Summary for Policy Makers

Electricity Systems Across Western Canada

A Landscape Analysis

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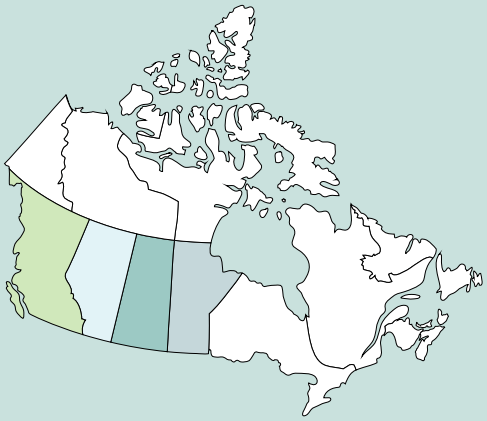
CANADAWEST FOUNDATION

Summary for Policy Makers



When it comes to electricity, the four western provinces share a common goal. All four aim to:

- Increase electricity supply to meet future demand
- Reduce greenhouse gas emissions from electricity production
- Maintain affordability while doing so.

However, each province faces unique challenges and appropriate solutions will look different for each jurisdiction. This is because there are key differences across the provinces in terms of current conditions, the energy resources available in each location and the way each province's electricity sector is structured. These factors act as boundaries that circumscribe what is possible, what is effective and what may be affordable.

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PART 01

The way the system is organized affects everything else

KEY FACTS

- The electricity sector comprises:
  - Utilities regulators, which set rules, ensure compliance and protect consumers
  - System operators, which manage and operate the grid and plan for future expansion
  - Utilities, which generate electricity, transmit it, distribute it and sell it to customers
- B.C., Saskatchewan and Manitoba all have government-owned, vertically integrated utilities. They are also fully regulated, meaning the government regulates electricity generation, transmission, distribution and selling to consumers.
- Alberta, in contrast, is de-regulated. It has no government ownership of assets, allows competition for some functions, and has private sector electricity providers.

IMPLICATIONS

- The way each province's electricity sector is organized and regulated influences everything from the power resource mix to emissions to end-user prices.
- In addition, it impacts investment. In B.C., Saskatchewan and Manitoba, investment in power generation facilities is normally limited to the monopolies that operate in each province. In Alberta, all power generation facilities are privately owned and electricity is sold through a competitive bidding process. Alberta's deregulated market also allows for corporate Power Purchase Agreements (PPAs) with renewable electricity producers. This has led to major investments from companies such as RBC, Budweiser Canada, Amazon and Microsoft that have spurred rapid growth of wind and solar in Alberta.

PART 02

Where power comes from, what it does to emissions and how much we need (now and in the future)

KEY FACTS

- The four provinces have very different power resource mixes that stem from both policy decisions and the hard facts of geography.
- B.C. and Manitoba get almost all their power from hydro. As a result, GHG emissions are very low—both total emissions and emissions intensity.
- Alberta and Saskatchewan get most of their power from fossil fuels. As a result, their emissions are much higher than B.C. and Manitoba. However, both have had a substantial decline in emissions intensity—particularly Alberta, where it decreased 45% between 2015 and 2021.
- Alberta uses primarily natural gas and will decommission its last remaining coal-fired plant in 2023. It has also become the leading developer of wind and solar projects in the country, making up 26% of installed capacity in 2022. Saskatchewan is on a path to eliminate unabated coal from its power resource mix by 2030 and has also seen a surge in wind and solar development.
- Over the coming decades, demand for electricity is expected to increase: Canada will require between 62% and 210% more electricity by 2050.
- Electricity is traded among the four western provinces, and between each province and the U.S. Manitoba and B.C. are by far the largest electricity exporters, and the majority of their exports go south of the border. These electricity exports are a major source of revenue. B.C. also engages in power price arbitrage—importing power when prices are low and exporting it when prices are high.

IMPLICATIONS

- All four western provinces will need to grow their electricity supply to meet a future demand that is substantially higher than today. This growth will require careful planning and many trade-offs—and is made more difficult because current forecasts of future demand are highly uncertain.
- The provinces are at different starting points in terms of their ability to reduce emissions, both in terms of how much they need to reduce and what options are available to them. This leads to distinct challenges, costs and opportunities for each—and may clash with the federal government's proposed Clean Electricity Regulations.
- The vast hydro resources of B.C. and Manitoba offer both provinces flexibility when planning the future of their electrical systems. Alberta and Saskatchewan face a substantial challenge in maintaining reliability as they move to more intermittent power sources such as wind and solar.
- As energy exporters, B.C. and Manitoba must decide whether to develop additional capacity sufficient to continue exporting large volumes of electricity; or to use their existing surplus to meet demand increases and reduce the need for new investment—a strategy that would reduce revenue and increase electricity prices within the province. The decisions made by B.C. will have knock-on effects for Alberta as it relies on power from its neighbouring province to satisfy a portion of its own domestic demand.

62%–210%

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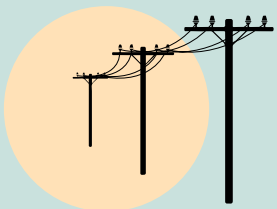


45%

Alberta and Saskatchewan have had a substantial decline in emissions intensity—particularly Alberta, where it decreased 45% between 2015 and 2021.

Exports

Manitoba and B.C. are the largest electricity exporters among the four provinces, and the majority of their exports go south of the border. These electricity exports are a major source of revenue.

PART 03

Moving to the grid of tomorrow… And paying for it

KEY FACTS

- To prepare for changes in future electricity demand, utilities and governments must implement a variety of grid modernization policies and programs. These include advanced metering infrastructure (AMI), demand side management and distributed energy resources. All four western provinces are examining grid modernization programs, but implementation is patchy.
- Meeting future electricity demand—whether building new generation facilities, powerlines, interties or rolling out grid modernization programs—is expensive.
- Each province places different constraints on the ways companies are allowed to earn a return on their investments. In all four provinces, regulated utilities are only allowed to earn a return on capital investments—with the exception of demand-side management in B.C.

IMPLICATIONS

- Grid modernization programs will dictate each province's ability to respond to future demand in an efficient and cost-effective manner.
- However, different approaches to regulation affect the extent to which utilities are motivated to invest in innovation. The current regimes strongly incentivize large capital investments and disincentivize investments in non-infrastructure solutions such as software development, pilot or research projects, efficiency programs and public education. This bias towards large capital projects makes it more difficult to foster rapid innovation under current cost-of-service models. Without policy and regulatory changes to incentivize innovation and risk-taking, grid transformation is likely to be slower.
- A deregulated market is ultimately the best environment for innovation, as changes can occur organically as companies react to market conditions and look for new competitive advantages.

PART 04

Cost to consumers – the price of electricity

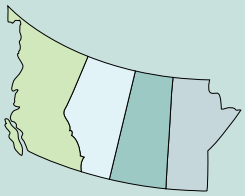
KEY FACTS

- In the fully-regulated provinces of B.C., Saskatchewan, and Manitoba, electricity rates are fixed by the provincial regulator. As a result, prices are relatively consistent over the long term.
- In Alberta, supply and demand determine price within the deregulated competitive wholesale electricity generation market; and only distribution and transmission rates are regulated. As a result, the price of electricity in Alberta is far more volatile—although the province sets a price cap of $999/MWh. Most customers reduce exposure to volatility by purchasing electricity on fixed price contracts.
- B.C. and Manitoba's power prices are much lower than the prairie provinces. Much of this is due to their low-cost hydro resources. Both provinces also have large exports of power to the U.S., which earns revenue and reduces the returns required from domestic customers.

IMPLICATIONS

- Canadians have access to some of the lowest cost electricity in the world—a competitive advantage for large electricity consumers such as heavy industry and manufacturing. However, the competitive advantage is not equal across all provinces. B.C. and Manitoba's lower electricity prices favour them.
- The costs of grid expansion, modernization and emissions reduction may further increase the price disparity between provinces and reduce the investment attractiveness of certain regions—a concern that has been raised by the premiers of Alberta and Saskatchewan.
- Electricity prices also impact trade between the provinces. B.C. and Manitoba prefer international rather than interprovincial trade because power prices are higher in the U.S. than in Alberta and Saskatchewan. As long as this is the case, it will be difficult to encourage greater grid coordination between the provinces despite other potential benefits.
- Finally, low-income households in Alberta and Saskatchewan are likely to be the hardest hit by increased electricity rates.

Key challenges facing each province



British Columbia

Historically, B.C. has been able to rely on its substantial hydro assets to supply low-cost, reliable, low-emissions electricity. However, B.C. faces hard decisions around how to meet future demand. Additional major dams are unlikely, especially after the uncertainty and cost increases that plagued the Site C hydro project. Instead, B.C. will have to rely on a combination of run-of-river hydro; zero-emissions sources like solar and wind; and energy efficiency/demand-side measures. Because B.C. has a unique legislated requirement to produce enough electricity to be self-sufficient, it can't rely on imports to cover shortfalls in annual generation. B.C. could use some or all of its lucrative energy exports—the majority of which currently go to the U.S.—to satisfy increased domestic demand. This would lessen the need to build new generation capacity, but would decrease provincial revenue and increase electricity costs for B.C. consumers. The final question hanging in the air for B.C. is exactly how much future demand there will be—the scale of demand will be highly influenced by whether or not an electrified LNG industry is built in the province.

Alberta

Alberta has capitalized on its access to low-cost fossil fuels to develop a reliable and affordable grid. But now the province faces a triple challenge. First, electricity supply must increase substantially to meet a large growth in future demand. Second, this new supply must be low- or zero-emissions. And third, the province must at the same time figure out a way to bring existing generation to net-zero. Alberta has committed to reaching net-zero by 2050 but has raised concerns about the federal government's proposed Clean Electricity Regulations—stating that the 2035 target is not technologically feasible. The scale of the transition needed is enormous, and is likely to have massive cost implications for utilities and their customers. The context in which these developments take place is also different than the other western provinces. Alberta's privatized generation market isn't backed by the government; but it is flexible and able to rapidly incorporate innovation. This has resulted in corporate power purchase agreements (PPAs) that have made Alberta the leading developer of wind and solar projects in Canada. But the replacement of fossil fuel with intermittent renewables will require additional measures to ensure reliability—and there are no easy solutions. The only certainty is that Alberta's electricity future will look substantially different than its past.

Saskatchewan

Like Alberta, Saskatchewan provides baseload and dispatchable electricity through fossil fuels—in Saskatchewan's case, a mix of natural gas and coal. Although the province has seen a recent surge in wind and solar development, future growth will eventually bump up against reliability issues. The province has also taken measures to reduce emissions through investment in carbon capture technology for the Boundary Dam coal-fired power facility, which captured over five million tonnes of CO_2 between operational start-up in 2014 and the end of 2022. Saskatchewan has stated that it will reach net-zero on its own terms (by 2050) and will run fossil fuel sources until their end of life. This puts Saskatchewan on a collision course with the proposed Clean Electricity Regulations and sets the stage for an upcoming battle over what order of government has authority to decide how to reduce provincial emissions from the sector and at what pace.

Manitoba

Manitoba is in a good position in terms of both supply and emissions. The province's massive, low-emissions hydro resources provide 96% of its current power generation; and on average Manitoba produces 30% more electricity than it needs. This excess electricity is exported to interprovincial and international markets, which provides substantial revenue to the province and keeps domestic electricity costs lower than the other western provinces. To meet increased future demand, Manitoba plans to use some of its export capacity for use in province. This would result in reduced export revenue and increased costs for local customers. In addition, not all of its export capacity is available to divert to Manitoba customers: only the portion that is surplus to long-term contracts. This may not be enough, and all future scenarios being explored by Manitoba Hydro include the addition of new thermal capacity by 2042. Diversified electricity generation sources will also increase the province's robustness, as its reliance on hydro makes it susceptible to the impacts of drought and flooding. This was seen in 2021 when low water levels resulted in historically low power production and lost export revenue.

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