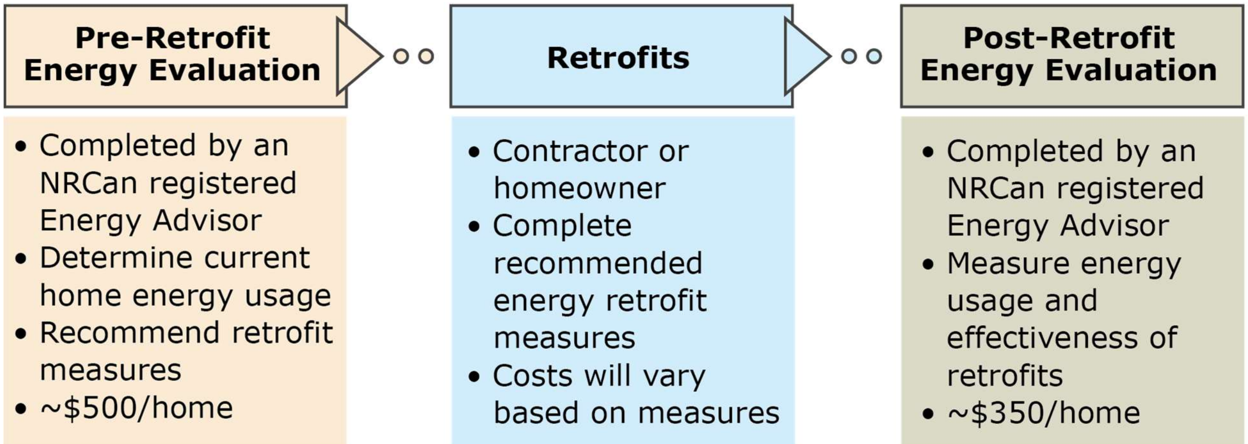
Upgrading your home's standard laundry machine to an ENERGY STAR® Model can significantly reduce your energy bill and water usage. Through intentional front-loading and top-down designs that can sense water levels, water temperatures, and moisture more accurately, energy-efficient laundry machines have been found to use 25% less energy and 33% less water than standard models.[15] Also, higher-efficiency models tend to have faster spin speeds when spinning water from washed clothes, so more water is extracted, and the drying process takes less time and energy. Upgrade the laundry dryer to an ENERGY STAR® model to create an energy-efficient laundry routine for additional savings.

Home Retrofit Process

You can get started with home retrofit actions at any time, and many people find it helpful to get started with small actions to build momentum. It can also be helpful to complete pre- and post-retrofit energy evaluations when prioritizing actions and/or accessing funding for retrofits. The process highlighted in **Figure 2** is commonly followed when an energy evaluation is needed.

[14] Natural Resources Canada. (2023). Televisions. Webpage Retrieved from: https://natural-resources.canada.ca/energy-efficiency/products/electronics/televisions/14043
[15] Natural Resources Canada. (2023). Appliances for residential use: Clothes washers. Webpage Retrieved from: https://natural-resources.canada.ca/energy-efficiency/products/appliances-for-residential-use/clothes-washers/13984

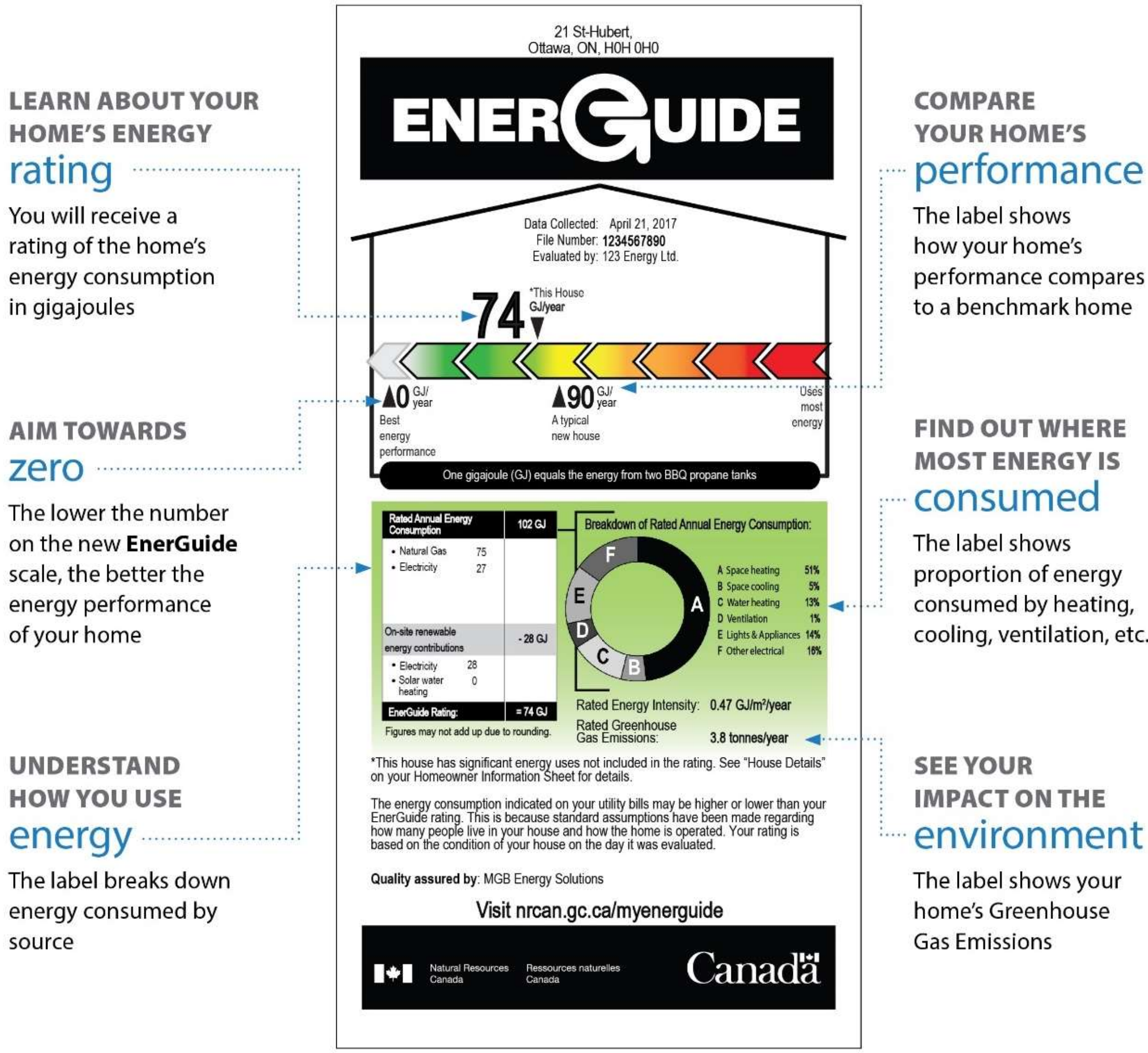
Figure 2: Typical Home Retrofit Process



It is beneficial to complete a building condition assessment along with the pre-retrofit energy evaluation to ensure non-energy-related renovations can be included in the plan.

During the pre-retrofit evaluation, an Energy Advisor will take building measurements, record equipment information, and perform a blower-door test, which measures the air leakage rate of the building envelope. They will then model the home using computer software (i.e., HOT2000) to determine its energy consumption and establish its EnerGuide rating. **Figure 3** breaks down the key aspects of the EnerGuide home label.

Figure 3: NRCan EnerGuide Label[16]



Along with the EnerGuide label, the Energy Advisor will provide the following:

- **Homeowner Information Sheet:** Highlights the calculations and assumptions from the evaluation.
- **Renovation Upgrade Report:** Provides an action plan of recommended renovation upgrades.

[16] https://natural-resources.canada.ca/energy-efficiency/homes/buying-energy-efficient-new-home/energuide-rated-new-homes/20578

Vehicles

10. Reduce Your Vehicle's Emissions

Go electric! In contrast to vehicles with internal combustion engines (ICE), electric vehicles, a type of zero-emission vehicle (ZEV), can operate with no tailpipe emissions. ZEVs include battery electric (BEV), plug-in hybrid electric (PHEV), and fuel cell electric vehicles.

The Government of Canada, through the 2030 Emissions Reduction Plan,[17] committed to a mandatory target for all new light-duty cars and passenger truck sales to be zero-emission by 2035 and all heavy-duty vehicle sales to be zero-emission vehicles by 2040. These targets include the following interim targets:

- 20% of all new light-duty vehicles offered for sale must be zero-emission by 2026.
- 60% of all new light-duty vehicles offered for sale must be zero-emission by 2030.
- 35% of all new medium- and heavy-duty vehicle sales must be zero-emission vehicles by 2030.

The sale of BEVs and PHEVs has been growing in the province – from 2017 to 2022, the number of BEV and PHEV vehicle registrations in Saskatchewan increased from 178 to 1,557. However, these 1,557 vehicles make up only 0.17% of the total vehicles registered in the province.[18] Increasing the availability of charging stations, incentivizing the purchase of electric vehicles, and providing education on the differences between ZEVs and ICE vehicles would help increase the uptake of electric vehicles in Saskatchewan.

Cost

ZEVs currently have a higher upfront cost than comparable models of ICE vehicles, largely due to the cost of the battery. There are numerous battery electric vehicle models in the $39,000 to $60,000 price range.[19] Comparable ICE models are typically priced at $7,000 to $10,000 less than the ZEV alternative.[20] However, ZEVs offer operation and maintenance savings that can add up to thousands of dollars over a vehicle's lifetime.

The electricity required to fuel a ZEV is about 1/3 of the cost of the gasoline required to propel an ICE vehicle over the same distance. ZEVs also have fewer regular maintenance requirements than ICE vehicles because they have fewer moving and wearable parts and regenerative braking, which puts less wear on the brakes.

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[17] https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/climate-plan-overview/emissions-reduction-2030.html

[18] https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=2310030801&pickMembers%5B0%5D=1.9&cubeTimeFrame.startYear=2017&cubeTimeFrame.endYear=2022&referencePeriods=20170101%2C20220101

[19] https://evbuyersguide.caa.ca/available-in-canada?_gl=1*lf96vy*_up*MQ..*_ga*MjA0MTQ2NDAwMi4xNzA3ODU5Mjk4*_ga_LBR2RL3Q6P*MTcwNzg1OTI5Ny4xLjAuMTcwNzg1OTI5Ny4wLjAuMA.

[20] https://www.cnbc.com/2023/09/14/how-electric-vehicle-prices-compare-with-gas-powered-cars.html

Range

The range capacity of ZEVs varies depending on the vehicle's make, model, and year. Many common BEVs have a battery range between 250 to 400 km. In comparison, common PHEVs typically have a lower battery range between 35 and 60 km and can switch to gasoline or diesel for longer distances.[21] Extreme cold weather can reduce an electric vehicle's range by as much as half. This means there should be a charging station about every 100 km along common routes to ensure ZEV drivers can travel safely in the wintertime with sufficient recharging options for the worst-case range scenario.

Charging

Charging at Home

Most EV charging is done at home and is the most convenient and affordable option. The standard 120 V outlets in a home provide what is called **Level 1** charging, which is the slowest charging option. It can take 12 to 20 hours to fully charge an EV.[22] A **Level 2** charger can be installed in a home for faster charging. A Level 2 charger uses a 240 V outlet, like those used by ovens and clothes dryers, and takes about 6 to 14 hours to fully charge an EV battery.

Public EV Charging Stations

While electric vehicles are mostly charged at home, it is important to have options to recharge when commuting and travelling. There are two types of charging stations commonly found in public spaces:

- **Level 2** chargers can fully charge most vehicles overnight at 2-9 hours to full charge, adding 32-96km of travel per hour of charge.[23]
- **Level 3** chargers are the fastest chargers at 0.5 to 3 hours to full charge, adding 96-400km of travel per hour of charge.

Plugshare[24] is a web and mobile app that provides crowd-sourced data on known public EV charging infrastructure and its real-time availability. **Figure 4** shows the known stations in Saskatchewan and nearby as of February 2024. As the figure shows, the availability of charging infrastructure is limited north of Prince Albert. The northernmost Level 2 stations include one port at Ile-a-la-Cross, La Ronge, and Meadow Lake and four ports near Eagles Lake. The northernmost Level 3 charging stations include two ports in Shellbrooke and six ports in Prince Albert.

[21] https://electricvehicles.bchydro.com/buying/EV-models-in-BC#ev-compare--table
[22] https://electricvehicles.bchydro.com/charge/choosing-a-home-EV-charger, accessed May 5, 2024
[23] Pembina Institute. (2023). *A Guide to Installing EV Infrastructure in Alberta's Multi-Unit Residential Buildings. How to prepare for an electric vehicle future.*
[24] https://www.plugshare.com/, accessed February 13, 2024

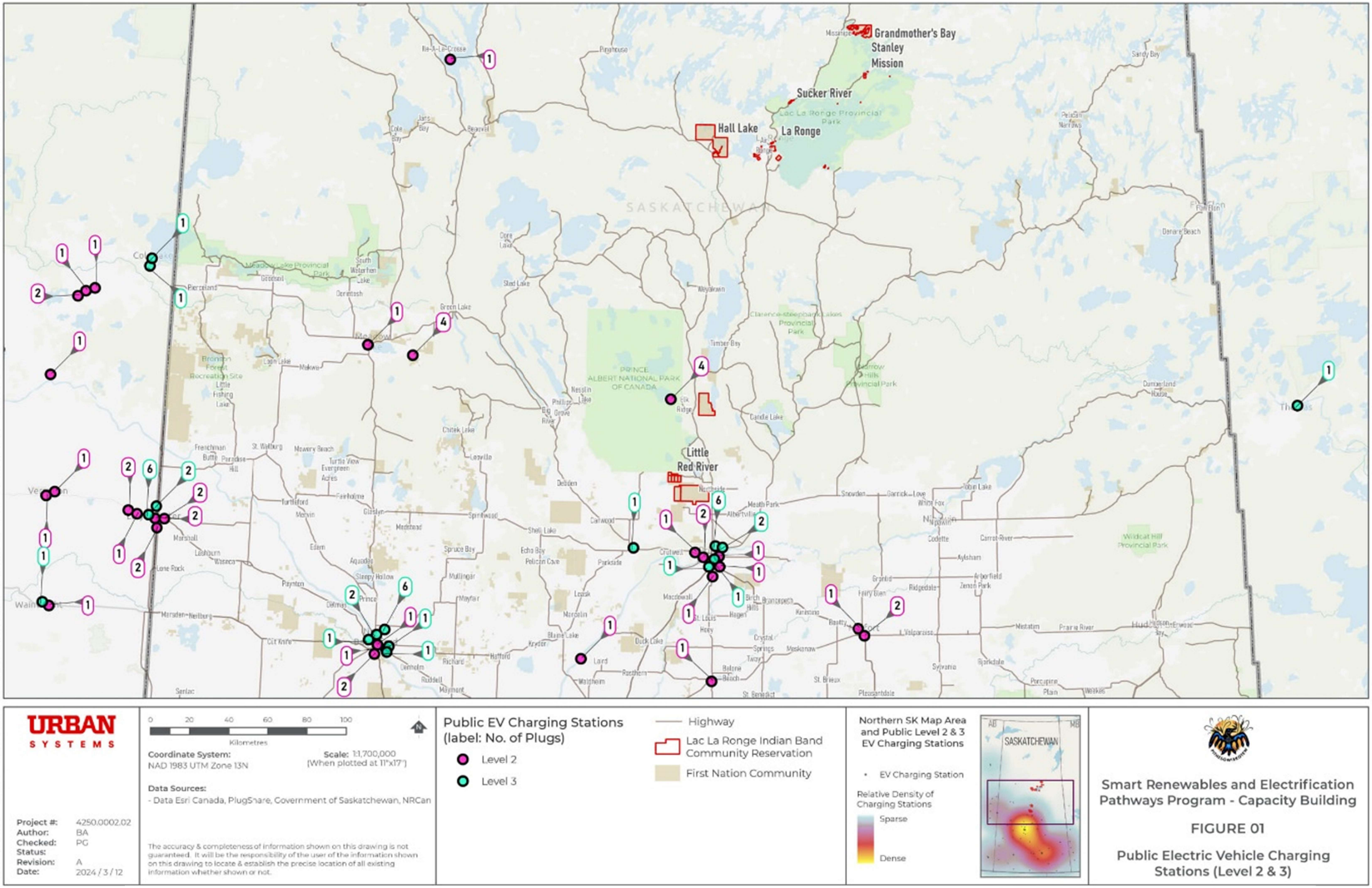

Figure 4: Charging Stations in Saskatchewan

Renewable and Low-Emission Energy

Renewable and low-emission energy emits less GHG emissions when generated compared to other energy generation technologies, such as fossil fuels like coal and gas. Because 79% of Saskatchewan's electricity is currently generated from fossil fuels[25], switching to renewable energy generation results in avoiding GHG emissions from using electricity. This summary of renewable and low-emissions energy technologies outlines the potential opportunities and considerations for each type of energy generation technology in the community.

Solar PV Energy

Summary

Solar PV stands for solar photovoltaic, which means using sunlight to make electricity. Solar PV panels are made of cells that absorb the sun's rays and convert them into electricity that can be used to power appliances, lights, or electric vehicles or stored in batteries for later use. Solar PV panels can be installed on rooftops, ground-mounted systems, or even floating platforms on water bodies. Solar PV energy is clean, renewable, and abundant, but it depends on the weather and the time of day.

A closer look

In addition to its life-giving capability, solar energy offers the most abundant renewable energy resource. The sun's energy can be converted to electricity using solar photovoltaic (PV) systems, commonly referred to as solar panels.

Here is how a solar PV system works...

- **Solar panels** mounted either on rooftops or on the ground on **racking,**[26][27] soak up sunlight and turn it into electrical energy. However, the energy they soak up cannot be immediately used for our needs.
- So, **inverters** act as translators, taking electricity from the solar panels and turning it into energy that can be distributed and used in our homes and businesses.

Solar electricity is customizable and versatile – any property with sunlight access can potentially generate solar power, depending on PV panel access and installation requirements. Solar PV systems can be installed in spaces that would not typically be used for any other purposes, such as the roof of a building or an area with contaminated soil that cannot be used for food production or development.

[25] https://www.saskpower.com/Our-Power-Future/Our-Electricity/Electrical-System/Where-Your-Power-Comes-From
[26] Racking can include specialized tracking systems, so modules better capture solar energy throughout the day
[27] The technical solutions deployed generally depend on the characteristics of the soil and forces faced by the system (e.g., wind, snow).

Energy is only generated when the sun is shining, so it must be used in real-time, stored in a battery, or fed back into the electric grid to be net-metered (i.e., credits on an electricity bill). The success of a solar PV project depends on multiple site factors, including:

1. **Solar irradiation:** How much sunlight the area gets.
2. **Local climate conditions:** What the local weather is like.
3. **Site shading restrictions:** Whether there are, for example, trees or buildings that could block sunlight.
4. **Accessibility to the grid for interconnection:** Whether/how close the system is to the electric grid.
5. **Structural capacity of the surface to support the installation:** Whether the surface (roof or ground) can support the panels' weight.
6. **The support surface's angle (if any) in relation to the sun:** The angle of the solar panel surface relative to the sun. Because of this, the support surface's angle should be optimized to align with the Sun's movement throughout the seasons.
7. **End-user energy demands:** How much electricity a person, household, or business needs from solar panels.
8. **Available surface area for desired generating capacity:** Whether there is enough space to put up the number of panels needed to meet electricity demand.

Environmental Considerations

Producing solar panels requires extracting certain mined materials and using potentially hazardous chemicals and other materials. This becomes a concern when solar panels reach the end of their lifespan and require disposal. For materials past their usable life, recycling is becoming more accessible, with battery recycling facilities in the United States preparing to accept them for recycling. Typically, solar panels are made up of 90% recyclable materials by mass, such as copper, aluminum, glass, and electronic components. Through disassembly or shredding, each component can then be processed through established recycling processes, and the toxic materials can be disposed of safely through hazardous waste facilities.

Additionally, depending on the scale of the project, solar PV systems may damage large areas of land and cause habitat loss.

Rooftop Solar

Typically, large buildings with south-facing roofs and minimal shading are ideal for solar electricity. Rooftop solar PV systems need racking systems designed for the specific roof and expected loads. Rooftop solar installations often connect directly to a building's existing electrical system, with equipment designed to match the building's system voltage. Solar generation will directly offset the building's electrical energy needs in these cases.

To comply with the National Building Code, structures with rooftop solar panels must be able to accommodate the additional weight of the panels and snow, rain, and wind loads. The age and condition of the roof are also considered; if the roof needs to be replaced during the lifetime of a solar PV system, the entire system must be removed and then reinstalled. The average size of rooftop solar PV systems is typically 7 kW for a residential system and 32 kW for a commercial system.

Legislation/Regulation	Details
National Building Code, 2015 Division B, Part 4	Rooftop structures with solar panels must be able to accommodate the additional weight of the panels and snow, rain, and wind loads.[28]

Ground-Mount Solar

Ground-mount solar PV installations may be the best option for large, open sites. The installation cost can be much lower than for rooftops and does not require consideration for rooftop replacement within its lifecycle. Ground-mount systems are typically larger, which can reduce costs with bulk purchasing of solar PV panels. The foundations of ground-mounted systems will vary depending on the ground and soil type at the site, which would be determined by conducting a geotechnical engineering investigation. Ground-mounted systems can be constructed as steady or tracking systems that follow the sun throughout the day.

If the proposed site is already developed, considerations include surrounding buildings and the potential for further development. If the site is undeveloped, considerations include the nature and timing of any potential future development. Agri-voltaics may be suitable as co-location projects before urban growth reaches an area. Agri-voltaic projects allow for farming and solar power generation to occur on the same site. Panels are installed with enough height to allow people and equipment to pass underneath and prevent prohibitive shading.

Biomass Energy

Summary

Biomass energy means using plants and animals to make electricity. Biomass can come from crops, wood, waste, or animal manure. Biomass can be burned directly to generate heat and power, or it can be converted into biogas or biofuels that can be used in engines or generators. Biomass energy is renewable and can reduce waste and greenhouse gas emissions, but it can also cause air pollution and deforestation.

A closer look

A biomass facility essentially converts organic material into usable energy. It does this by burning material such as secondary wood products, waste wood from sawmills, logging slash,

[28] https://publications.gc.ca/collections/collection_2019/cnrc-nrc/NR24-28-2018-eng.pdf, 4.1.4

clean construction and demolition waste or farm waste to produce energy that can power our homes and buildings.

The Government of Canada considers biomass to be "carbon neutral." In 2017, the Canada Energy Regulator released an analysis stating, "biomass is generally considered carbon neutral because the carbon dioxide (CO2) released from either burning or decomposing biomass approximately equals the CO2 that trees or plants take in from the atmosphere during their lives. If the trees harvested as biomass are replanted as fast as the wood is burned, new trees take up the CO2 produced by the combustion or decomposition."[29]

At the community scale, biomass heat projects can provide heat for buildings connected to a biomass heating network called District Heating. Biomass heat projects typically have higher capital costs than conventional heating systems; however, cost savings are often realized over time (e.g., fuel cost savings), and the heating source is very consistent, which enables lower, more reliable, and predictable monthly heating costs. Ideally, a long-term supply contract from one or several suppliers should be negotiated to ensure an uninterrupted and cost-effective fuel supply.

A typical biomass and district heating project includes a boiler, energy transfer stations, and a heating distribution system (i.e., pipes). The success of a biomass project depends on multiple factors, including:

1. **Type and reliability of feedstock material used.**
2. **Whether burning the feedstock for energy is its best use.**
3. **Proximity of the facility to the feedstock material** and subsequent transportation needs.
4. **The energy source that the facility is replacing.**
5. **Proximity of the facility to the end-users** and subsequent piping needs for transportation.
6. **Heating needs of end users.**
7. **Any building modifications required** for the end-user to convert their heating source to biomass boilers.
8. **Proximity of end users to each other** – the higher the density of needs, the less infrastructure is needed and the lower the up-front installation costs.

[29] Canada Energy Regulator. (2020). Canada's Adoption of Renewable Power Sources-Energy Market Analysis: Biomass. Retrieved from: https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/archive/2017-canadian-adoption-renewable-power/canadas-adoption-renewable-power-sources-energy-market-analysis-biomass.html

Another example of biomass energy is the use of landfill gas to generate electricity. As organic waste decomposes at the landfill, it produces methane and carbon dioxide, which can be collected and piped to a power generation facility and combusted to generate electricity. The collection of gas requires capping the landfill and drilling vertical wells into the waste to be piped to the facility, as well as processing the gas to a higher quality for electricity generation.

Woodstoves

A common small-scale application of biomass energy is using woodstoves for heating. This will be further discussed in the Energy Efficiency Retrofits Section.

Environmental Considerations

Greenhouse emissions associated with biomass are often considered "carbon neutral" because the carbon dioxide released is roughly the same as the carbon dioxide the tree took in from the atmosphere during its life. However, many people argue that the release of greenhouse gases is still a problem as it takes many years to grow a new tree to sequester the equivalent amount of carbon dioxide.[30] This period is known as the "carbon payback time," which refers to when pre-harvest carbon levels are reached, or the "time to carbon parity," which compares carbon levels to a reference case, such as burning natural gas instead of biomass.[31] Laganière et al. studied carbon payback periods for biomass from Canadian forests relative to heat generation from natural gas, coal, and oil.[32] **Figure 5** highlights the length of time needed for a newly established biomass system to reach the point of sequestering the cumulative carbon emissions of a natural gas heating system. The research suggests that **green trees all have a payback period of more than 100 years relative to natural gas**. The only type of biomass with no carbon payback period is harvest residues normally burned by the roadside, identified as "Harvest Residues.*"[33]

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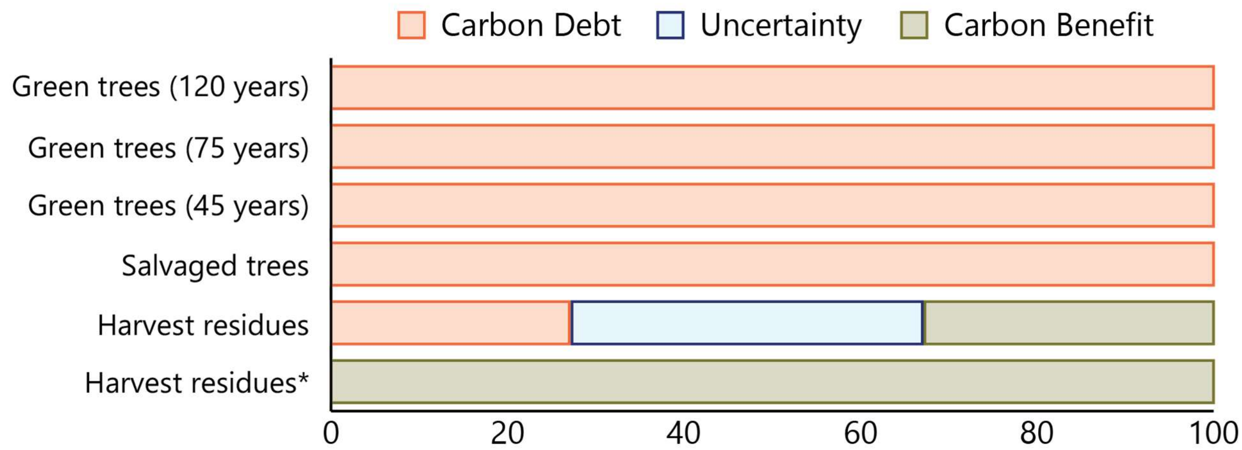
[30] Baker, Rochelle. (2021). The burning question: Is your wood stove actually green? Canada's National Observer. Retrieved from: https://www.nationalobserver.com/2021/01/07/news/is-your-wood-stove-actually-green

[31] Hanson, C. & Ranganathan, J. (2017). *Insider: Why Burning Trees for Energy Harms the Climate.* World Resources Institute. Retrieved from: https://www.wri.org/insights/insider-why-burning-trees-energy-harms-climate

[32] Laganière, J., Paré, D., Thiffault, E., & Bernier, P. Y. (2017). Range and uncertainties in estimating delays in greenhouse gas mitigation potential of forest bioenergy sourced from Canadian forests. Gcb Bioenergy, 9(2), 358-369.

[33] According to the article, harvest residues are "defined as all woody debris generated in harvest operations for traditional wood products (e.g., branches, treetops, bark), excluding stumps and downed nonmerchantable trees". Harvest residues (with an asterisk) refers to residues that are piled by the roadside and burned under controlled conditions to reduce the fire hazard. Harvest residues (without an asterisk) refers to residues that are left on site to decompose, resulting in a multi-year delay in the release of carbon dioxide.

Figure 5: Length of Carbon Debt using Biomass Relative to Natural Gas for Heating



Hydropower

Summary

Hydropower means using water to make electricity. Hydropower plants use dams, turbines, pumps, and generators to capture the energy of flowing or falling water. Hydropower can produce large amounts of electricity without emitting greenhouse gases, and the amount of electricity it generates can be adjusted to meet demand. It also provides other benefits like irrigation, flood control, and recreation. However, hydropower can also affect the environment and the people who live near the water sources.

A closer look

Hydropower utilizes the energy from moving water to activate a turbine connected to a generator. Electricity can also be generated consistently if the moving body of water is large and fast enough to have a consistent flow rate. Hydropower is financially competitive with Saskatchewan's current major electricity sources, especially at a larger scale. Advantages include low fuel and operating costs and a long and reliable service life.

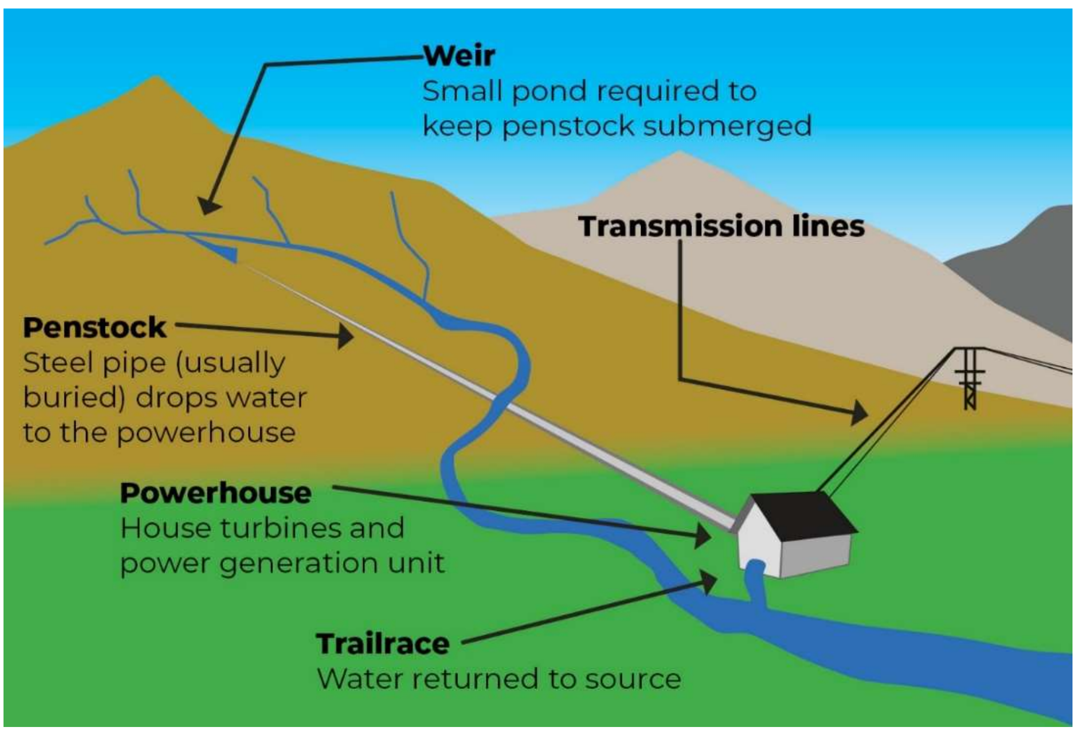
A hydroelectric facility requires a dependable water flow and an elevation difference, called the "head." In a typical installation, water is fed from a reservoir through a channel or piped into a turbine. The pressure of the flowing water on the turbine blades causes the shaft to rotate. The rotating shaft is connected to an electrical generator that converts the motion of the shaft into electrical energy.

Small hydro is the development of hydroelectric power on a scale serving a small community or industrial plant. The definition of a small hydro project varies. Small hydro typically has a generating capacity of 0 to 50 MW,[34] but can be further categorized as mini-hydro (100 kW-1 MW) or micro-hydro (<100 kW). Mini- and micro-hydropower can satisfy low-to-medium voltage electricity needed for buildings or small industries.[35]

Small hydro projects are typically comprised of the following components (**Figure 6**):

- **Headworks/Weir:** The pond and structure at the head/top of the hydropower project, used to divert water from a river, stream, or canal into the intake structure.
- **Intake structure:** The structure used to collect/withdraw water from the source, used to filter or remove any debris from the water prior to it entering the penstock.
- **Penstock:** The water from the intake structure flows into/through the penstock and down the gradient before reaching the powerhouse.
- **Powerhouse:** The powerhouse contains turbines which convert the water's energy into electricity.
- **Tailrace:** This structure allows water to flow back into the stream.
- **Transmission line:** The transmission line transports the power produced in the powerhouse to the interconnection point.

Figure 6: Small Hydropower Generation Process



[34] https://www.enerdevbase.ca/small-hydro-projects.
[35] https://www.unido.org/our-focus-safeguarding-environment-clean-energy-access-productive-use-renewable-energy-focus-areas/small-hydro-power.

Developing a small hydro project typically takes two to five years. Environmental permitting and interconnection approvals must be completed prior to construction.

Small hydropower plants are often best suited for isolated areas where there is no or limited access to the electricity grid. All sizes of hydropower plants are designed for the location and specific project design objectives. Design typically includes civil (i.e., structures, penstock or canal, water flow), mechanical (i.e., turbine system), and electrical (i.e., generator, interconnection) engineering. The engineering phase of a small hydropower project typically takes two to three years.

The success of a hydropower project depends on multiple site factors, including:

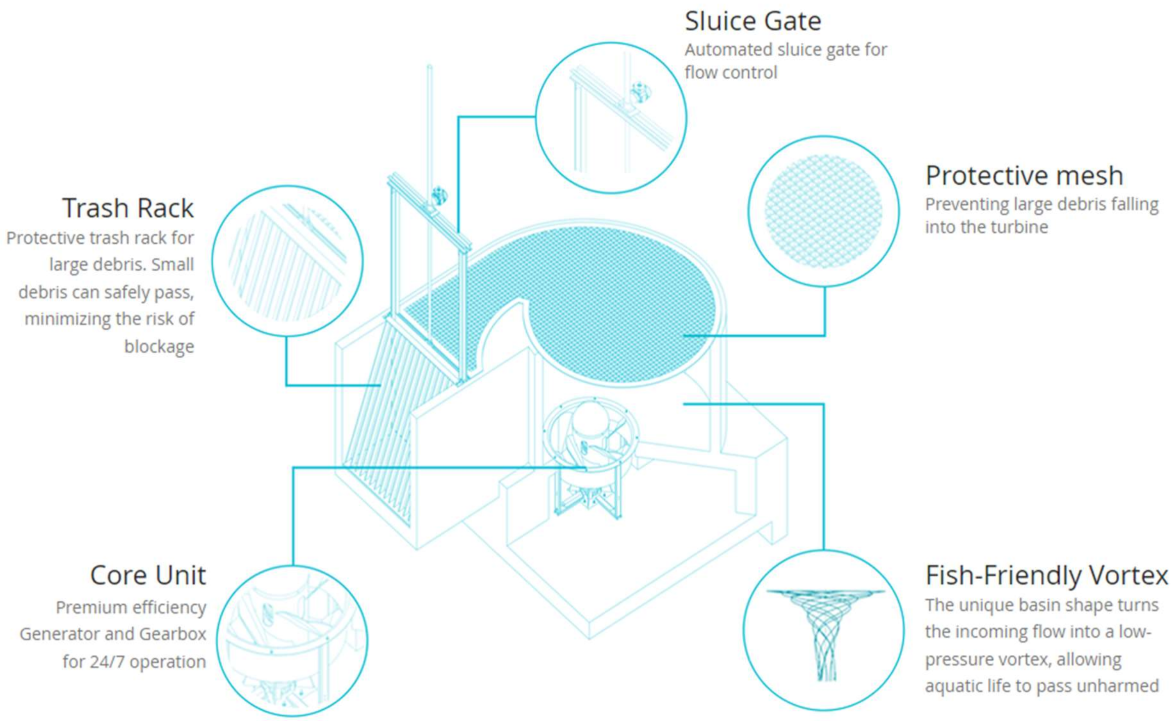
1. **Local climate conditions.**
2. **Site access.**
3. **Proximity to interconnection**, site terrain.
4. **Site topography:** There must be enough of a tilt to the river to speed the water up significantly.
5. **Water volume from rainfall or a melting snowpack.** Attention must be paid to the seasonal and yearly differences in water flow availability.

Market Analysis

Due to the relatively low head available in Saskatchewan, the project team contacted local micro-hydro system installers to assess options for low-head turbines. The two suggested systems were the Turbulent Hydroelectric Turbine and the Kouris Centri Turbine (KCT).

Figure 7 shows the key components of the Turbulent Hydroelectric Turbine.

Figure 7: Turbulent Hydroelectric Turbine Schematic



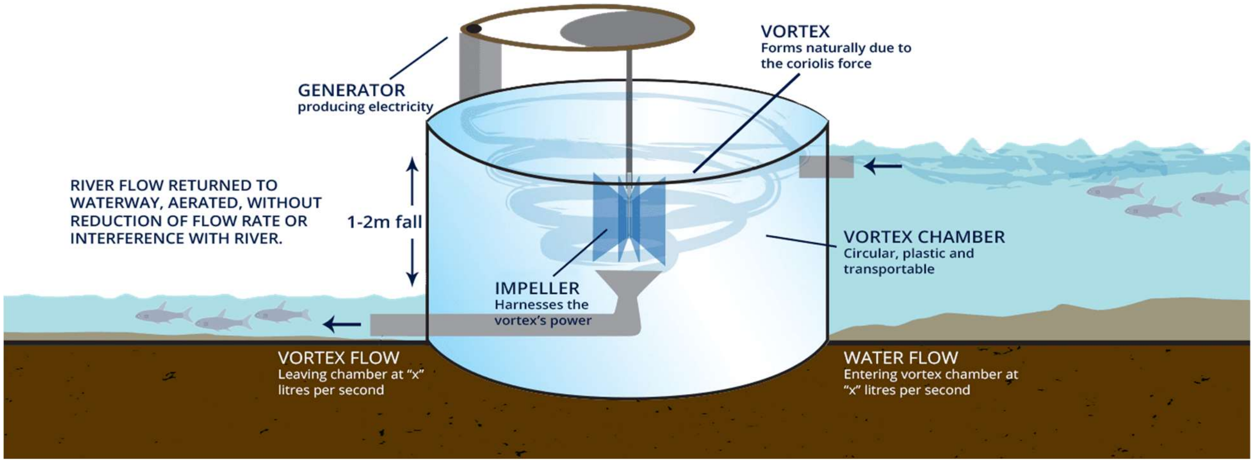
The Turbulent turbines can range in size from 15 to 70 kW and operate at a range of heads from 1.5 to 5 m. Multiple turbine units can be installed to increase the system's overall energy production. One 15 kW example project in Indonesia achieved 85% efficiency with a head of 1.5 m.[36]

Turbulent requires a canal or a gravity pipe to be constructed to divert river water from the inlet to the turbine. This is a limiting factor to implementing one of these systems since the distance required to achieve the minimum nominal head of 2 m for their smallest turbine is approximately 470 m.

Similarly, the KCT system uses a gravity pipe to divert water from the inlet to the turbine. **Figure 8** shows how the KCT operates.

[36] https://www.kourispower.com/wp-content/uploads/2017/09/A-Review-of-Gravitational-Water-Vortex-Hydro-Turbine-Systems-for-Hydropower-Generation.pdf

Figure 8: KCT Hydroelectric Unit Diagram



The unit works similarly to a sink drain where the water enters the chamber and forms a vortex that spins an impeller, which then turns a shaft to generate electricity. The water exits through the drainage exit at the bottom of the chamber and returns to the river.

The KCT system can work at a head as low as 0.6 m and offers systems from 500 W to 20 kW in size. Similarly to the Turbulent turbines, multiple units can be installed in parallel to generate additional power. Limited information was available for the KCT systems since they are a new technology to the region. Based on testing completed in Australia, the largest 20 kW system operated at 45% efficiency when installed in a location with a head of 3 m. The smaller 500 W systems operated at 85% efficiency at a low head of 0.6 m.[37]

Similar to the limitations of the Turbulent system, the distance required to achieve adequate head levels could be a limiting factor in implementing a KCT unit.

Environmental Considerations

Reservoir hydropower dams can interfere with fish migration, deplete oxygen in reservoirs, mobilize contaminants, and trap sediment important for maintaining downstream habitats including protecting deltas from erosion, which can result in new GHG emissions. Run-of-river facilities, which do not use dams, can cause fewer disturbances to fish and natural water flow when installed and operated according to specified limits. Bodies of water disrupted for hydropower electricity generation can also impact traditional and Indigenous land use.

[37] https://www.kourispower.com/wp-content/uploads/2017/09/A-Review-of-Gravitational-Water-Vortex-Hydro-Turbine-Systems-for-Hydropower-Generation.pdf

Small hydropower projects impact aquatic ecosystems and communities less than larger projects. However, like all forms of hydro-based energy generation technologies, they need to be carefully assessed and reviewed to mitigate and reduce their impact.

Installing a hydropower facility requires a water license, which can be applied for through the Water Security Agency. Projects for private domestic are not required to have a license and do not require approval from the Water Security Agency. This process will include assessing water availability at the point of diversion. There is no overarching policy and regulation for water allocation in Saskatchewan; however, if the diversion is used for domestic or livestock purposes for landowners adjacent to the water source, and the annual use is less than five cubic decameters – four acre-feet – then no approval is required.[38]

Currently, SaskPower is the only licensed Hydro Power producer in Saskatchewan.

Legislation/Regulation	Details
Water Power Act Regulation 3 Section 3	If the project includes the construction and operation of a small dam, the Water Security Agency would require an Approval to Construct and/or Water Right and Approval to Operate Works. The application must include a detailed description of the project. The project will be reviewed for its suitability for hydropower, impacts on existing water users, the watershed, or future water management. And, where necessary, apply mitigation measures or operating conditions to manage or prevent negative impacts.[39]
The Environmental Management and Protection Act, 2010	Any permanent work within the bed, bank, and boundary of a water body or watercourse would require an Aquatic Habitat Protection Permit.

[38] https://www.wsask.ca/permits-approvals/water-allocation/
[39] https://www.wsask.ca/permits-approvals/regulatory-information/surface-water-approval-process/

Wind Power

Summary

Similarly to hydropower, wind power uses turbines to capture the flow of wind to generate electricity. Wind turbines can be installed on land or offshore, and, like solar PV energy, they can be connected to the grid or to batteries. Wind power is clean, renewable, and abundant, but it depends on the weather and the location. Wind power can also cause noise, visual, and wildlife impacts.

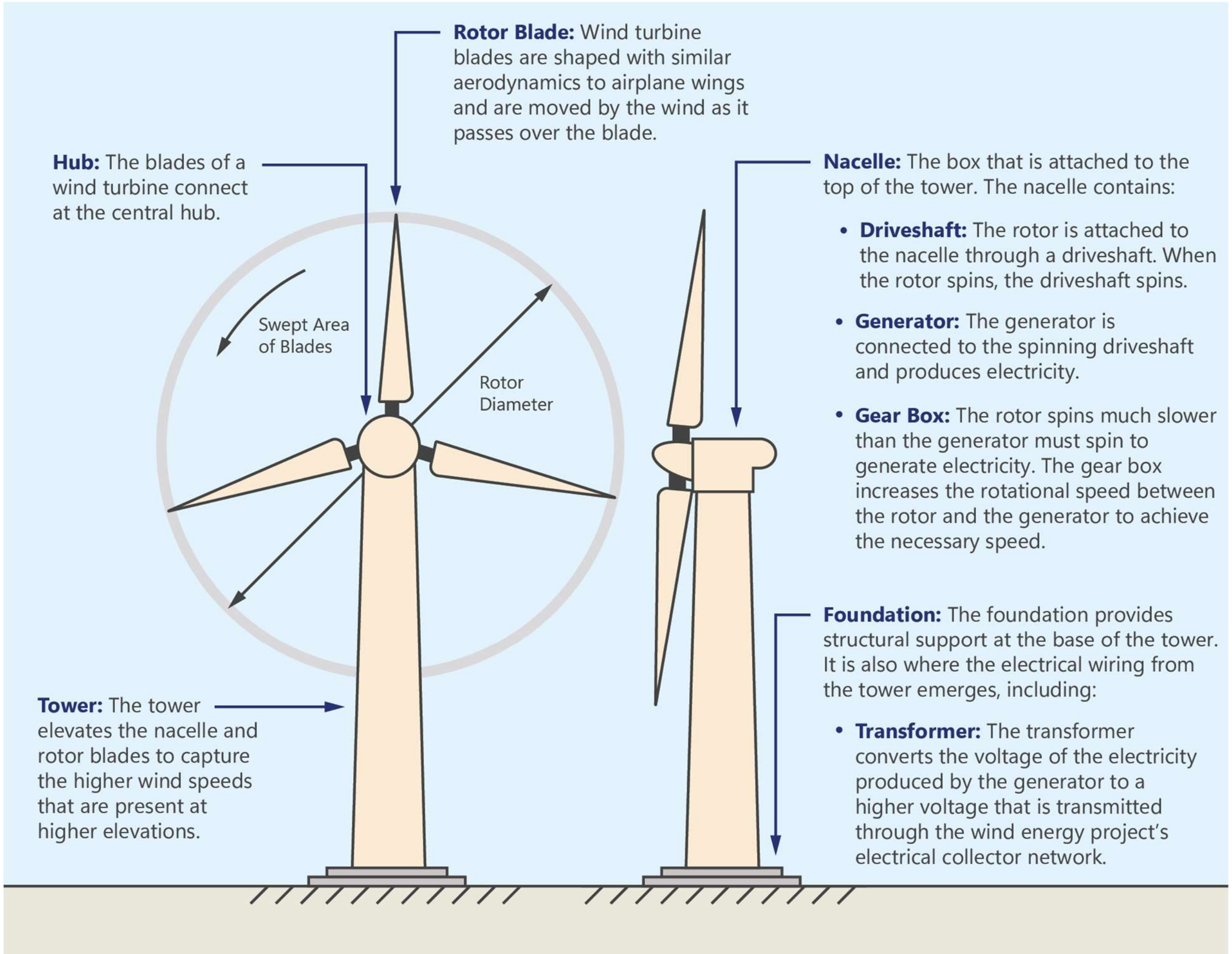
A closer look

Wind power is produced when wind blows across turbine blades that spin a rotor connected to a driveshaft, which then spins a generator to create electricity. Like solar, energy is only generated when the wind blows, so it must be used in real-time, stored in a battery, or sold back to the electric utility.

Wind turbines are available in different sizes, from small-scale with 10 kW capacity per turbine to large-scale with 10 MW capacity per turbine. There are two types of wind turbines: vertical-axis wind turbines and horizontal-axis wind turbines, which are the more common of the two. Wind turbines can be installed in different configurations, from a single turbine to hundreds across a site.

A wind energy system has the following components, shown in **Figure 9**.

Figure 9: Major Components of a Wind Turbine



Along with wind turbines, wind energy projects require a network to collect the electricity, a facility to connect the electricity to a grid, a meteorological tower for wind and weather information, and access roads for the facility's operation and maintenance.

The success of a wind power project depends on multiple factors, including:

1. **Site-specific climate conditions.**

- Air density (mass per unit volume)
- Airspeed

2. **Area of the wind turbine rotor blades.**
3. **Ground conditions** (e.g., soil stability, site drainage).
4. **Accessibility to existing roads for construction and maintenance.**
5. **Accessibility to the grid for interconnection.**
6. **Energy demands of the end-user.**

The timeline for development of a wind energy project largely depends on the time required to:

- Collect weather data from the proposed site for energy modelling purposes, which typically takes more than one year.
- Identify a customer who will purchase the power and establish a power purchase agreement (PPA).
- Complete environmental studies and any required environmental assessment processes and approvals.
- Procure infrastructure, including transformers and wind turbines, which can have long lead times.
- Complete interconnection processes and construct interconnection facilities.

Larger wind farms can take upwards of 10 years or more to develop due to complicated planning applications and the increased scope of supporting surveys. More sensitive sites (e.g., those near habitat ranges of protected species, with multiple wetlands onsite, etc.) can require further survey work, environmental studies, and approvals, resulting in additional constraints to development timeframes.

Environmental Considerations

Environmental risks associated with wind projects include the following:

- **Impacts on vegetation and soil:** The construction of a wind project typically calls for vegetation and forest clearing that can result in soil erosion, microclimate change, and animal habitat loss.
- **Threat to local wildlife:** Constructing wind projects can affect the habits and activities of birds, bats, and other flying creatures, as the rotating blades of the turbine pose a danger to flying fauna. They can also impact migrating species, like caribou.
- **Noise pollution:** Despite reducing the operating noise of wind turbines, this still poses a considerable nuisance to people living near any wind power project.
- **Shadow flicker:** Rotating wind turbine blades cast shadows on sunny days, so people residing in the areas of the shadows will experience shadow flicker, which means the repetitive light and dark of the shadow passing over their residence.

The Saskatchewan Ministry of Environment recommends a 5 km setback from important bird areas, ecological reserves, and waterways.[40] These recommendations are just guidelines, and a community can submit a wind energy project proposal to the Ministry in their avoidance zones. It might get complex and costly to assess and operate and may not be feasible for construction.

[40] Saskatchewan Ministry of Environment, Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects. September 2016. www.saskatchewan.ca/-/media/news-release-backgrounders/2016/sept/windsiting-guide.pdf, pp. 13

Name of the legislation/regulation	Key information
Wildlife Siting Guidelines for Saskatchewan Wind Energy Projects – complement to the Saskatchewan Environment Code[41]	Wind facilities must be sited outside the 5 km buffer around and including designated environmentally sensitive areas. These areas include national and provincial parks, Important Bird Areas, and ecological reserves.

Geothermal Energy

Summary

Geothermal energy draws on the heat below Earth's surface to make electricity. Geothermal plants use wells, pipes, or pumps to bring hot water or steam from underground to the surface. The hot water or steam is used to power turbines or heat buildings. Geothermal energy is renewable and can provide constant and reliable electricity (i.e., it is not weather-dependent like solar or wind energy). Still, it also requires drilling and can cause land subsidence, earthquakes, or water contamination.

A closer look

Geothermal Energy utilizes heat that is harnessed from the sub-surfaces of the earth. Usage depends largely on the temperatures accessible at reasonable drilling depth - if the geothermal reservoirs have a high enough temperature, they can drive a turbine and generate electricity. The geofluid's heat can be used for direct heating and cooling (geo-exchange) applications using ground-source heat pumps for lower-temperature reservoirs.

Ground Source Heat Pumps work by moving heat from one space (a source) to another (a sink). The pumps use electricity to transfer the underground heat to a building and can be reversed in the summer to transfer heat inside the building into the ground. These heat pumps can be scaled to the right size for any home or building and are much more efficient than generating heat through electricity. However, installing this technology requires shallow open pits for horizontal piping or vertical drilling. Open pit installations are the least expensive if the ground is sandy, silty, or clay, with minimal previous landscaping to disturb and no rocks. The success of a geothermal exchange project depends on multiple site factors, including:

1. **The temperature of the site's geothermal reservoirs** below.
2. **The depth of the reservoirs.**
3. **The type of ground of the site** that must be drilled to get to the reservoir.
4. **Heating needs of end users and current method of heating.**
5. **Any building modifications required for the end-user to connect** to the geothermal heat source.

[41] https://publications.saskatchewan.ca/api/v1/products/101100/formats/137591/download

Environmental Considerations

Drilling through the earth to reach the reservoirs required for geothermal energy has a comparable impact on the environment as drilling for a water well. The drilled holes are plugged with grout so the pipes are not touching the surface to avoid contamination and enable temperature conductivity for the heat exchange. The worst-case scenario associated with heat pump drilling is that it drills through an unknown and contaminated water well, which could contaminate the aquifer with slough water.

Air-Source Heat Pumps – an Alternative to Geo-exchange

Air-source heat pumps are an alternative form of heat pumps that require a lower upfront cost and a simpler installation that is not dependent on geothermal conditions. Current technology can achieve 300-550% efficiencies compared to electrical heating. However, air source heat pumps become less efficient as the outside air temperature decreases. Currently, cold climate air-source heat pumps can still achieve efficiencies of 180% at -15°C and still function well up to -25°C.[42] Below this temperature, they have difficulty supplying enough heat to a home. As temperatures decrease, homes lose heat more quickly, requiring more energy to extract heat from the air.

Nuclear Energy

Summary

Nuclear energy uses uranium or other radioactive elements to create reactions that release a lot of energy. The energy can be captured and used to heat water and produce steam that powers turbines. Nuclear energy can produce large amounts of electricity without emitting greenhouse gases, but it also produces radioactive waste that needs to be stored safely and securely. Nuclear energy also poses risks of accidents, terrorism, or nuclear proliferation.

A closer look

Nuclear energy is generated through the reaction of milled, refined, and converted uranium. Because it uses finite resources, it isn't considered renewable, but the energy generated requires a relatively small amount of uranium and emits minimal carbon dioxide equivalent (CO2e) emissions. Nuclear power can provide a consistent energy source, something only possible with a backup battery for solar and wind.

Commercial power reactors can be quite large, with an average generating capacity of 1,000 MW, which would be enough to supply a quarter of the province of Saskatchewan's current users. Small modular nuclear reactors (SMRs) are sized to meet the energy needs of less populated regions. SMRs are physically small and have a smaller generating capacity of up to 300 MW. They are factory-constructed, portable, and scalable.

[42] https://www.cer-rec.gc.ca/en/data-analysis/canada-energy-future/2023/results/

The success of a nuclear energy project depends on multiple site factors, including:

1. **The proximity to uranium mining and processing.**
2. **The surrounding community buy-in.**
3. **Access to funds for high upfront construction costs.**
4. **Accessibility to roads for construction and maintenance.**
5. **Accessibility to the grid for interconnection.**
6. **Existing workforce.**
7. **Proximity to a large lake or reservoir.**
8. **The energy needs of the end-user.**
9. **The proximity to a secure and safe nuclear waste management system.**

Environmental Considerations

Both nuclear reactors and small modular nuclear reactors have the same environmental disadvantages – they both mine radioactive material and generate radioactive waste, with particularly severe consequences if released into the environment.[43] However, SMR waste would be in smaller quantities and decentralized across the region, and it is expected that SMRs will require either enriched uranium or plutonium as fuel, which has a higher concentration of radioactivity per kilogram than the wastes from CANDU reactors that use natural uranium.[44]

Battery Storage

Summary

Because not all the energy generated from renewable and low emissions sources can be used in real-time, battery storage is an important part of an electrified grid. Batteries can store electricity from renewable or low-emissions sources, such as solar PV or wind power and release it when needed. In doing so, batteries help balance the supply and demand of electricity and improve the reliability and resilience of the grid. Batteries can also be used in homes, businesses, or vehicles to reduce the dependence on fossil fuels. Batteries are becoming more efficient and affordable, but they also have environmental and social impacts, such as the extraction of raw materials, the disposal of waste, and the recycling of components.

A closer look

Energy storage systems allow energy generated from renewable sources, such as solar photovoltaic (PV) panels, to be stored and used later. One of the most common types of energy storage systems is batteries, which are typically high-performing lithium-ion batteries.

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[43] Winfield, Mark, Jamison, Alison, Wong, Rich, and Czajkowski, Paulina. "Nuclear Power in Canada: An Examination of Risks, Impacts, and Sustainability". Pembina Institute. www.pembina.org/reports/Nuclear_web.pdf. pp. 88-91
[44] Coxworth, Ann. "Small Modular Nuclear Reactors" Saskatchewan Environmental Society. August 2020. environmentalsociety.ca/wp-content/uploads/2020/11/Small-Modular-Nuclear-Reactors.pdf

Large battery energy storage systems include the following key components:

- **Battery system:** Consists of several lithium cells organized into modules combined into a battery rack.
- **Inverter:** Electronic devices that convert Direct Current (DC) stored by the battery into Alternating Current (AC) used by the grid.
- **Battery management system:** Monitors and protects the battery from damage.
- **Controller:** Monitors and protects the entire energy storage system, including external devices such as electricity meters.
- **Environmental controls:** Heating, ventilation, and air conditioning systems to regulate the internal environment around the battery.

Several benefits exist to installing battery storage systems alongside renewable energy systems such as solar photovoltaic panels or wind power systems. As renewable energy systems such as solar only produce energy when the Sun shines, energy may not be available when needed. The battery storage system allows energy to be stored when production is high and used at a later time. The stored energy can be used locally, increasing a community's energy independence. Alternatively, the stored energy can be sold back to the grid when the demand and price increase. Communities can negotiate higher prices during periods of peak demand as part of a Power Purchase Agreement.

Regulations to know for developing renewable energy

Legislation and regulation requirements enforce the following assessments and approvals for installing local, self-generation systems, regardless of the technology:

Legislation/Regulation	Details
Required by SaskPower	An Interconnection Service Study with SaskPower is required if the system would connect to the grid. Interconnection costs can range, on average, from $500 to $100,000 and could inhibit a project's financial feasibility, so applying for this before any major decisions is important.[45]
The Electrical Inspection Act, 1993 **Section 19**	One set of construction electrical plans and specifications for all renewable energy systems installations must be approved through the Technical Safety Authority of Saskatchewan (TSASK).[46]

[45] https://www.saskpower.com/Our-Power-Future/Our-Electricity/Connecting-to-the-Power-Grid/Interconnection-Agreements-and-Requirements
[46] https://www.tsask.ca/electrical/permits/solar-installations

Legislation/Regulation	Details
	TSASK is responsible for electrical permits, inspections, and licensing across the province.
The Environmental Assessment Act, 1980 **Section 9**	Environmental assessment through the Fish, Wildlife, and Lands Branch is required if the proposed project is likely to cause widespread public concern about potential environmental changes.[47] Guidelines to help self-assess and then submit a technical proposal for an assessment here: https://publications.saskatchewan.ca/api/v1/products/113159/formats/137589/download
Lac La Ronge Indian Band Zoning Law	All structures must be constructed and placed within a zone expressly permitted for that purpose. Renewable energy generation must be in a zone that permits Public Works (including systems for producing, distributing, or transmitting electricity). If generated for commercial applications, it must be in a Commercial Zone. Projects may be presented to the land code committee to request amendments to the law if the identified site is outside of a permitted zone.

Any further requirements pertaining to a specific technology will be described in their overview above.

Energy End Uses, Contracts, and Grid Interconnection

As of Spring 2024, SaskPower is committed to reaching net-zero GHG emissions by 2050 or earlier, and they have a GHG emissions reduction target of 50% below 2005 levels by 2030. SaskPower aims to add more than 3,000 MW of renewable energy to the grid by 2035. SaskPower is in the process of updating its long-term supply plan, with the plan set to be released in June 2024. This new plan could update renewable generation goals.

SaskPower has an Indigenous Procurement Policy that encourages involving Indigenous People in economic opportunities and growth and considering the role of Indigenous business entities within Saskatchewan in procurement opportunities for SaskPower power generation projects.

[47] Saskatchewan Ministry of Environment. 2018. Adaptive Management Guidelines for Saskatchewan Wind Energy Projects. Saskatchewan Ministry of Environment, 3211 Albert Street, Regina, Saskatchewan.

When developing a renewable energy project in Saskatchewan, the following questions must be considered:

- Who will use the energy generated?
- What contracts are required for the sale of the energy?
- How will the generator interconnect with the grid?

As of Spring 2024, the following options are available for power generated by renewable energy projects:

- Sell power to SaskPower (Power Purchase Agreements)
- Sell power to a commercial or industrial partner (Renewable Access Service)
- Net-Metering
- Behind-the-Meter Power Production
- Off-grid
- Innovative Proposals to SaskPower

Details about each option are provided below, specifically regarding who the end users of the power are, what power purchase contracts are required, and grid interconnection considerations. It is important to review current information available on the SaskPower website to assess the most recent programs and regulations.

Selling Electricity to SaskPower (Power Purchase Agreement)

Power End Users: Power produced by the renewable energy project is sold to SaskPower and added to the overall grid capacity. SaskPower then sells the power to other customers who are connected to the grid.

Power Purchase Contract Considerations: SaskPower purchases renewable energy through Power Purchase Agreements (PPAs) with Independent Power Producers (IPPs). The contracts can be established through several processes, two of relevance being:

- **Calls for Developers:** In this process, SaskPower identifies a project site, then issues an RFP to select an Independent Power Producer to finance, build, own, and operate a new generation facility, then clean up the site when the facility has reached its end of life.
- **Calls for Power:** SaskPower does not identify a project site in this process. An RFP is issued to identify Independent Power Producers with sites where they have assessed the renewable energy resource and have confidence in the energy production potential. Like the Call for Developers, the IPP will also finance, build, own, and operate each new wind generation facility, then clean up the site when the facility has reached its end of life. At present, no Calls for Power are open or anticipated.

Interconnection Considerations: The costs of interconnecting to the SaskPower grid can be expensive, so it is important to consider these costs as early as possible. Renewable energy projects can connect to the SaskPower grid through either the:

- Distribution System at 34.5 kV and below.
- Transmission System at 72 kV and above.

SaskPower provides guidance on interconnecting to their grid in documents available on their website. The interconnection process involves completing a series of studies to assess the proposed project's impact on the grid and determine the interconnection facilities and fees. A transmission service agreement with SaskPower must be completed when connecting to the transmission system.

Selling Electricity to a Commercial or Industrial Partner (Renewable Access Service)

Power End Users: The Renewable Access Service (RAS) program allows the power generated from a renewable energy project to be used by an industrial or commercial entity. SaskPower acts as the wheeling agent, which means the SaskPower grid is used to move the power from the IPP's renewable energy generation site to the customer's site.

Project Requirements: To sell electricity via SaskPower, the project must:

- Be located within the province of Saskatchewan.
- Be larger than 10 MW.
- Have a generation capacity that does not exceed the maximum peak demand of the specified RAS customer. This is because SaskPower will only act as a wheeling agent that moves the power over their transmission lines; it will not accept any excess power to sell to other SaskPower customers.

Power Purchase Contract Considerations: A Power Purchase Agreement (PPA) is negotiated directly between the Independent Power Producer (IPP) generating the power and the large commercial or industrial partner using the power. This means SaskPower is not involved in any contracts for the sale of the energy. However, a Licensed Renewable Supplier Participation Agreement with SaskPower must be completed.

The RAS process is currently being offered to a limited number of industrial customers, but SaskPower is tentatively planning to open the process to all interested commercial and industrial customers in 2024.

Interconnection Considerations: A RAS generation project must comply with SaskPower's Interconnection Requirements and be served through transmission service, which is 72 kV or greater. An Intra-Provincial Transmission Tariff transmission service agreement with SaskPower must be signed after the necessary studies to identify the interconnection facilities are completed. The interconnection facilities for the generator will include a revenue meter that will calculate the energy delivered to the SaskPower transmission system. During operation, SaskPower has the right to curtail output from the IPP's renewable energy project to maintain system reliability.

Net Metering

Power End Users: SaskPower's Net Metering Program allows customers to connect a small-scale renewable energy project (up to 100 kW of DC power, often solar PV systems) to the grid to offset their use of power from the SaskPower grid. The unused electricity from the generator is sent to the grid, and the participant receives credits for their electrical service account with SaskPower.

Power Purchase Contract Considerations: The program is open to all SaskPower customers – residential, farms, businesses, and institutions. Participants require a SaskPower electrical service account to participate in the program, which is the same as the typical account users have to access electrical service to their residence, farm, business, or institution. Once the project is operational, SaskPower will credit the participant's account for the excess power generated at a pre-determined rate, which is $0.075/kW as of Spring 2024.

Interconnection Considerations: An electrical permit is required before beginning construction. An interconnection study, paid for by the program participant, is completed by SaskPower Distribution Services to review the participant's system proposal, its impact on the SaskPower grid, and required interconnection facilities. The participant is responsible for all SaskPower construction costs associated with connecting the project to the grid. A bi-directional meter is required, which displays the power delivered by SaskPower to the participant and the excess power that SaskPower receives from the participant's generation system that the participant does not use.

Future Potential – Virtual Net Metering: No virtual net metering program is currently available in Saskatchewan. However, this concept is shared so the community can monitor future developments and offerings on this topic. Virtual net metering allows the electricity generation credits connected at one meter to be shared with other meters. Virtual net metering enables larger renewable energy projects to be built in a centralized area, near the community, rather than on individual buildings, and for generation production to be shared with community-owned buildings, housing units, and other end-users.

For more information about SaskPower's Net Metering program, see the User Guide[48] on their website.

Behind-the-Meter Power Production

Power End Users: The Behind-the-Meter program is for customers who want to offset electricity costs by generating power onsite and using it in real-time or storing it for future use. These projects are typically greater than 100 kW (projects under 100 kW fall under the Net Metering program). The Behind-the-Meter program is different from Net Metering because no excess electricity can be fed back to the grid, and no credits can be earned; in other words, all power generated on the site must be used on the site.

Power Purchase Contract Considerations: No power can be sent to the grid, so no contract is required with SaskPower for power sales.

Interconnection Considerations: SaskPower must grant approval before proceeding with a Behind-the-Meter power production project. The project must meet SaskPower interconnection requirements and have an Electrical Control System that prevents on-site power production from being exported to the grid.

Off-Grid Power Production

Power End User: Electricity is generated and used on-site, and the site is completely disconnected from SaskPower infrastructure. In this case, the electricity consumed must be completely self-generated because no backup power is available from the SaskPower grid. Energy storage or a backup generator would be required for any power needs beyond when electricity is generated in real time.

Power Purchase Contract and Interconnection Considerations: Because the generation system is disconnected from SaskPower infrastructure, no studies, contracts, or agreements are required from SaskPower.

Innovative Proposals

SaskPower is open to hearing about innovative solutions that support their service delivery goals and provide SaskPower with economic benefits. The Supplier Relations Department of SaskPower receives innovative proposals through an Unsolicited Innovation Proposal Process. This process can be used to propose renewable energy generation projects that do not fit into one of the above categories. See SaskPower's website for more information.

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[48] https://saskpower.com/-/media/saskpower/our-power-future/powering-2030/guidelines-netmetering.pdf

Definitions

Key terms are provided below and used throughout community engagement and education to help build this understanding.

Alternative energy – This refers to the use of any renewable power source in place of fossil fuels, including hydropower, solar power, wind turbines, and geothermal energy.

Clean energy – Also known as "low-emissions energy," the generation of energy that produces little to no greenhouse gas emissions, but there is a limited amount of that energy fuel source. Nuclear energy, for example, does not emit greenhouse gases. However, there is a limited supply of Uranium, which is a mineral that is mined from the earth.

Climate change – Describes a change in temperature and weather patterns over a long period. Some shifts are natural, but effects have been exasperated since the 1800s by human activity, primarily due to the burning of fossil fuels like coal, oil, and gas.

Emissions factor – Describes the rate at which an activity (e.g., electricity use) releases greenhouse gases into the atmosphere. In this CEP, emissions factors are reported in tons of carbon dioxide equivalent (CO2e) per gigajoule (GJ) of energy used.

Energy - In scientific terms, energy is defined as "the ability to do work." In everyday language, energy is used to power and heat buildings and homes throughout our communities. Another way to think of energy is the amount of [insert unit of energy] needed to get something done. Commonly used units of energy include:

- **GJ (Gigajoule) –** A common energy unit for natural gas. For example, the total amount of natural gas used over a period.
- **kWh (kilowatt hour) –** A common energy unit for electricity. It measures the amount of electrical energy used over time. 1 kWh is equal to using 1 kW of power for one hour.

Energy conservation – Efforts to reduce energy use (e.g., limiting heating and cooling) or increase energy efficiency.

Energy efficiency – Achieving the same level of output or service with less energy, for example, through the use of energy-efficient appliances and well-insulated building designs.

Greenhouse gas (GHG) - Gases that trap heat in the atmosphere are called greenhouse gases. They include carbon dioxide, methane, nitrous oxide, and fluorinated gases. Human activities produce and emit many of these gases into the atmosphere. Increased GHG traps more heat, which leads to increased global warming, also known as the greenhouse effect.

- **tCO2e -** tonnes (t) of carbon dioxide (CO_2) equivalent (e). Carbon dioxide is the primary greenhouse gas, so all other gases are converted to their CO_2 equivalent to account for all GHG emissions in one value.

Mitigation - Mitigation looks for solutions to directly decrease the quantity of emissions released into the atmosphere that lead to climate change (e.g., energy retrofitting, implementing renewable energy sources, etc.)

Non-renewable energy – The energy generation from fuel sources that cannot be replenished over a human-oriented timeline, that is, thousands to millions of years. This means that there are finite and fixed amounts of these fuel sources. Examples include coal and natural gas.

Pithisowiskotew - Cree for "electricity." A combination of two words, Pithisow (bird) and Iskotew (fire). The thunderbird is widely known to Indigenous groups across North America as a mythological being that controls the wind, rain, lightning, and, consequently, forest fires. The thunderbird is a giant being that can carry a whale in its grasp. The cultural connection to the Cree language is the reason for the thunderbird in our logo design.

Power Purchase Agreement (PPA) – A contractual agreement between a power producer and power buyer (e.g., SaskPower) that defines the amount of energy to be purchased, the period over which it will be purchased, and terms of rate adjustments.

Renewable energy – The generation of energy from sources that Earth's natural systems can replenish over a more human-oriented timeline, that is, decades to a century. An example is wind power; the earth's wind currents will continuously circulate due to the Sun's rays and can generate energy by spinning a turbine without the need to replenish anything. Another example is solar power, which converts the Sun's rays into electricity using photovoltaic (i.e., solar PV) panels.

Retrofits – In energy conservation, retrofits refer to upgrading or making changes to buildings or processes to make them more energy efficient.

RETScreen® Clean Energy Management Software – a software developed by the Government of Canada and partners that uses advanced algorithms and databases to help determine if a proposed energy project makes financial sense. This software is used and referenced in the Community Energy Analysis Reports and the Community Energy Plans.

Simple Payback Period – the number of years of annual savings required from the project to cover the total project investment.

3.0 Frequently Asked Questions (FAQs)

Project

Q: What is the purpose and outcome of the Community Energy Plan (Pithisowiskotew)?

A: A Community Energy Plan is a complete, long-term plan made by the community to improve energy efficiency, reduce greenhouse gas emissions, and encourage local sustainable energy solutions.

The Community Energy Plan will allow the community to create and implement actions related to building energy efficiency and renewable energy. This project is important for the community as it will explore what energy projects best suit Lac La Ronge. This project aims to support Lac La Ronge in achieving greater energy security and independence while sharing knowledge and skills and building in-community energy-related experience.

The plan will be revisited on an ongoing basis so that the community can reconnect with it when making policy, plans, programming, and funding decisions. It will become a continuous cycle of planning, monitoring, implementing, and evaluating.

Q: How do I sign up? How do I get involved in this project?

A: You can schedule an appointment with the community energy planning team to see how you could save on energy bills by contacting:

Jason.Cook-Studer@llrib.ca
306-4425-1019
https://llrib.com/community-energy-plan/

Energy Types

Q: Does renewable energy cost more than what we are currently paying?

A: While renewable energy has high upfront costs, the energy generated will reduce your energy bills and eventually pay itself off, and all remaining energy can be used for free. The initial investment can be expensive, but renewable energy generation can bring long-term savings to the community.

The costs for implementing your own renewable energy system include equipment, installation, operations & maintenance. For installation, the cost of interconnection with the utility can range from $500–$100,000 (and up to $6 MM), depending on the location, grid infrastructure, and load impact.

One way to reduce costs for installing renewable energy is to loop in subject matter experts at the start – this will make sure the system is appropriate for your climate and end-use.

Q: What is happening with coal-fired plants? Are we running out of coal?

A: The Government of Canada aims to have a net-zero electricity grid by 2035, which requires the phasing out of coal-fired power and natural gas. SaskPower is already working to transition from using coal-fired plants in its power supply. Coal is a finite resource that could run out, but we plan to use other types of renewable electricity before it does.

Solar

Q: How do you set up a solar panel?

A: An electrician will connect the solar panel to your home's breaker panel to feed the electricity back to SaskPower's grid.

Q: Do solar panels work in winter?

A: Yes, they do! Even in winter, solar panels can work well. They can work up to 20% better in colder weather. So, even when it's cold outside, solar panels can still make electricity from sunlight. They might not get as much sunlight due to how low and how few hours the Sun is in the sky and the potential for snow to cover the panels, but they can still make power.

Hydropower

Q: Do all hydropower facilities need a dam?

A: No! A Run-of-the-River System does not need a dam – it is powered by the natural flow of a river to generate power, instead of the power of water falling at a large distance with the force of gravity seen with a dam system.

Q: Does hydropower work in the winter?

A: A hydropower water turbine system would work in the winter if it was deep enough below the ice. Otherwise, it would only work seasonally when the ice is gone, and water can flow through the turbine.

Q: How does hydropower interact with wildlife?

A: Hydropower systems disturb the water and earth where they are installed, impacting how wildlife travels in the area.

Smaller systems (e.g., micro-hydropower) have a smaller impact on wildlife and are more comparable to a well.

Whatever the size, the equipment installed has measures in place to minimize impacts to wildlife, and there is a required environmental impact assessment before installing hydropower to ensure that any other impacts are minimized or removed.

Wind Power

Q: Why is wind energy not an option for my community?

A: For most communities (except for Little Red River), wind power is not suitable due to the lengthy and expensive payback period and a recommended 5 km buffer from major waterways, Important Bird Areas, and ecological reserves, which limits options for siting these wind projects.

Biomass

Q: Can I have a wood stove in my home?

A: The Band has stopped building homes with wood stoves in a commitment with SaskEnergy to eventually hook up all communities to natural gas. If you own your home, you can install your own wood stove – it needs to be energy-efficient and installed correctly to minimize the fire risk in your home and reduce the greenhouse gas emissions produced.

Geothermal

Q: Does geothermal require drilling? What is the difference between geothermal drilling and shallow-pit geothermal?

A: Deep geothermal electricity generation is produced by drilling deep into the Earth and pressurizing water into steam, turning a turbine and creating usable energy.

Geo-exchange heating (i.e., ground-source heat pumps) is produced by an exchange system rooted in the ground to absorb the Earth's natural heat source, which is used to heat and cool homes/buildings. It can require drilling but could also be installed by digging a shallow pit, about the same depth as water pipes.

Air-source exchange heating (i.e., air-source heat pumps) does not require drilling or digging and instead uses the difference in temperature between the outside air and the inside air to heat or cool a building. This type of heating does not work as well on the colder days of winter and requires a backup heating system.

Q: Why is geothermal energy not an option for my community?

A: For most communities, geothermal energy is not a feasible option. This is due to the type of ground every community – except Little Red River – sits on. Drilling through the Canadian shield rocks would be costly, and the ground temperature isn't warm enough.

Nuclear

Q: Why is nuclear power not an option for my community?

A: Nuclear power, including Small Modular Nuclear Reactors (SMRs), is not presently a suitable option for most Saskatchewan communities to implement independently because their generating capacity is too high for the community's needs. SaskPower is currently leading the implementation of nuclear power in the province.

Home Energy

Q: What are some ways that I can save on energy bills?

Energy conservation and building energy retrofits are the two main ways to save on energy bills.

Energy conservation involves adjusting your behaviours and habits to use less energy. Some energy-saving behaviours might take more time and effort to adopt than previous habits. However, some energy-saving behaviours can be relatively easy and just need minor changes to our everyday habits. More information can be found in the Energy Conservation section of this document, on page 6.

Building energy retrofits consist of improving or upgrading an existing building's systems, equipment, and infrastructure to increase energy efficiency, improve functionality, and decrease operating costs. More information can be found in the Energy Efficiency – Improvements and Switches section of this document, on page 13.

Reach out to the team to learn what you can do in your home!

Q: How can I get support for the repairs and retrofits needed in my home?

A: Possible funding opportunities to make homes more energy-efficient through retrofits include:

Canada Greener Homes Loan ($40,000)

- Indigenous governments/organizations can register multiple homes.

SaskEnergy Residential Equipment Replacement Rebate

- Rebates for homeowners in Saskatchewan replacing residential equipment with more energy-efficient options.

Home Renovation Tax Credit

- A tax credit to assist homeowners with the costs of renovating and improving the energy efficiency of their homes.

Northern First Nations Home Retrofit Program

- Specifically designed to aid homeowners in Northern First Nations with retrofitting their homes for improved energy efficiency.

Oil to Heat Pump Affordability Program

- Assistance program for homeowners transitioning from oil heating systems to more efficient heat pump options.

Talk to the Community Energy Team to see what supports may be available for your home!

Q: Who will be responsible for modifying windows, doors, and insulation in homes?

A: If you pursue retrofits through a funding program, trained staff will perform the modifications. Ideally, local community members trained in retrofits can perform the installations.

Q: What types of retrofits work for different homes? (e.g. what works for older homes?)

A: Air sealing around windows and doors, including their frames, and any deficiencies in the wall are some of the most universally critical retrofits that will benefit any home regardless of age. Air sealing is also one of the easiest retrofits to complete on your home. Other retrofits that will benefit any home are appliance upgrades to energy-efficient models, including switching incandescent lights to LED, and attic insulation upgrades.

The biggest way to lower your energy usage and create a more efficient home is to become educated about energy conservation measures you can take at home.

Q: What materials and steps do I need to take to make sure my doors and windows are fully sealed and covered?

A: First, you need to assess the condition of your doors and windows by looking for cracks, holes, or gaps in the windows, doors and frames. Looking for light coming through any edges will help find gaps. Depending on what you have available and what size the gap is, you can use fibre insulation, spray foam, caulking, or any material that will prevent air from passing through. This will seal the frames and the air barrier system. You can also use window wrap (clear wrap) on your windows to add an extra layer of air barrier around your windows to prevent heat loss.

Q: Do longer extension cords use more energy?

A: Yes, longer extension cords can lose more electricity because the power travels a longer distance, and some gets lost in the cord. It's better to use shorter – or no – extension cords when possible, to save energy.

Q: Do electric appliances affect the environment?

A: Yes, the electricity used for powering electric appliances, like dryers and heaters, is currently powered by fossil fuels, which emit greenhouse gas emissions that negatively impact the environment.

Q: Are air fryers more energy-efficient than ovens?

A: Yes - air fryers, microwaves, and toaster ovens can use less than half the electricity a conventional oven uses, making them a cost-and eco-friendly substitute for oven cooking.

Q: Do air conditioners use a lot of energy?

A: Air conditioners do not use a lot of energy, but compared to a fan, then yes, air conditioning does use a lot more energy. There are other methods to cool down your home that do not require electricity, such as closing the blinds and installing windows and doors that seal tightly.

Q: Should I use space heaters?

A: It depends. If you really need to keep warm, especially for things like caring for a baby or preventing pipes from freezing, then it's okay. But be careful because space heaters use a lot of energy. Anything that heats using electricity uses a bunch of energy, so it's good to use them less if you can.

Q: How much power do appliances use when not in use?

A: Appliances that are turned off but plugged in can still use up to 10% of your total power bill! Even when they're not being used, these appliances use a bit of electricity – this is called "phantom energy." Being aware of this can help lower your electricity costs.