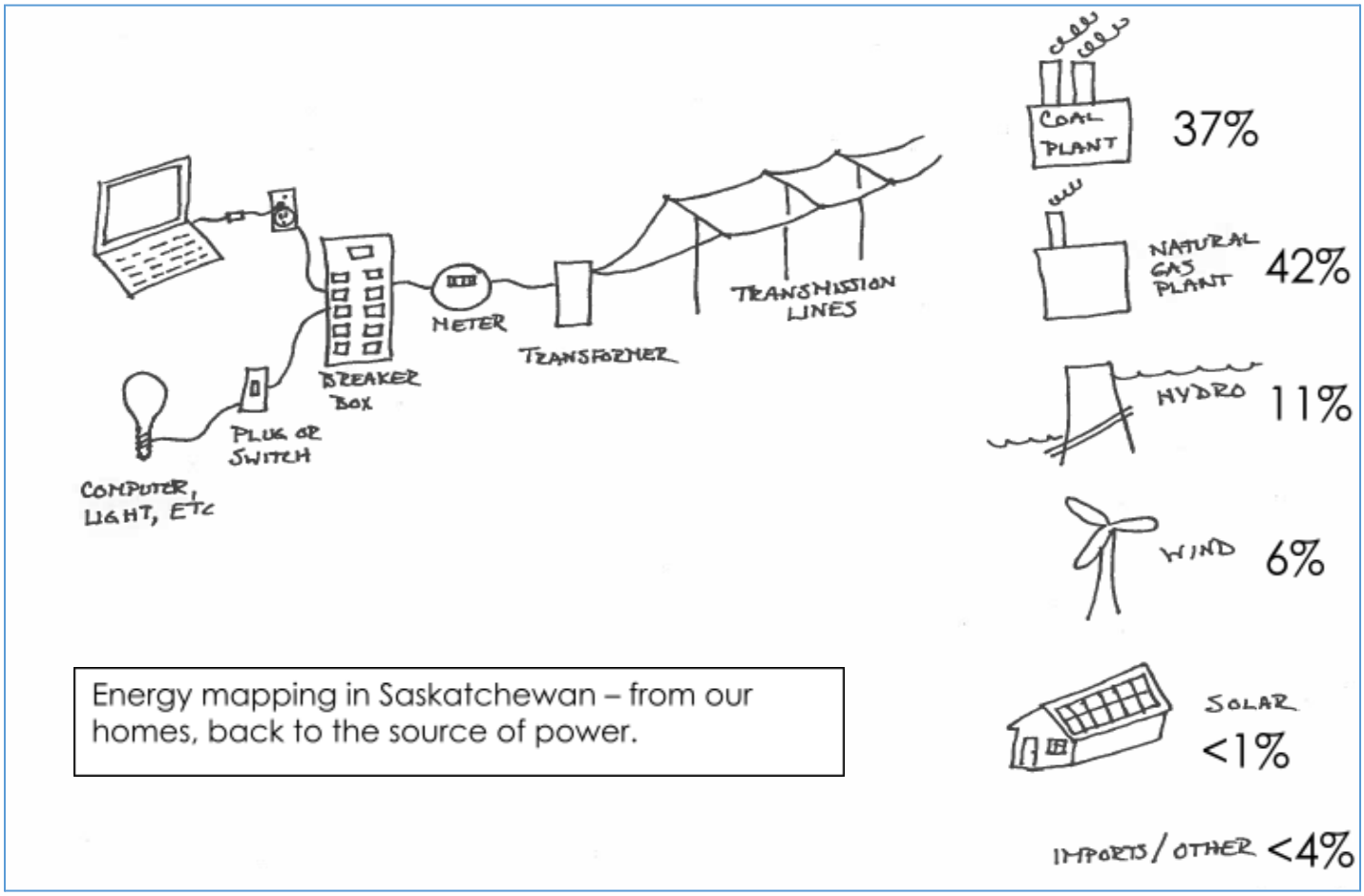
How SaskPower generates electricity for Saskatchewan (2022) – Case Study

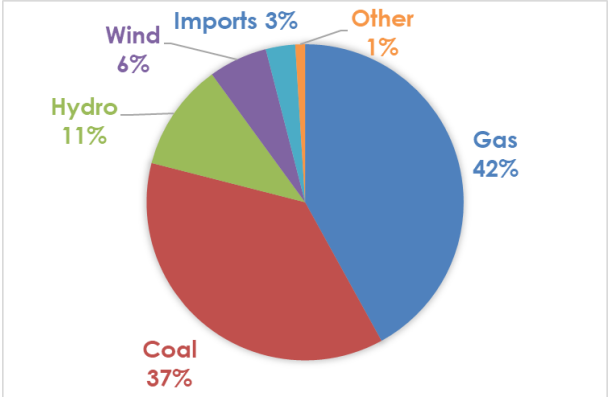
Electricity in Saskatchewan is generated using a variety of sources of energy. Some of these sources produce a lot of greenhouse gases and other pollutants when they generate electricity. Some sources are better for the environment than others. The energy mapping sketch below maps the path of energy from electrical devices in our homes, back to the source of the power. The percentages represent the amount of electricity that was generated from that source in 2020.



Energy mapping in Saskatchewan – from our homes, back to the source of power.

Here is what that looks like in a graph.

Source: SaskPower 2021.22
Gross Electrical Energy Supplied



The pros and cons of each power source

Pros	Cons
Coal	
In the past, coal has been an inexpensive way to create electricity in Saskatchewan because we have a lot of it, close to where the electricity is generated. Right now, Saskatchewan relies heavily on coal for power generation to provide base load supply, which means the electricity is available from this source every day.	In the energy mapping sketch on page 1, the coal-fired power plant has two stacks to represent the large amount of emissions. Burning coal is a very dirty way to generate electricity because it produces a lot of carbon dioxide (CO_2), particulates, mercury (Hg), and other harmful greenhouse gases (GHG).
➔ **Saskatchewan's plan for coal** is to phase out conventional coal power plants by 2030. After this point, SaskPower says that conventional coal plants will be retired or converted to carbon capture and storage facilities.	
Natural Gas	
In the sketch, this plant has only one stack. It still produces a lot of CO_2, but only about half as much as coal, and it doesn't produce the other gases and particulates. Natural gas is an ideal backup for wind power because it can quickly provide electricity for peak energy times.	Natural gas is a non-renewable resource and when it is burnt to produce power, it produces a lot of CO_2 that is released into the atmosphere. Recovering natural gas from the ground also requires a lot of energy.
Hydroelectricity	
Produces clean electricity. Water flows through pipes and turns turbines to produce electricity.	The environmental damage in hydro is all created when the dam is constructed, and the reservoir flooded. A waterway is dammed to create a lake (reservoir). The

	trees, grasslands, and shoreline above the dam will be flooded. Over time, when these habitats rot under water, it creates methane (CH_4), a potent greenhouse gas.
Wind	
Wind turbines are also a very clean energy source. Once they are built, they produce no emissions. As wind turbines spin, they generate electricity.	The wind doesn't always blow, meaning wind turbines don't always produce power. Finding optimal locations depends on many factors including wind paths, human settlements, bird migration paths, etc.
Imports/Other	
➔ These are the amounts of power that are bought and sold from Alberta, Manitoba and North Dakota, and also what is generated by diesel generators in the far north.	
Imports are great for when the required amount of power exceeds what SaskPower can provide. Even better if they come from clean sources of power. For example, electricity imported from Manitoba is generated from hydropower stations.	Other sources, like diesel, are fossil fuel sources and emit CO_2 when used. Remote communities currently have limited options for sources of power, because they are not connected to our power grid.
Solar	
Many people and businesses have solar panels on their roofs or farms and generate power that way. Although SaskPower is planning for solar to be a source of electricity, it is not yet one of the ways SaskPower currently generates large amounts of electricity.	Solar power comes from the sun's energy. If the sun doesn't shine, then panels can't produce power. This, like wind, is known as an intermittent power source.

Nuclear

➔ Although we mine uranium for other countries to generate electricity, we don't generate nuclear power here in Saskatchewan.

Note: SaskPower has committed to up to 50% renewable energy capacity by 2030. This will likely be a combination of solar, wind, or other renewable projects like biofuels. SaskPower compares power supply options here, including some that emit greenhouse gases: [*Balancing Supply Options*]

SaskPower plans to add 60 megawatts of solar power to Saskatchewan's electricity grid by 2021. A ground-mounted solar installation of that size will have the generating capacity to power between 10,000 and 12,000 homes.

Think/Share:

- Which of these sources of electricity is non-renewable? Why is it called "non-renewable"?
- Which of these sources of electricity is renewable? Why is it called "renewable"?
- What percentage of Saskatchewan's electricity comes from fossil fuels? Why is that a problem?
- Name a renewable source of power that is not represented in the circle graph. Can you name more than one renewable source of power that isn't represented in the circle graph?
- In order to reduce our greenhouse gas emissions which sources of power will we need to move away from? Which sources of power will we need to increase the use of?
- Look at the energy map on page 1. It maps the path of energy from electrical devices in our homes, back to the generation source of the power. There are two important ways we can reduce energy use:
    - Behaviour – Change how we use electrical devices. E.g. Turn them off when not in use.
    - Technology – Replace inefficient technology with efficient electrical devices. E.g. Use LED light bulbs and ENERGY STAR® rated appliances.

Curriculum Connections

Grade 4 Mathematics **P4.1** Demonstrate an understanding of patterns and relations by: identifying and describing patterns and relations in a chart, table or diagram, reproducing patterns and relations in a chart, table, or diagram using manipulatives, creating charts, tables, or diagrams to represent patterns and relations, solving problems involving patterns and relations **Science** **RM4.2** Assess how human uses of rocks and minerals impact self, society, and the environment. **Social Studies** **RW4.1** Analyze the strategies Saskatchewan people have developed to meet the challenges presented by the natural environment. **RW4.3** Assess the impact of Saskatchewan resources and technological innovations on the provincial, national, and global communities.
Grade 5 English Language Arts **CR5.4** Read and demonstrate comprehension of a range of contemporary and classical grade-appropriate fiction, script, poetry, and non-fiction (including magazines, reports, instructions, and procedures) from various cultures including First Nations, Métis, and Inuit and countries (including Canada). **CC5.3** Speak to express and support a range of ideas and information in formal and informal speaking situations (e.g., giving oral presentations and reports, retelling a narrative, explaining a display to others, working in groups) for particular audiences and purposes. **Science** **MC5.3** Assess how the production, use, and disposal of raw materials and manufactured products affects self, society, and the environment. **Social Studies** **RW5.1** Explain the importance of sustainable management of the environment to Canada's future.**RW5.2** Hypothesize about economic changes that Canada may experience in the future.
Grade 6 English Language Arts **CR6.2** Select and use appropriate strategies to construct meaning before (e.g., considering what they know and need to know about topic), during (e.g., making connections to prior knowledge and experiences), and after (e.g., drawing conclusions) viewing, listening, and reading. **CR6.3** Use pragmatic (e.g., function and purpose of texts), textual (e.g., form/genre, sequence of ideas), syntactic (e.g., word order and emphasis on particular words), semantic/lexical/ morphological (e.g., capture particular aspect of intended meaning), graphophonic (e.g., sound-symbol patterns and relationships), and other cues (e.g., the speaker's non-verbal cues) to construct and confirm meaning. **CR6.7** Read independently and demonstrate comprehension of a variety of information texts with some specialized language including grade level instructional materials, non-fiction books, reports and articles from magazines and journals, reference materials, and written instructions. **Mathematics** **P6.1** Extend understanding of patterns and relationships in tables of values and graphs. **SP6.1** Extend understanding of data analysis to include: line graphs, graphs of discrete data, data collection through questionnaires, experiments, databases, and electronic media, interpolation and extrapolation. **Science** **EL6.1** Assess personal, societal, economic, and environmental impacts of electricity use in Saskatchewan and propose actions to reduce those impacts. **Social Studies** **RW6.2** Contribute to initiating and guiding change in local and global communities regarding environmental, social, and economic sustainability.
Grade 7 English Language Arts **CR7.2** Select and use appropriate strategies to construct meaning before (e.g., formulating questions), during (e.g., recognizing organizational structure), and after (e.g., making judgements supported by evidence) viewing, listening, and reading. **CR7.3** Use pragmatic (e.g., author's purpose and point of view), textual (e.g., how author organized text), syntactic (e.g., main and subordinate ideas), semantic/lexical/morphological (e.g., figurative language and specific word meanings by their context, common affixes, and allusions), graphophonic (e.g., word patterns), and

other cues (e.g., non-verbal cues, headings, charts, and diagrams) to construct and confirm meaning when viewing, listening, and reading. **CR7.7** Read independently and demonstrate comprehension of a variety of specialized information texts including non-fiction books, grade-level instructional materials, articles, reports, reference materials, instructions, advertising and promotional materials, and websites. **Mathematics** **P7.1** Demonstrate an understanding of the relationships between oral and written patterns, graphs and linear relations. **SP7.2** Demonstrate an understanding of circle graphs. **SP7.3** Demonstrate an understanding of theoretical and experimental probabilities for two independent events where the combined sample space has 36 or fewer elements. **Science** **IE7.4** Analyze how ecosystems change in response to natural and human influences, and propose actions to reduce the impact of human behaviour on a specific ecosystem. **MS7.2** Investigate methods of separating the components of mechanical mixtures and solutions, and analyze the impact of industrial and agricultural applications of those methods. **Social Studies** **RW7.2** Investigate the influence of resources upon economic conditions of peoples in circumpolar and Pacific Rim countries. **RW7.3** Assess the ecological stewardship of economies of Canada and the circumpolar and Pacific Rim countries.
Grade 8 English Language Arts **CR8.2** Select and use appropriate strategies to construct meaning before (e.g., previewing and anticipating message), during (e.g., making inferences based on text and prior knowledge), and after (e.g., paraphrasing and summarizing) viewing, listening, and reading. **CR8.6** Read and demonstrate comprehension and interpretation of grade-appropriate texts including traditional and contemporary prose fiction, poetry, and plays from First Nations, Métis, and other cultures to evaluate the purpose, message, point of view, craft, values, and biases, stereotypes, or prejudices. **CC8.8** Write to describe a landscape scene; to narrate a personal story or anecdote and a historical narrative; to explain and inform in a presentation of findings, a biography, a documented research report, and a résumé and covering letter; and to persuade in a mini-debate and a review. **Health Education** **USC8.6** Examine and assess the concept of sustainability from many perspectives, and develop an understanding of its implications for the well-being of self, others, and the environment. **Mathematics** **P8.1** Demonstrate understanding of linear relations concretely, pictorially (including graphs), physically, and symbolically. **SP8.1** Analyze the modes of displaying data and the reasonableness of conclusions. **SP8.2** Demonstrate understanding of the probability of independent events concretely, pictorially, orally, and symbolically. **Social Studies** **RW8.1** Analyze the social and environmental consequences of living in the Canadian mixed market economy based on consumerism. **RW8.3** Critique the approaches of Canada and Canadians to environmental stewardship and sustainability.
Grade 9 Science **CE9.3** Assess operating principles, costs, and efficiencies of devices that produce or use electrical energy.**CE9.4** Critique impacts of past, current, and possible future methods of small and large scale electrical energy production and distribution in Saskatchewan. **Social Studies** **RW9.1** Compare differing perspectives regarding the acquisition and distribution of resources and wealth in the societies studied. **RW9.2** Appraise the significance of trade and transportation in the development of the societies studied.