Chapter 14
SaskPower—Transitioning to Low and Non-Emitting Energy Sources

1.0 Main Points

Saskatchewan ranked fourth highest for greenhouse gas emissions in Canada in 2022 (first in per capita emissions), which includes emissions emitted from electricity generation. SaskPower generates most of the power in the province—in 2023–24, about 35% of SaskPower's total generating capacity came from renewable (non-emitting) sources with the remainder fueled mainly from coal and natural gas.

Reducing greenhouse gas emissions is important to help mitigate the effects of climate change. In 2024, SaskPower had two primary targets relating to renewable energy sources and reducing greenhouse gas emissions:

- Increase its electricity generating capacity from non-emitting sources (like hydro, wind, solar and nuclear) to a minimum of 40–50% of its total electrical generation capacity by 2030
- Reduce its greenhouse gas emissions by 50% from 2005 levels by 2030

We audited SaskPower's planning processes, for the period ended August 31, 2024, to transition to low and non-emitting energy sources to meet its greenhouse gas emissions reduction and renewable energy generation targets. We found overall SaskPower generally had effective processes.

SaskPower projects energy demand will more than double from current levels by 2050. It evaluated cost, reliability, environmental impact, and development timelines for four supply pathways (containing various mixes of low and non-emitting energy alternatives to meet forecasted demand) through its long-term supply planning. SaskPower is currently using its net-zero 2050 pathway to make electricity generation investment decisions expecting about 57% of available generating capacity by 2050 will come from renewable non-emitting sources, with nuclear (12%) and natural gas with carbon capture (12%) also utilized.

Under its net-zero 2050 pathway, SaskPower would not be compliant with the draft federal Clean Electricity Regulations by 2035. SaskPower may need to adjust its pathway once the Clean Electricity Regulations are finalized.

We found SaskPower needs to:

- Analyze further expansion of distributed energy resources (e.g., solar panels) to help meet emerging needs. Other provinces like Alberta and Ontario are planning for increased capacity from such energy sources.

- Clarify action plans to address when annual low and non-emitting energy targets are not met. In 2023–24, SaskPower planned to reduce greenhouse gas emissions by 8% compared to 2005 levels. Instead, greenhouse gas emissions decreased by 4% in 2023–24. Outlining clear action plans to address missed incremental targets demonstrates SaskPower's intent to act so long-term targets (50% reduction by 2030) are not missed, and cost impacts are minimized.

2.0 INTRODUCTION

Low-emitting generation refers to electricity produced in a manner that releases a small amount of greenhouse gases (e.g., 50 tonnes CO_2/GWh or less) as a result of fuel combustion.[1,2] Natural gas generation with carbon capture utilization and storage is an example of a low-emitting source.

Non-emitting generation is electricity produced in a manner that does not directly release any greenhouse gases as a result of fuel combustion. Non-emitting generation sources include hydro, wind, solar, and nuclear.[3]

In 2024, SaskPower had two primary targets related to reducing greenhouse gas emissions. The first being to increase its electricity generating capacity from non-emitting sources to a minimum of 40–50% of its total electrical generation capacity by 2030.[4] The other being to reduce its greenhouse gas emissions by 50% from 2005 levels by 2030.[5] SaskPower publicly reports on its progress to meet these targets each year in its annual report.

Saskatchewan has also set a renewable energy generation capacity target that by 2030, up to 50% of total electricity capacity will come from renewable energy sources (e.g., hydro, wind, solar).[6] Under *The Power Corporation Act*, SaskPower is responsible for the generation, transmission, distribution, purchase, sale, and supply of electrical energy in the province.

2.1 Background

SaskPower generates the majority of power in Saskatchewan. Due to Saskatchewan's large trade-exposed economy, industrial customers use approximately 70% of power produced by SaskPower.

The Canadian Net-Zero Emissions Accountability Act, which became law on June 29, 2021, enshrines in legislation Canada's commitment to achieve net-zero emissions by 2050. SaskPower publicly stated its commitment to meet this net-zero emission target by 2050.[7]

SaskPower continues to cite environmental regulation as a key risk area each year in its annual report.[8] Federal regulations require the phase out of conventional coal-fired generation by 2030. The Federal Government has also proposed new Clean Electricity Regulations.[9] These draft regulations would establish performance standards to reduce

[1] canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/achieving-net-zero-emissions-electricity-generation-discussion-paper.html#toc0 (25 September 2024).
[2] One gigawatt hour (GWh) is equivalent to the energy consumed by 125 typical houses in one year. GWh is a common unit to describe energy consumption. One GWh is 1,000 MWh, one MWh is 1,000 kWh. Household bills are commonly charged in kWh.
[3] canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/achieving-net-zero-emissions-electricity-generation-discussion-paper.html#toc0 (25 September 2024).
[4] canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/agreements/equivalency/canada-saskatchewan-greenhouse-gas-electricity-producers.html (25 September 2024).
[5] *SaskPower Annual Report 2023–2024*, p. 12.
[6] saskatchewan.ca/business/environmental-protection-and-sustainability/a-made-in-saskatchewan-climate-change-strategy/climate-resilience-framework-and-reports, p. 5, (30 September 2024).
[7] *SaskPower Annual Report 2023–2024*, p. 8.
[8] Ibid., p. 49.
[9] Government of Canada (2023) Canada Gazette, Part I, Volume 157, Number 33: Clean Electricity Regulations. gazette. gc.ca/rp-pr/p1/2023/2023-08-19/html/reg1-eng.html (30 September 2024).

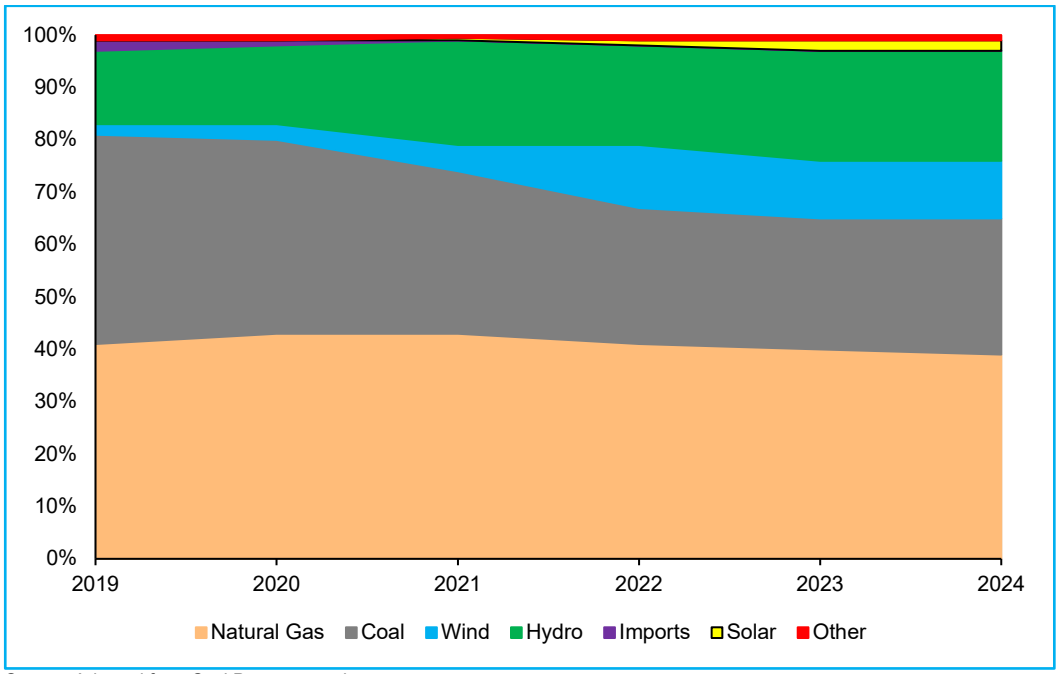
greenhouse gas emissions from fossil fuel-generated electricity starting in 2035. For example, natural gas plants built after 2025 need to meet greenhouse gas emissions intensity standards as of 2035.[10,11]

Federal regulation significantly affects SaskPower as it still used natural gas for 39% and coal for 26% of its power generating capacity at March 31, 2024 (see **Figure 1**).[12]

Saskatchewan is one of two provinces in Canada that still relies on coal as one of its main sources of energy.[13] As recently as five years ago, Alberta was in a similar situation to Saskatchewan, but it moved to retire coal plants or convert them to run on natural gas. By the end of 2024, Alberta is not expected to have any power plants running on coal.[14]

As shown in **Figure 1,** hydro is SaskPower's largest non-emitting energy source; however, generation can fluctuate with annual precipitation levels. Saskatchewan has abundant wind and solar potential, but wind and solar are not constant.[15] In 2023–24, hydro represented 21%, wind 11%, and solar 2% of SaskPower's total generating capacity, respectively. In 2023–24, about 35% of SaskPower's total generating capacity came from renewable (non-emitting) sources.

Figure 1—SaskPower Electricity Generation Capacity by Energy Source from 2019 to 2024



Source: Adapted from SaskPower annual reports.

[10] For example, natural gas plants that do not meet the CO_2 emissions intensity limit starting in 2035 may be retired early or require retrofitting with carbon capture and storage. Emissions intensity is greenhouse gas emissions relative to production for an emitter's industrial facility.
[11] The draft Clean Electricity Regulations (CER) were published in August 2023, for public consultation and review, with the final version expected to be published by the end of 2024.
[12] *SaskPower Annual Report 2023–2024*, p. 12.
[13] Nova Scotia is the other Canadian province that uses coal as a primary source of energy.
[14] cbc.ca/news/canada/calgary/bakx-coal-china-power-cop28-1.7080706. (25 September 2024).
[15] cer-rec.gc.ca/en/data-analysis/energy-commodities/electricity/report/canadas-renewable-power/provinces/renewable-power-canada-saskatchewan.html (27 September 2024).

2.2 Importance of Reducing Greenhouse Gas Emissions

Reducing greenhouse gas emissions is important to help mitigate the effects of climate change.

In 2022, Saskatchewan ranked fourth highest for greenhouse gas emissions in Canada (first in per capita emissions) with 75.9 million tonnes emitted, including 13.4 million tonnes emitted from electricity generation.[16] SaskPower is targeting to reduce its greenhouse gas emissions from power generation to 7.1 million tonnes by 2030 (50% reduction from 2005 levels).[17]

As part of the Government of Canada ratifying the Paris Agreement to reduce greenhouse gas emissions, it committed to reduce Canada's emissions by 30% below 2005 levels by 2030.[18] In 2021, that Agreement was amended to reduce emissions by 40–45%, with an additional objective of having net-zero greenhouse gas emissions by 2050. SaskPower maintaining a power supply plan that includes low and non-emitting energy sources is important to help in meeting these commitments.

In 2019, Saskatchewan signed (with the Federal Government) *An Agreement on the Equivalency of Federal and Saskatchewan Regulations for the Control of Greenhouse Gas Emissions from Electricity Producers in Saskatchewan, 2020*. By signing this Agreement, Saskatchewan agreed to mandatory greenhouse gas emissions limits for the electricity sector up to 2030, along with specified levels of electricity generation capacity from non-emitting energy sources (e.g., 34–40% by December 31, 2027). As of March 2024, about 35% of SaskPower's electricity generation capacity comes from non-emitting energy sources, according to SaskPower's annual report.

Saskatchewan is well positioned for certain non-emitting energy technologies given it has some of the highest solar and wind potential of all the Canadian provinces.[19] However, energy sources such as wind or solar are intermittent or variable, so are only available at certain times. To ensure reliability, these energy sources require dispatchable capacity (e.g., natural gas) present as back-up when these intermittent energy sources are unavailable.

Without a long-term supply plan that incorporates low and non-emitting energy sources, Saskatchewan risks not achieving its greenhouse gas emissions reduction targets and obligations by the expected dates. A global effort to reduce greenhouse gas emissions can limit global warming and lessen the worst impacts of climate change (e.g., floods, forest fires, droughts). Not having effective planning processes could also result in increased costs, delayed timelines, and impact the reliability and sufficiency of the power supply.

[16] canada.ca/en/environmentclimatechange/services/environmentalindicators/greenhousegasemissions.html (30 September 2024).
[17] *SaskPower Annual Report 2023–2024*, p. 5.
[18] Office of the Auditor General for Canada, Fall 2017, *Report 1—Progress on Reducing Greenhouse Gases—Environment and Climate Change Canada*.
[19] cer-rec.gc.ca/en/data-analysis/energy-markets/provincial-territorial-energy-profiles/provincial-territorial-energy-profiles-saskatchewan.html (25 September 2024).

3.0 AUDIT CONCLUSION

We concluded, for the 12-month period ended August 31, 2024, SaskPower had, other than the following areas, effective planning processes to transition to low and non-emitting energy sources to meet its greenhouse gas emissions reduction targets and renewable energy generation targets.

SaskPower needs to:

- **Analyze further expansion of distributed energy resources (e.g., solar panels, battery storage systems) to help meet emerging needs**
- **Clarify action plans to address when annual low and non-emitting energy targets are not met**

Figure 2—Audit Objective, Criteria, and Approach

Audit Objective: Assess the effectiveness of SaskPower's planning processes, for the 12-month period ended August 31, 2024, to transition to low and non-emitting energy sources to meet its greenhouse gas emissions reduction targets and renewable energy generation targets.

Audit Criteria:

Processes to:

1. **Set a long-term power supply plan that includes low and non-emitting sources**
   - Know existing supply capacity and forecast future supply and demand-side resources required
   - Establish short, mid-term and long-term low and non-emitting energy objectives
   - Align plan with relevant legislative requirements, good practice, and strategic direction
   - Determine expected outcomes and targets for low and non-emitting energy sources
2. **Determine strategies to meet low and non-emitting energy objectives**
   - Evaluate the comprehensive range of low and non-emitting sources (e.g., seek public input, compare jurisdictions, consider real-world experience and potential funding available, estimate supply capacity, impact of distributed energy resources, technical and market potential)
   - Assess and manage key risks and constraints (e.g., cost uncertainties, regulation, variable supply challenges) to low and non-emitting energy transition
   - Identify all supply and demand side resources required (life-cycle costs) and select reasonable low and non-emitting energy sources
3. **Adapt long-term power supply plan**
   - Continually assess progress against expected outcomes and targets
   - Establish a process for amending the supply plan for new or emerging trends, technology, and environmental regulations to meet expected outcomes and targets (e.g., utilize contingency plans)
   - Communicate progress on efforts to transition to low and non-emitting sources, meet greenhouse gas emissions reduction targets, and meet renewable energy generation targets (e.g., to senior management, public)

Audit Approach:

To conduct this audit, we followed the standards for assurance engagements published in the *CPA Canada Handbook—Assurance* (CSAE 3001). To evaluate SaskPower's planning processes, we used the above criteria based on review of literature including reports of other auditors, and consultations with management and subject matter experts. SaskPower agreed with the above criteria.

We examined SaskPower's policies and procedures relating to transitioning to low and non-emitting energy sources to meet its greenhouse gas emissions reduction targets and renewable energy generation targets. We interviewed key staff responsible for activities related to long-term power supply planning. We assessed SaskPower's long-term power supply plan, including the energy alternatives SaskPower considered, against good practice and plans of other jurisdictions in North America. We used external consultants with expertise in electricity generation planning to help us identify good practice and to assess SaskPower's processes.

4.0 KEY FINDINGS AND RECOMMENDATIONS

4.1 Power Supply Plans Maintained

SaskPower maintains a ten-year supply plan for power generation (currently looks to 2035), as well as a long-term supply plan (currently looks to 2050).

We found SaskPower updates its ten-year supply plan each year. When updating the plan, it considers key variables such as future power demand, expected retirements of existing power generation units (e.g., coal-fired plants), expanding and integrating renewable resources, and escalating fuel prices.

According to SaskPower management, the overarching goal of this plan is to determine the lowest cost pathway that meets both reliability requirements and environmental targets. The ten-year supply plan serves as a guideline for future supply decisions (e.g., which energy alternatives to invest in and how much depending on anticipated costs, estimated power generation capacity, reliability, and environmental impact). Individual projects for new power supply must still be identified and approved throughout the year, but they are expected to align with the ten-year supply plan direction.

We found SaskPower updates its long-term supply plan every two to three years. This currently looks out to the year 2050. The plan was last updated in September 2023.[20] The long-term plan considers different scenarios that may impact delivering electricity to meet Saskatchewan's needs (e.g., number of electric vehicles, quantity of businesses and homes using electricity for heat). This plan incorporates lessons learned from near-term planning decisions like power generation capacity shortfalls (e.g., as shown in **Figure 3**, wind facilities did not supply as much power as available capacity).

Both plans are available to applicable staff responsible for supply planning on SaskPower's internal website.

Overall, we found SaskPower updated both the ten-year supply plan and long-term supply plan as expected.

Updating long-term supply plans on a periodic basis reduce the risk of overlooking new or emerging energy alternatives or using outdated costs, assumptions, and strategies within the plans.

4.2 Adequate Processes to Determine Generation Capacity and Forecast Demand

To support power supply planning, SaskPower reasonably determines its existing power generation capacity (i.e., supply) and forecasts its customers' long-term energy needs (i.e., demand).[21]

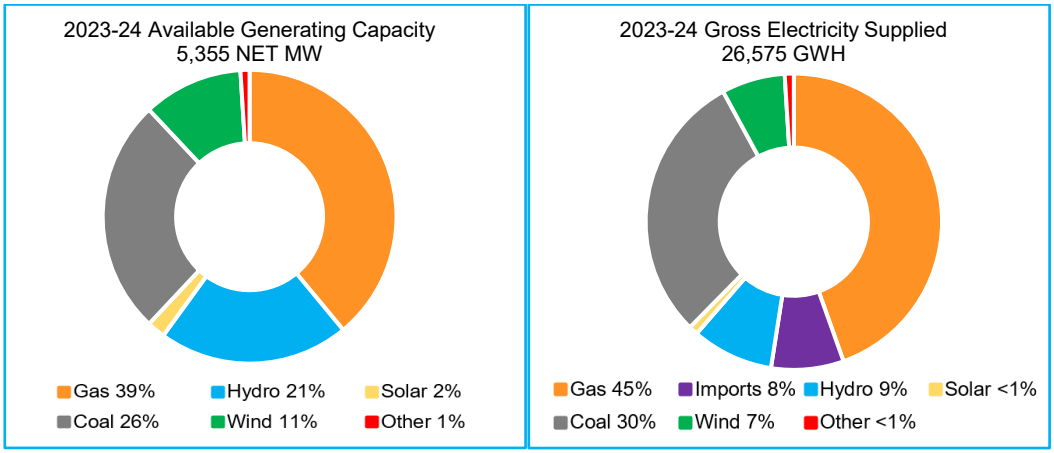
[20] SaskPower expects to have an updated plan by early 2025.
[21] Customer classes include oilfield, commercial, industrial, residential, and farms. Oilfield, commercial, and industrial customers represent about 70% of demand, while residential and farm represent about 13% and 5% respectively.

Existing Supply

SaskPower uses the intended output of each of its power generation facilities (called nameplate capacity) to determine its existing (available) power generation capacity on a daily and annual basis. This practice aligns with industry standards and other Canadian jurisdictions. In 2023–24, SaskPower's generation capacity was largely fueled by natural gas, coal, and hydro, with hydro being the largest non-emitting energy capacity source with 21% of total capacity (see **Figure 1**).

SaskPower also tracks actual energy (gross electricity) supplied by energy source because nameplate capacity is often not achievable (e.g., wind facilities do not generate electricity if there is no wind). **Figure 3** shows SaskPower's available generation capacity compared to gross electricity supplied by fuel type for 2023–24. As indicated, during 2023–24, available hydro and wind generation capacity was higher than the actual percentage of gross electricity supplied (i.e., 21% capacity for hydro compared to 9% supplied by the end of the year and 11% capacity for wind compared to 7% supplied by the end of the year). As a result, other non-renewable sources (i.e., coal and natural gas) had to supply a higher percentage of gross electricity.

Figure 3—SaskPower's Generation Capacity Compared to Electricity Supplied for 2023–24



Source: *SaskPower Annual Report 2023–2024*, p. 4.

Future Demand

To forecast Saskatchewan's future power needs, each year SaskPower prepares a 30-year load forecast that estimates both long-term energy requirements and peak loads. Peak load occurs when energy use is highest at various times of each day and year, such as during the coldest and hottest days. Staff (e.g., professional engineers) who prepare the load forecast are knowledgeable about energy production and statistical modelling. The load forecast uses information from many sources including:

- Independent statistical data such as population projections
- Historical energy sales based on SaskPower's corporate records

- Individual customer forecasts based on data provided by SaskPower's larger customers (e.g., mines) or the Ministry of Energy and Resources (e.g., potash and oil production forecasts)

SaskPower documents the methods and assumptions used within the load forecast report. Documented methods and assumptions support the understanding of resulting information for future planning or other purposes. About every five years, SaskPower hires an external consultant experienced with energy production to help it assess and improve its load forecasting process. Management advised us it addressed the recommendations made in the last assessment completed in 2018 and is conducting a new assessment in late fall 2024.

SaskPower also used reasonable performance measures to help it plan enough power generation capacity to meet peak demand periods and build in sufficient contingency for unforeseen events. The primary metrics (assumptions) used in SaskPower's supply planning were:

- **Expected Unserved Energy** (assumption currently set at 0.02% of forecasted energy): measures customer demand not supplied due to shortage of generation capacity or electricity produced

- **Planning Reserve Margin** (assumption currently set at 15–17%): measures extra power generation capacity needed to meet periods of highest demand (e.g., enough power for maximum air conditioner use on the hottest days of summer) required to maintain the desired Expected Unserved Energy

SaskPower estimates demand for power generation in 2024–25 will be approximately 26,000 GWh (for the entire year) and forecasts demand will increase to approximately 29,000 GWh in 2033, and around 38,000 GWh by 2053. **Section 4.9** provides more details on the alternatives (e.g., new generation facilities) SaskPower is exploring in order to meet this increased demand, including low and non-emitting energy sources.

We found SaskPower's load forecasting methods and assumptions (e.g., population growth, projected weather patterns, increases in electric vehicle use) aligned with industry practices and were comparable to some other Canadian jurisdictions (e.g., Alberta, New Brunswick).

Robust processes to determine generation capacity and to forecast energy needs help SaskPower to develop short- and long-term energy supply plans to provide a reliable and sufficient power supply for Saskatchewan.

4.3 Public Consultation Process Conducted to Inform Planning

Since 2022, SaskPower has been conducting an extensive five-stage public consultation process to help update its long-term power supply planning. It informed the public during the consultation process about supply options to allow for feedback.

SaskPower divided its public consultation project into five different stages. **Figure 4** outlines what each stage focused on, when it took place, and a brief description.

Figure 4—SaskPower Public Consultation Process Outline

Stages	Timeline	Brief Description of Work Done or Planned
Stage 1: Getting to Know You	September to November 2022	SaskPower asked the public how they wanted to participate, what power supply options they would like to know more about, and what supply opportunities they see for the future.
Stage 2: Understanding your Priorities	November 2022 to May 2023	SaskPower shared detailed information about supply options they were considering. It focused on the public's values and priorities when evaluating power supply options.
Stage 3: Exploring Power Supply Scenarios	September 2023 to January 2024	SaskPower shared power supply mix scenarios (see **Section 4.9**). It explored the benefits and trade-offs that come with each power supply option or scenario.
Stage 4: Reviewing the Draft Long-Term Supply Plan	March 2024 – Late 2024	SaskPower is updating the long-term power supply plan based on what it heard from the public.
Stage 5: Long-Term Supply Plan Release	Late 2024 or Early 2025	SaskPower plans to release its long-term supply plan and show the public the impact their input had on the final plan.

Source: Adapted from SaskPower reporting.

We found, during Stages 1 and 2, over 15,000 people shared their values, priorities, and preferences for power sources. This number increased to over 25,000 in Stage 3. For example, SaskPower learned many people supported power being generated directly in the province (e.g., lower reliance on imports).

SaskPower used a variety of reasonable methods to educate and reach out to the public, including online sessions, in-person meetings, town hall meetings, and information pamphlets mailed with customer billings. Information provided focused on pertinent topics relating to the long-term supply planning process such as cost, large-scale wind and solar production, and nuclear small modular reactor planning. Education sessions often included both internal, from SaskPower, and external panelists to provide additional insights from across Canada and North America.

Involving the public in supply planning allows for engagement and feedback that can be used to help inform future supply planning decisions, including preferences for low and non-emitting sources.

4.4 Long-Term Supply Plan Aligned with Existing Legislative Requirements

SaskPower aligned its long-term supply plan with legislative requirements in force as of August 2024 and monitored its required generation capacity for renewables under the Canada-Saskatchewan Equivalency Agreement.

The Canada-Saskatchewan Equivalency Agreement (Saskatchewan signed with the Federal Government) outlines specific targets for non-emitting generation that Saskatchewan agreed to meet as it moves toward 2030. The Agreement contains provisions that result in Saskatchewan following equivalent provisions to the Federal *Canadian Environmental Protection Act, 1999* and the *Reduction of Carbon Dioxide Emissions from Coal-fired Generation of Electricity Regulations (Coal-Fired Electricity*

Regulations).[22] This Agreement outlines mandatory greenhouse gas emissions limits for Saskatchewan's electricity sector (on an electricity-wide basis as opposed to every coal-fired plant) from 2018 to 2029. It also documents established commitment levels that Saskatchewan agrees to meet with regards to electricity generation capacity from non-emitting energy sources. These targets include the following minimum levels of electricity generation capacity from non-emitting sources:

- 30–34% by December 31, 2024
- 34–40% by December 31, 2027
- 40–50% by December 31, 2030

At March 31, 2024, we found SaskPower had 35% of its electrical generation capacity coming from non-emitting sources (i.e., mostly hydro, wind, and solar).

The Canadian Net-Zero Emissions Accountability Act allows the Federal Government to set five-year national emissions reduction targets, including the requirement to achieve a net-zero greenhouse gas emitting electricity system across Canada by 2050.

We found SaskPower considered all significant legislation when developing and finalizing its long-term supply plan and updated the plan accordingly to consider different pathways (see **Section 4.9**) to comply with existing and future legislation.

The Federal Government has also proposed Clean Electricity Regulations under the *Canadian Environmental Protection Act, 1999*. The proposed legislation highlights the Government of Canada's commitment to achieving a net-zero electricity grid by 2035 and provides a framework of accountability and transparency as to how it will deliver on that. The Clean Electricity Regulations were not finalized or in force as of August 2024.

SaskPower is monitoring the progress of this proposed legislation and the impact it will have on its long-term supply plan, including potential carbon penalties. SaskPower noted publicly in August 2023 that the net-zero greenhouse gas emissions by 2035 target is not feasible in Saskatchewan from logistical, technical, and affordability perspectives.[23] Rather, SaskPower is committed to achieve net-zero greenhouse gas emissions by 2050.[24]

Continuously aligning its long-term supply plan with applicable legislation reduces the risk of non-compliance with legislation when SaskPower selects future generation projects from low and non-emitting energy alternatives.

4.5 Low and Non-Emitting Energy Objectives, Measures and Targets Established

SaskPower documented its strategic priorities relating to low and non-emitting energy sources in its 2023–24 annual report. It also established measures and targets for periodically assessing its progress toward those priorities.

[22] canada.ca/en/environment-climate-change/services/canadian-environmental-protection-act-registry/agreements/equivalency/canada-saskatchewan-greenhouse-gas-electricity-producers.html (25 September 2024).
[23] saskpower.com/about-us/our-company/blog/2023/reaching-net-zero-in-saskatchewan (10 October 2024).
[24] *SaskPower Annual Report 2023–2024*, p. 8.

SaskPower set four overarching strategic priorities in its 2023–24 strategic direction.[25] Of these priorities, the one strategic priority clearly relating to future supply planning is to build a cleaner, reliable, modernized electricity system.

In addition, SaskPower's ten-year supply plan outlined six primary supply plan themes:

- Transition from conventional coal
- Leverage natural gas in the short-term
- Expand and integrate renewable resources into the system
- Increase and bolster transmission interconnections to bridge toward the future
- Stage distributed energy resource additions to match the pace of grid modernization
- Advance low or non-emitting supply options for 2035

SaskPower also held consultations throughout the organization to determine key low and non-emitting energy objectives and targets. SaskPower's Board of Directors and the Provincial Government approved the long-term objectives and targets set. SaskPower has set the following measures and targets relating to low and non-emitting energy supply:[26]

- **Renewable Generation Portfolio Capacity Percentage:** Measures SaskPower's capacity from renewable sources as a percentage of total capacity.[27] SaskPower's 2023–24 target was 35.8% (2023–24 actual 35.5%) exceeding the 34% target set in the Canada-Saskatchewan Equivalency Agreement.

- **Greenhouse Gas Emissions Reduction Target** (shown as a % change from 2005 levels): Measures annual greenhouse gas emissions against SaskPower's 2005 greenhouse gas emissions from electricity generated by SaskPower and from electricity supplied from independent power producers.[28] SaskPower's target for 2023–24 was an 8% reduction from 2005 levels (2023–24 actual 4% reduction).

- **Equivalent Availability Factor:** Measures the percentage of time that an energy generating unit is available for producing electricity to show the reliability of SaskPower's power grid. SaskPower set a target for its generation portfolio of equal to or greater than 85% (2023–24 actual 86.9%).

Reporting on these measures and targets is discussed further in **Section 4.10**.

[25] saskpower.com/about-us/our-company/our-strategic-direction (25 September 2024).
[26] *SaskPower Annual Report 2023–2024*, p. 18.
[27] Capacity is the maximum electric output a source can produce, whereas generation is the amount of power actually produced. Generation facilities cannot operate at full capacity 100% of the time because of maintenance, unplanned outages, and other factors and therefore this measure does not evaluate the actual amount of power generated from renewable sources.
[28] An independent power producer refers to individuals or corporations that SaskPower enters into an agreement with to supply power typically for at least a 20-year period.

We found the measures set by SaskPower relating to low and non-emitting energy targets reasonable and aligned with other jurisdictions across Canada and North America.

Setting long-term supply planning objectives, measures, and targets allow SaskPower to consistently track its progress in its transition to low and non-emitting energy alternatives.

4.6 Risk Analysis Conducted and Incorporated Into Planning

SaskPower properly identified and documented its risks as part of its low and non-emitting energy transition. It also identified reasonable strategies to mitigate each of the associated risks.

Some of the key risks SaskPower identified impacting the low and non-emitting energy transition include:

- Federal regulatory uncertainty
- Cost uncertainties
- Aging infrastructure
- Ensuring reliability as intermittent sources of renewable generation are expanded
- Load growth (demand) uncertainties
- More extreme weather arising from climate change
- Technical and financial feasibility associated with adopting certain low and non-emitting energy alternatives

We found SaskPower established reasonable mitigation strategies to reduce the impact of each risk. For example, to balance the risk associated with climate change, SaskPower plans for available alternatives that pair well together during extreme weather such as natural gas when wind or solar are not operating at full capacity during extreme cold, or solar when natural gas cannot operate at full capacity during extreme heat.

SaskPower also considers the risk associated with new and emerging energy alternatives (e.g., nuclear small modular reactors). It has built contingency plans directly into its long-term supply planning process in case future analysis shows a planned new or emerging technology may not be technologically or financially feasible (e.g., one potential energy supply pathway plans for over 45% of total production to come from nuclear power by 2050, while another pathway plans for less than 10% to come from nuclear power by 2050).

By identifying and planning mitigation strategies for key risks, SaskPower increases the likelihood it will meet its long-term goals and objectives.

4.7 Comprehensive Range of Energy Alternatives Evaluated

When preparing its future supply plans, SaskPower appropriately evaluated each energy alternative using four key traits aligned with its overarching goals and objectives. SaskPower evaluated each energy alternative for cost, reliability, environmental impact, and development timelines.

SaskPower uses reasonable modelling and simulation software to help evaluate alternatives. We observed this software incorporated many factors in its analysis including emissions, costs, and energy demand. This software is used by other Canadian jurisdictions.

Cost

SaskPower continually updates its estimated costs of new generation. When SaskPower identifies new information, it updates its costing information. SaskPower uses information from both public (e.g., Lazard from the United States, Environment and Climate Change Canada) and private (e.g., recent bids on existing low or non-emitting energy projects) sources to inform its costing.[29] SaskPower also considers and includes life cycle costs during this analysis (e.g., periodic maintenance costs, costs to decommission at the end of an asset's useful life). Overall, from a low and non-emitting energy source perspective, SaskPower estimates wind and solar cost less than nuclear and hydro.

Reliability

SaskPower also evaluates the reliability of energy alternatives. As mentioned in **Section 4.2**, SaskPower uses Expected Unserved Energy and a Planning Reserve Margin to help ensure the reliability of its power grid (meaning it builds in increased supply capacity so actual energy generated will meet demand, even at peak times). It also considers whether energy alternatives are dispatchable or intermittent. For example, natural gas can be switched on or off depending on need, whereas wind and solar may not be available depending on the weather conditions.

Environmental Impact and Development Timeline

SaskPower evaluates energy alternatives for environmental impacts (e.g., greenhouse gas emissions) and the development timeline to produce that energy alternative (i.e., how long it would take for SaskPower to design and implement that type of energy facility).

For example, SaskPower's evaluation found a new hydro facility takes approximately 12 years to develop and costs significantly more than a wind facility. In addition, wind project construction can be completed in a much shorter time frame (e.g., Bekevar Wind Project began construction in summer 2023 with expected completion prior to the end of 2024—less than two years). Both wind and hydro are non-emitting energy sources, and therefore rank better for environmental impact. However, wind is not a dispatchable energy alternative compared to hydro, thereby making hydro more desirable from a reliability perspective.

[29] Lazard is a financial advisory and asset management firm that engages in investment banking, asset management, and other financial services, primarily with institutional clients.

We found SaskPower assessed several different energy alternatives (e.g., hydro, natural gas, natural gas with carbon capture, wind, solar, nuclear, biomass, geothermal) against each of the four traits. It also conducted pilot projects to better assess the feasibility of new and emerging energy alternatives. Recent pilot projects completed by SaskPower took place around battery energy storage systems (BESS), biomass, and geothermal technologies. These projects assisted SaskPower by providing real life examples to assess the current value of these emerging alternatives against the four traits.

Traits considered by SaskPower were consistent with good practice and were similar to those used in other Canadian jurisdictions.

We also found SaskPower assessed energy alternatives considered in other jurisdictions (i.e., Ontario, Alberta, and New Brunswick). We did not identify any energy alternatives considered in other jurisdictions that SaskPower had not evaluated.

Comprehensive assessment of the different energy alternatives available to SaskPower is important so that SaskPower selects energy alternatives that maximize the reliability of the power grid while reducing greenhouse gas emissions and controlling costs. Making selection decisions timely is important given longer development timeframes for certain energy alternatives.

4.8 Analyze Further Expansion of Distributed Energy Resources

While SaskPower considered and incorporated distributed energy resources into its long-term supply planning process, it should analyze additional ways distributed energy resources could assist in alleviating some of the strain associated with future load growth uncertainty.

Distributed energy resources often refer to smaller generation units located on the consumer's side of the meter. An example of a renewable distributed energy resource that can be installed is roof-top solar photovoltaic units.[30] Other examples include home battery storage and distribution-connected generation coming from resources such as a wind farm.

As noted in **Section 4.5**, one of SaskPower's six supply plan themes is to stage distributed energy resource additions to match the pace of grid modernization.

SaskPower currently offers a variety of smaller, distribution-system connected generation options to its customers. These include a Net Metering Program where SaskPower compensates customers 7.5 cents per kWh for any excess electricity sent to the grid.[31] In 2023–24, 3,700 customers enrolled in the program supplied a total available generating capacity of approximately 67 MW to the grid (65 MW from customer-generated solar capacity and 2 MW from customer-generated wind capacity).[32]

As noted in **Figure 3**, SaskPower's total available generating capacity as of March 31, 2024, was 5,355 MW, meaning the net metering customer-generated locations supplied approximately 1.25% of total generating capacity.

[30] aemc.gov.au/energy-system/electricity/electricity-system/distributed-energy-resources#:~:text=Distributed%20energy %20resources%20(DER)%20refers,battery%20storage (26 September 2024).
[31] Information provided by SaskPower.
[32] *SaskPower Annual Report 2023–2024*, p. 117, and additional information provided by SaskPower.

In its long-term supply plan, SaskPower assumed small expansions from distributed energy resources, primarily through its Net Metering Program. In comparison to other jurisdictions, Alberta has developed a distributed energy resources roadmap and had 625 MW of distributed energy resources in 2020.[33] Ontario completed a study in 2022 concluding significant economic potential existed for distributed energy resources to meet its emerging needs, with potential capacity for 10,000 MW.[34] SaskPower should also analyze further expansion of distributed energy resources.

Distributed energy resources could be a greater component to SaskPower's long-term supply plan. Analyzing additional ways to further expand its distributed energy resources programs could alleviate some of the strain associated with future load growth uncertainty as it transitions to low and non-emitting energy alternatives.

1. **We recommend SaskPower analyze further expansion of distributed energy resources to help it transition to low and non-emitting energy alternatives.**

4.9 Different Pathways Evaluated Toward 2035 and 2050

SaskPower appropriately identified and evaluated four separate supply pathways as part of its long-term supply planning. The supply pathways contain various mixes of low and non-emitting energy alternatives.[35] As of August 2024, SaskPower was operating with net-zero 2050 as the most likely pathway to 2035 and 2050.

Below are the four separate pathways SaskPower evaluated to 2035 and 2050:

- **Net-Zero 2050** features a diverse mix of supply options including natural gas with carbon capture, solar, wind, hydro, and nuclear and aims for 75% greenhouse gas emissions reduction from 2005 levels by 2035. It gets SaskPower to net-zero emissions by 2050.

- **Diverse Mix (net-zero 2035)** aims to achieves net-zero emissions by 2035 and utilizes a diverse mix of supply options (e.g., wind and imports) which shifts to an import focus by 2050.

- **Natural Gas Bridge (net-zero 2035)** aims to achieves net-zero emissions by 2035 by utilizing a blend of natural gas generation as a transition path to nuclear energy.

- **Imports Bridge (net-zero 2035)** aims to achieves net-zero emissions by 2035 and utilizes imported energy as a transition path to nuclear.

SaskPower estimated all four pathways would cost in excess of $50 billion.[36]

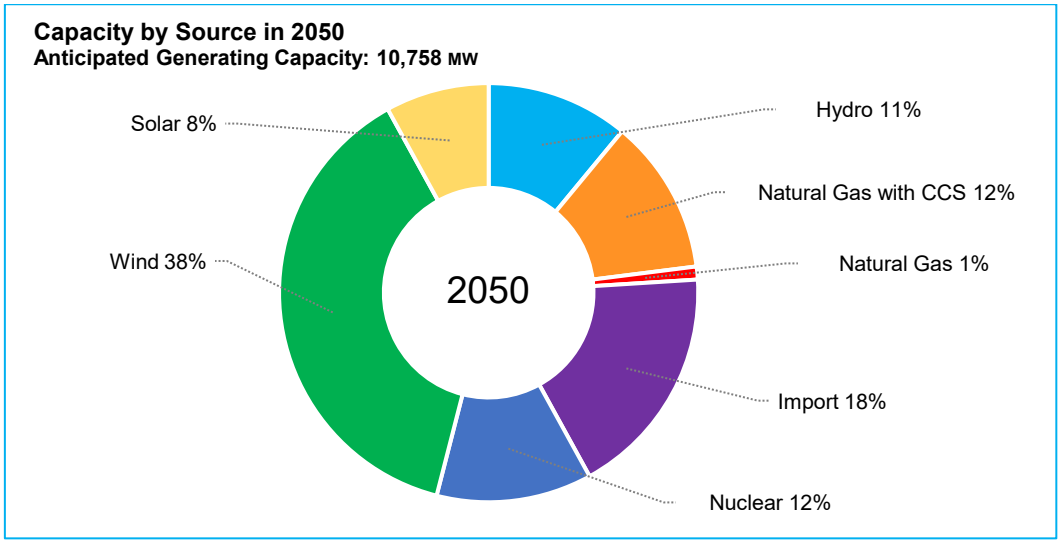
[33] aeso.ca/assets/Uploads/DER-Roadmap-2020-FINAL.pdf (26 September 2024).
[34] ontario.ca/page/powering-ontarios-growth (26 September 2024).
[35] saskpower.com/ourpowerfuture/creatingacleanerpowerfuture/futuresupplyplanning/whatwehaveheard (26 September 2024).
[36] Ibid.

Based on its theoretical analysis, SaskPower determined that the last three pathways are not currently feasible from a cost and reliability perspective. SaskPower projected the Net-Zero 2050 pathway as the lowest cost. According to SaskPower, renewable supply options are often associated with a lack of reliability. Reliance on imports was also a common area of concern identified through public consultations.[37]

SaskPower is currently using the net-zero 2050 pathway to make investment decisions. Under this pathway, SaskPower would not be compliant with the draft federal Clean Electricity Regulations by 2035. SaskPower may need to adjust its pathway once the Clean Electricity Regulations are finalized.

Figure 5 highlights the expected mix of energy alternatives under this pathway in 2050 as shared with the public during consultations from September 2023—January 2024. Approximately 11% of available generating capacity would come from hydro, 8% from solar power, and another 38% from wind by 2050—all renewable resources. Other low and non-emitting energy sources such as nuclear (12%) and natural gas with carbon capture and storage (12%) are also utilized. In total, 99% of generating capacity would come from low and non-emitting energy alternatives by 2050.

Figure 5—SaskPower Anticipated Capacity By Source in the Year 2050 under Net-Zero 2050 Pathway



Source: Adapted from SaskPower Stage 3 Public Consultation Report – What We Heard. CCS stands for carbon capture and storage.

We found SaskPower also incorporates varying levels of forecasted power demand (i.e., electrification) into its long-term supply plan. The plan considers the expansion of the use of different items such as electric vehicles, electric heat, and electric water heaters. SaskPower projects growth in these areas at different levels and builds this into its long-term planning decisions. For example, it is projecting a provincial population of 1.4 million by 2030 and significant growth in electric vehicles, as well as electrification of recreational vehicles and construction and farm equipment. In the most aggressive scenario (i.e., full electrification), SaskPower projects the demand for energy will more than double from current levels by 2050.

[37] saskpower.com/ourpowerfuture/creatingacleanerpowerfuture/futuresupplyplanning/whatwehaveheard (26 September 2024).

We found SaskPower's power supply planning analysis reasonably considered different scenarios and pathways. It also considered feedback from its public consultation sessions (e.g., public preference to produce power within the province as opposed to placing heavy reliance on imports).

Modelling and evaluating potential pathways and varying levels of power demand allows SaskPower to explore cost, feasibility, and risk. It also allows SaskPower to select a pathway and adjust for changes like new regulatory requirements or technologies.

4.10 Need Clear Plans to Address When Short-term Targets Not Met

SaskPower periodically reported its progress toward meeting low and non-emitting energy targets. However, SaskPower did not always meet its short-term targets relating to low and non-emitting energy, and reports did not outline clear action plans to address not meeting these targets.

SaskPower reports regularly on its progress toward its low and non-emitting energy targets (e.g., reduction of greenhouse gas emissions, renewable generation capacity—see **Figure 6**). Periodic reporting informs senior management, the Board, and the public on progress made. SaskPower senior management receives monthly updates on key metrics, and its Board receives quarterly updates as part of the Corporate Balanced Scorecard. SaskPower reports publicly on key metrics each year in its annual report and Corporate Sustainability Report.[38]

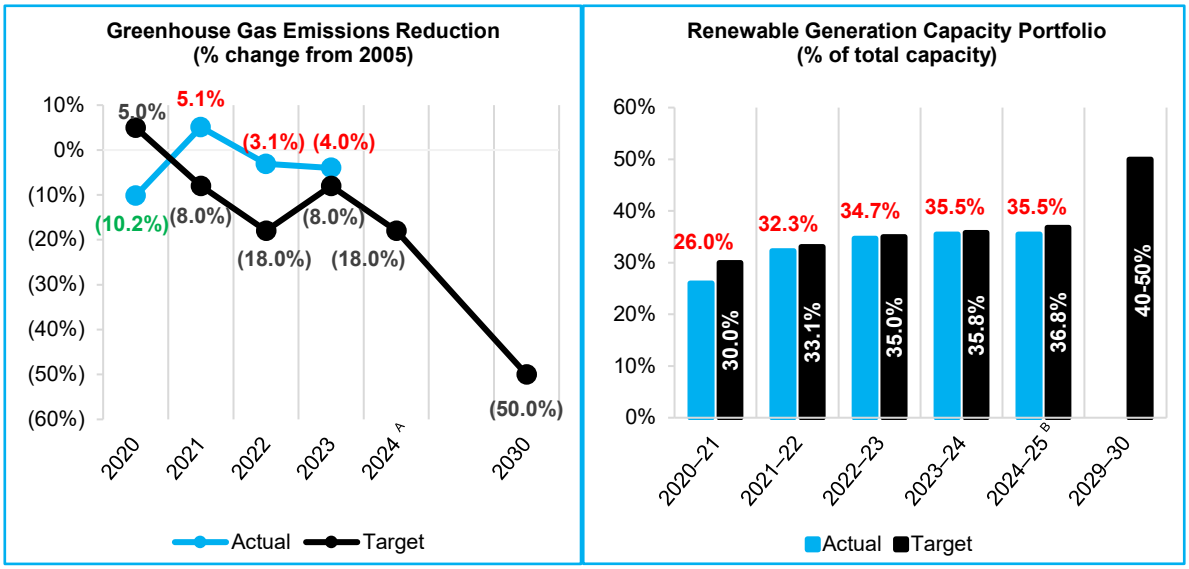
We found SaskPower consistently prepared and reviewed reports as expected. **Figure 6** shows the reported results of key targets relating to low and non-emitting energy for the past five years. SaskPower's analysis found it did not always meet its key targets relating to the low and non-emitting energy transition. However, reports did not include clear action plans to address shortfalls.

Figure 6 shows, in 2023, SaskPower planned to reduce greenhouse gas emissions by 8% during the year. Instead, greenhouse gas emissions in 2023–24 decreased by 4% compared to 2005 levels. By 2030, SaskPower expects to decrease its greenhouse gas emissions by 50% compared to 2005 levels.

In 2023–24, as shown in **Figure 6**, SaskPower planned for a renewable generation percentage of 35.8%, but fell just short with an actual total of 35.5%. By 2029–30, SaskPower expects to increase its renewable generation capacity to 40–50% of its total portfolio.

[38] saskpower.com/about-us/our-company/current-reports (8 October 2024).

Figure 6—SaskPower Low and Non-Emitting Energy Targets Compared to Actual Results 2020 to 2024



Source: Adapted from SaskPower annual reports and corporate balanced scorecards.
Actual results are highlighted in **red** when they fall short of target.
[A] Actual – Not yet available
[B] Actual – Results as of June 30, 2024

SaskPower management indicated its short-term targets are incremental stretch targets as it works toward 2030 and 2050, and that it consistently met and even performed better than the requirements of the Canada-Saskatchewan Equivalency Agreement (i.e., requires a minimum of 34% of electricity generation to come from non-emitting sources by December 31, 2024—SaskPower already has 35.5% as of June 30, 2024). Having short-term targets, which align with good practice, allow SaskPower to monitor progress and adjust strategies sooner for identified concerns (i.e., incremental targets not met).

SaskPower indicated external factors contributed to falling slightly short of its annual targets in recent years, such as construction delays as a result of the COVID-19 pandemic, funding delays, and unfavourable market conditions. However, we found reports did not outline the actions SaskPower planned to get back on track to meeting its targets. For example, plans to increase support for lagging projects or intentions to advance other low- or non-emitting energy projects that could help offset shortfalls.

Continually falling short of annual targets relating to low and non-emitting energy increases the risk SaskPower is not transitioning to low and non-emitting energy alternatives fast enough to meet its 2030 targets. Outlining clear action plans to address not meeting incremental low and non-emitting energy targets demonstrates SaskPower's intent to take prompt action so long-term targets are not missed.

2. We recommend SaskPower clarify its action plans to address when annual low and non-emitting energy targets are not being met.

5.0 SELECTED REFERENCES

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