Ivey Business School
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Energy Policy and Management Centre

Ivey Energy Paper

The State of Canadian Energy in 74 Figures

Brandon Schaufele
Luis Mazzali
Lis Hoxha
Andrew Kerr
Chirag Singhal

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TABLE OF CONTENTS

1 Executive Summary 3

2 Energy Mix 6

2.1 Canada and the World 6
2.1.1 Fossil Fuels 8
2.1.1.1 Coal 9
2.1.1.2 Oil 10
2.1.1.3 Natural Gas 11
2.1.2 Non-emitting Resources 12

2.2 Across the Provinces 14
2.2.1 Renewable Supply 18
2.2.1.1 Solar 18
2.2.1.2 Wind 19
2.2.1.3 Hydro 20
2.2.1.4 Nuclear 20
2.2.1.5 Biomass 21

3 Pipelines, Natural Gas Liquids and Fossil Fuel Infrastructure 22

4 EV Market and Transport 24

5 Hydrogen and Renewable Fuels 27

6 Storage and Battery Supply Chain 28

7 Macroeconomic and Industrial Competitiveness 29

8 Emissions, Carbon Capture and Industrial Decarbonization 31

9 References 33

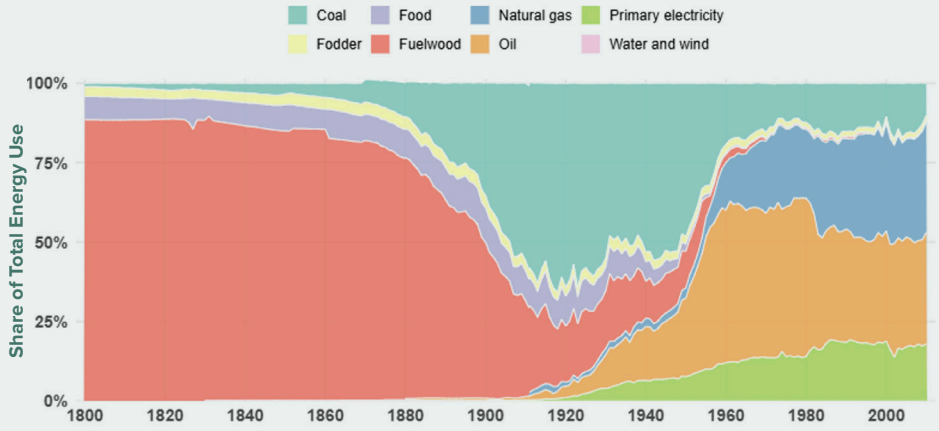
EXECUTIVE SUMMARY

Understanding the state of the Canadian energy sector can be challenging. To that end, the **Ivey Energy Policy and Management Centre** has assembled 74 charts illustrating different components of the Canadian and world energy economy. 74 figures is a lot and we have only scratched the surface of potential topics. The paper already includes much to digest. To make things easier, here are three big key themes evident in the data.

1 Canada repeatedly reinvents its energy system.

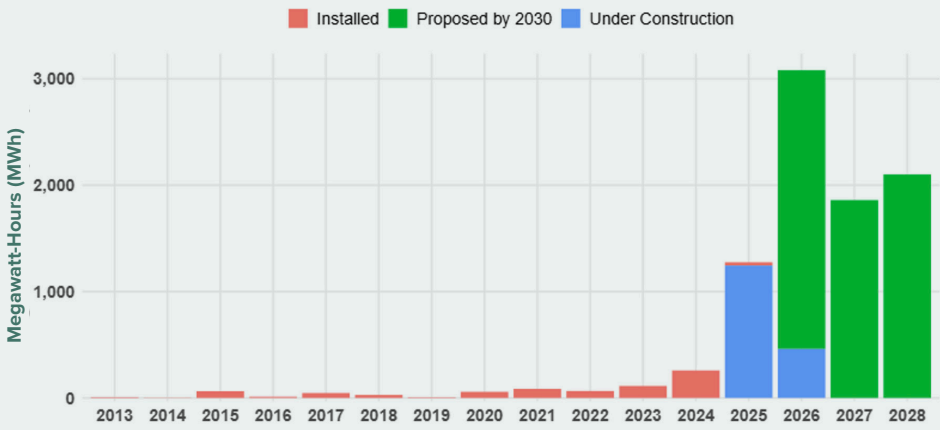
Figure E1 shows how over 200 years Canada's energy consumption shifted from wood to coal, coal to oil, oil to gas, and now from fossil fuels to electricity. Many of these shifts occurred in mere decades such as the shift from wood to coal. Others, including the growth of primary electricity, are more gradual. The lesson for Canadian energy is obvious: If Canada can align policy ambition with its resource advantage, the energy transition will unlock this country's resource and geographical advantages. Energy will continue to be the foundation of our competitiveness in the global economy. Shoots of new technologies are already evident. **Figures E2** and **E3,** for example, show the growth of grid-level storage and evolving mix of critical minerals production. Energy storage and critical minerals represent risk, but also the future of Canada's energy advantage.

Figure E1: Energy Consumption Shares in Canada, 1800–2010
Percentage share of total energy use by source



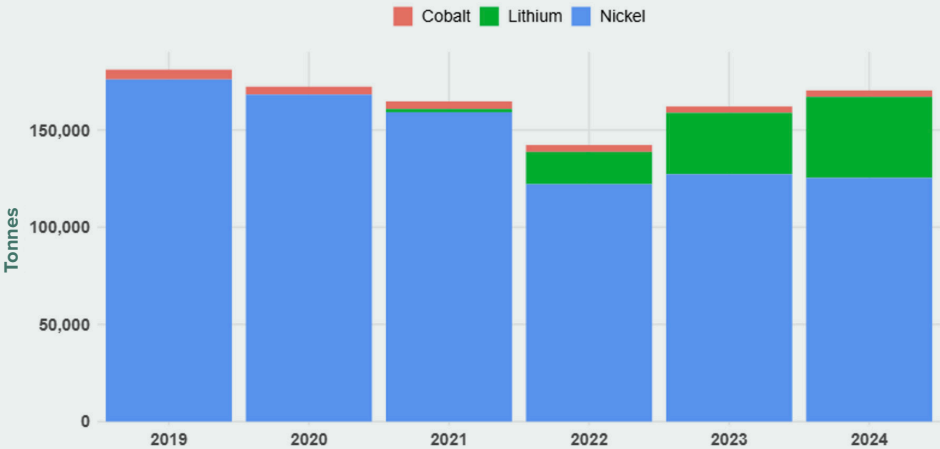
Source: Energy History at Harvard University

Figure E2: Canada Energy Storage Capacity by Commercial Operation Year and Project Status, 2013–2028



Source: Canada Energy Regulator

Figure E3: Canada Critical Mineral Production, 2019–2024

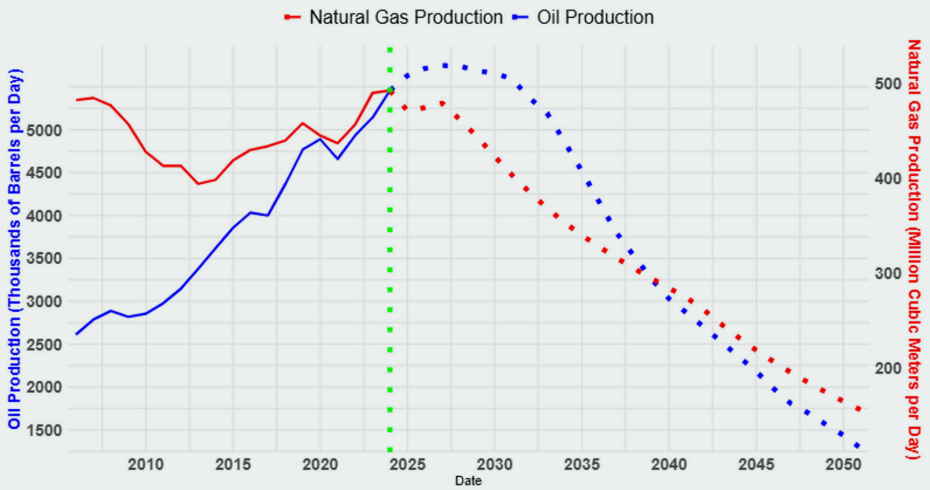


Source: Statistics Canada (16-10-0022-01)

2 Canada is a major player in global oil and gas markets.

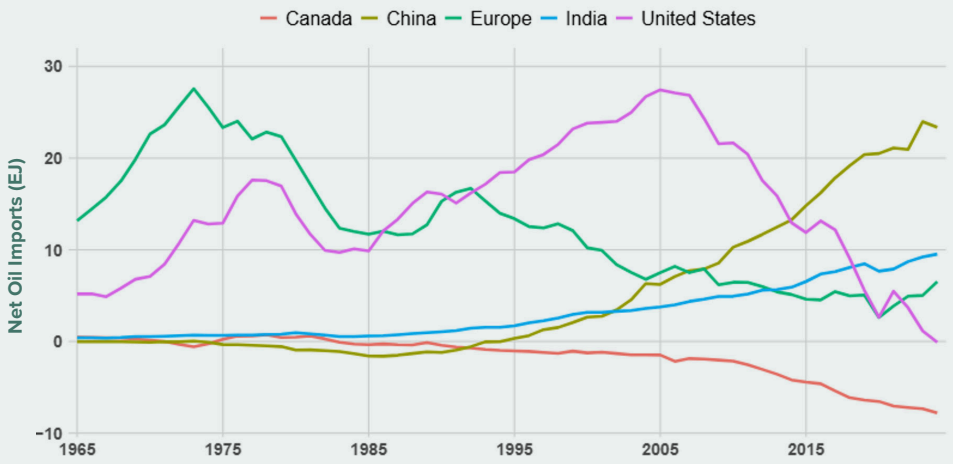
Canada is the world's 4th largest producer of oil[1] and the 5th largest producer of natural gas.[2] **Figure E4** illustrates the growth of natural gas and oil production. Also shown, in the dotted lines, are federal projections that Canadian oil output will rapidly decline by 2050. These forecasts are aligned with federal net zero legislation but likely strain credibility. Oil and gas extraction remains one of the country's most productive and capital-intensive industries, deeply embedded in trade balances, employment, and fiscal revenues. Despite recent tension, the United States remains Canada's most important trading partner. **Figures E5** and **E6** demonstrate that even as the U.S. transitions from importer to exporter of oil and gas, Canada has continued to increase its oil exports and maintain gas exports (negative values represent imports in the figure).

Figure E4: Total Production for Oil and Natural Gas (Excluding Liquids)



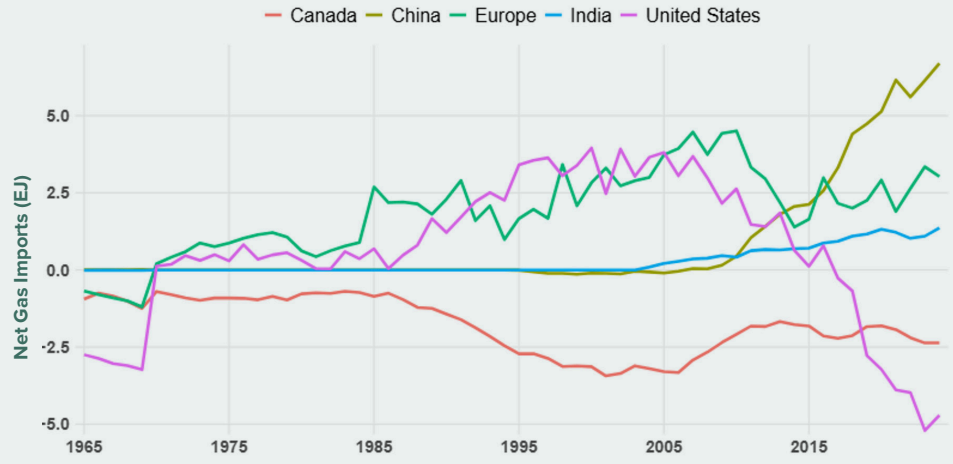
Source: Canada Energy Regulator. Canada's Energy Future Data Appendices.

Figure E5: Net Oil Imports by Country, 1965–2024



Source: Our World in Data

Figure E6: Net Natural Gas Imports by Country, 1965–2024



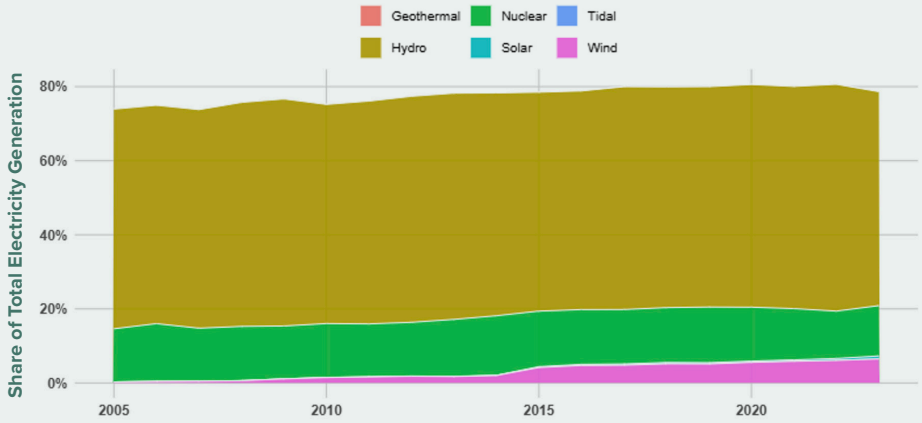
Source: Our World in Data

[1] https://www.eia.gov/tools/faqs/faq.php?id=709&t=6
[2] https://www.iea.org/world/natural-gas

3 Canada has one of the cleanest grids among major industrialized countries.

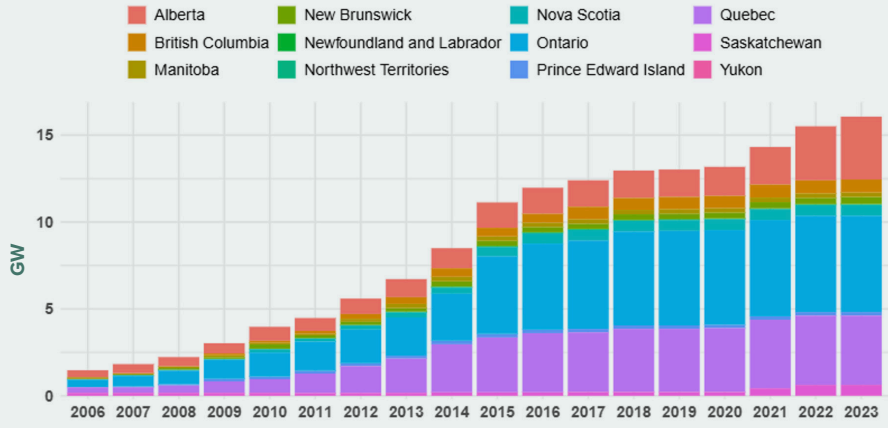
Figure E7 demonstrates more than 80% of our electricity comes from non-emitting sources. Wind and solar remain modest by international standards. Given our hydro resources, this is to be expected. Still, wind capacity continues to increase, and solar output as seen in **Figure E9** has surged in provinces such as Alberta. Further, Canada remains a consistent exporter of clean electrons to the U.S. as is clear from **Figure E10**.

Figure E7: Non-emitting Share of Canadian Electricity Generation, 2005–2023



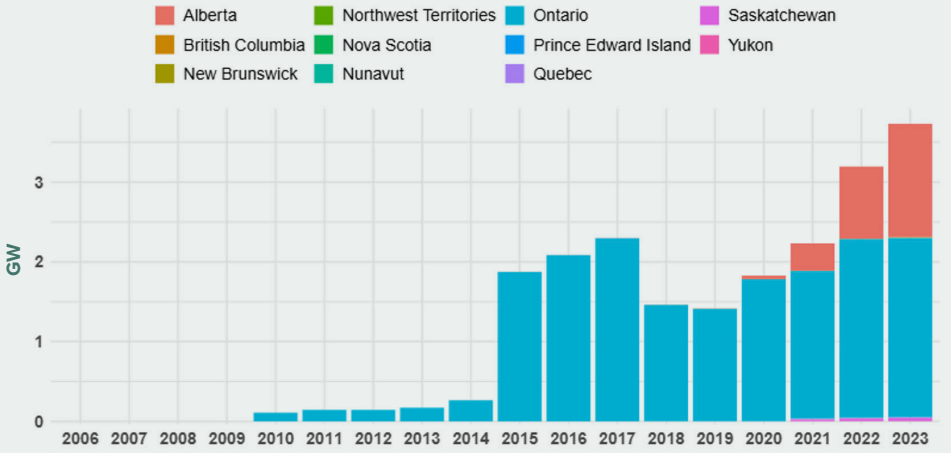
Source: Statistics Canada (25-10-0020-01)

Figure E8: Canada Wind Generation Capacity by Province, 2006–2023



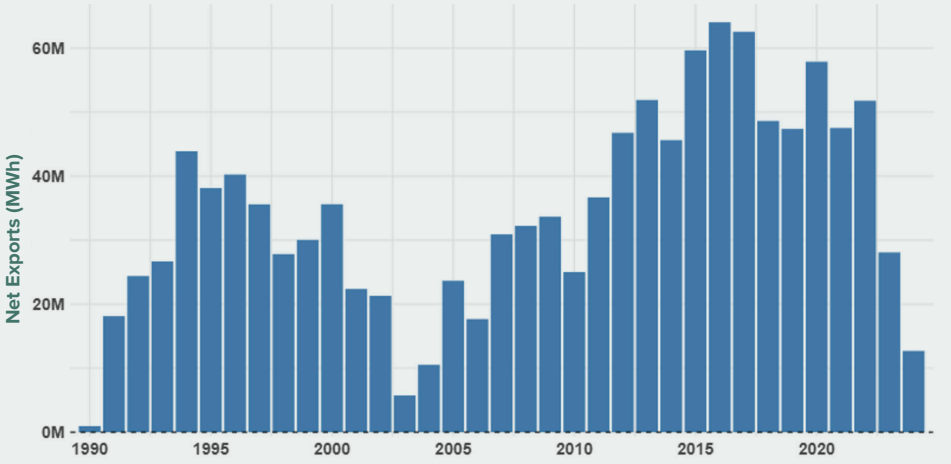
Source: Statistics Canada (25-10-0020-01)

Figure E9: Canada Solar Generation Capacity by Province, 2006–2023



Source: Statistics Canada (25-10-0020-01)

Figure E10: Canadian Net Electricity Exports, 1990–2024

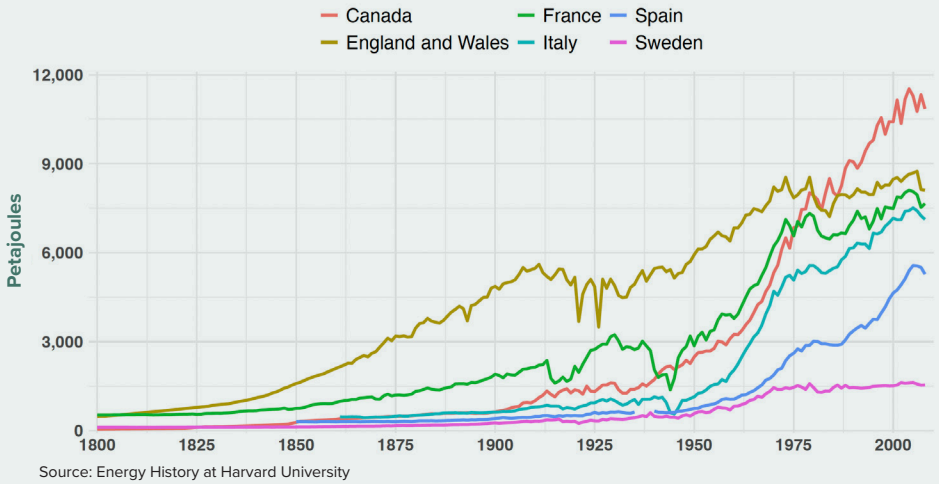


Source: Government of Canada

2. ENERGY MIX

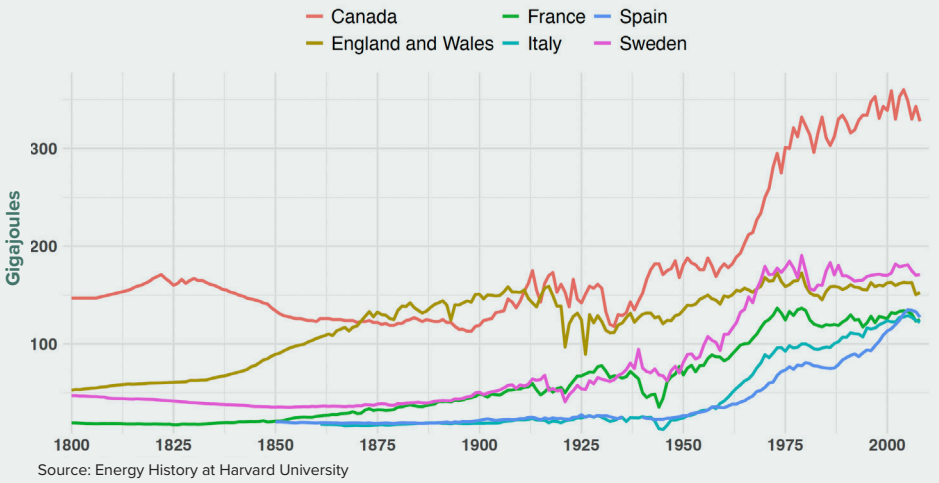
2.1 Canada and the World

Figure 1: Total Energy Consumption by Country, 1800-2008



Source: Energy History at Harvard University

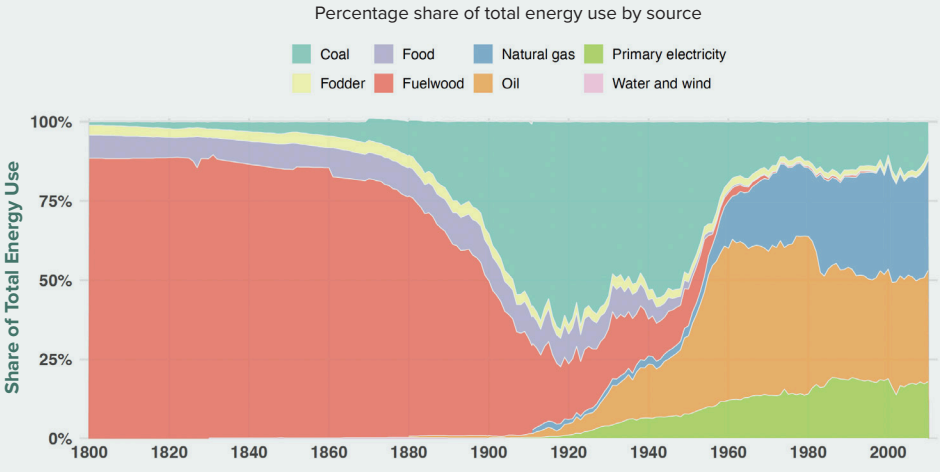
Figure 2: Per Capita Energy Consumption by Country, 1800–2008



Source: Energy History at Harvard University

Figures 1 and **2** show historical total and per capita energy consumption for a selected group of countries. England & Wales rank highest through the 19th century for total energy consumption thanks to coal-fuelled industrialisation, but their growth flattens after mid-20th century. At the same time, Canada experiences a rapid increase in energy consumption, most notably in per capita terms, reflecting its abundant hydro, oil and gas. Interestingly, among this collection of countries, Canadians have always consumed a lot of energy on a per person basis. By 2008, Canada's per capita energy consumption was roughly four times that of Italy or Spain. Explanations for these differences include Canada's cold climate, resource-intensive industry and long travel distances, whereas England's early advantage fades as it shifts from heavy industry to services and as efficiency gains spread across Europe.

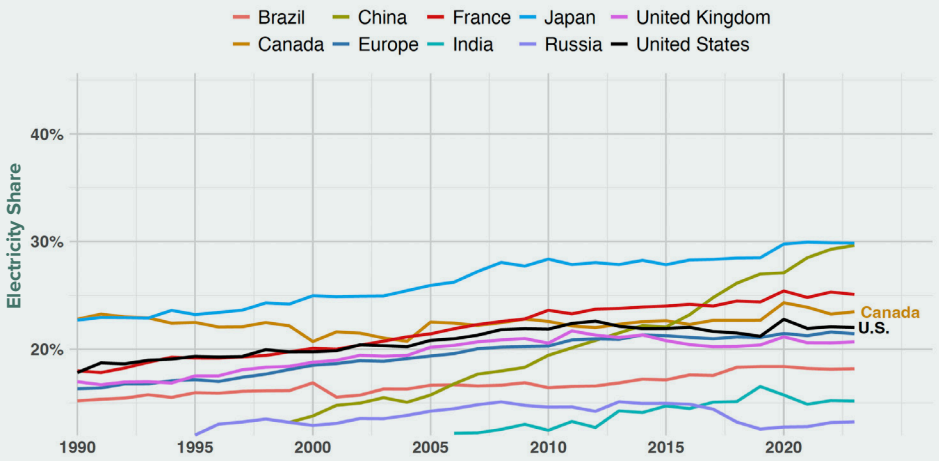
Figure 3: Energy Consumption Shares in Canada, 1800-2010



Source: Energy History at Harvard University

Figure 3 shows that Canada's fuel mix has evolved in waves: biomass (fuelwood, fodder, food) dominates until the late-19th century. Coal becomes the leading source by about 1903. Oil overtakes coal in the mid-1950s, and natural gas surpasses oil in the mid-1990s. Successive moves to higher-energy-density fuels reflect the country's growing industrial base. From the 1950s onward, primary electricity accelerates; by 2018 hydro alone supplies roughly 60% of Canada's electricity generation, giving the country one of the cleanest power systems among industrialized countries.

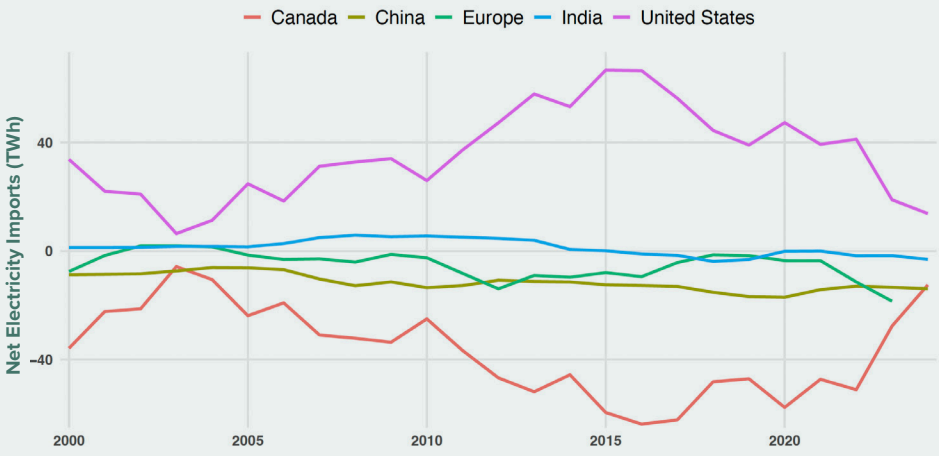
Figure 4: Electricity Share of Final Energy Consumption by Country, 1990-2023



Source: Enerdata Yearbook, 2024

Figure 4 presents the share of electricity in total final energy consumption across major economies from 1990 to 2023. Canada's electricity share has gradually increased, reaching over 25% in recent years — higher than India and the US but lower than France, which maintains extensive nuclear generation. The upward trend in Canada is supported by decarbonization efforts, including electrification of heating and transportation, and investments in clean electricity. While gains are visible, Canada's electricity share remains below leading countries such as Japan and China, indicating room for further electrification of final energy use — especially in buildings and transport.

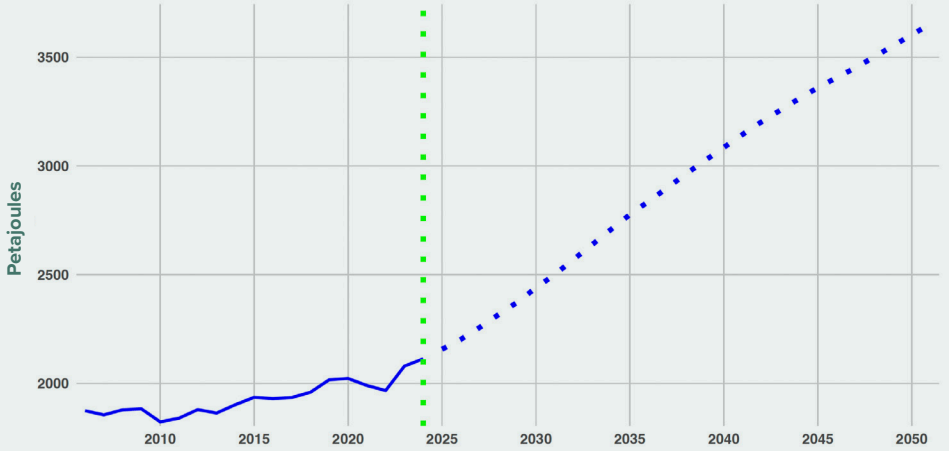
Figure 5: Net Electricity Imports by Country, 1965-2024



Source: Our World in Data

Figure 5 reveals Canada's unique role as an electricity exporter while. Canada's long-standing export surplus is a consequence of the abundant hydro resources, underscoring how Canada is a source of low-carbon electricity for its trade partners.

Figure 6: Total Demand for End Use Electricity in Canada, 2005-2050



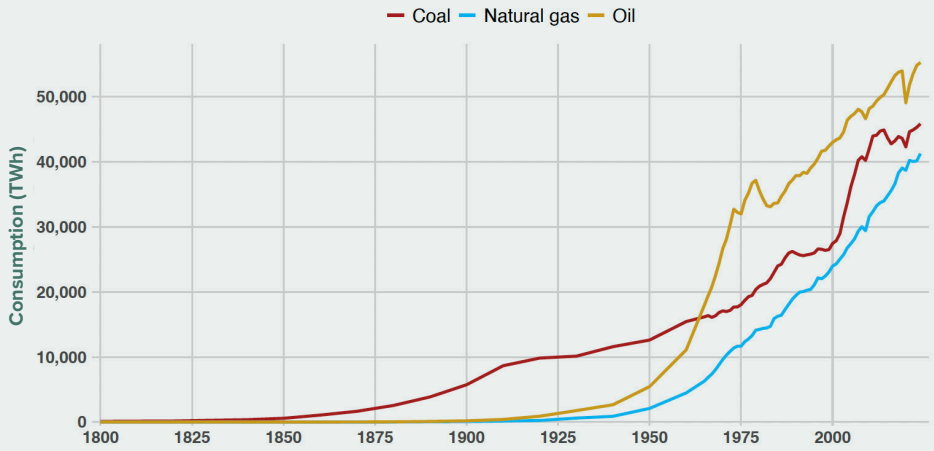
Source: Canada Energy Regulator. Canada's Energy Future Data Appendices.

According to **Figure 6,** since 2010 total demand for end-use of electricity has gradually risen. Projections made by the Canada Energy Regulator (CER) are that demand for end-use electricity will continue to increase. Most of that extra demand is predicted to come from economy-wide electrification—electric vehicles, heat pumps and new industrial processes—so the line on the chart rises steadily from just over 2,000 PJ in the mid-2000s to well above 3,500 PJ by mid-century. This surge reflects the story in Figures 1-5: Canada already leads major economies on electricity's share and even exports surplus power, yet decarbonising transport, buildings and heavy industry will still require expanding the grid at a pace not seen since the big hydro build-outs of the 1950s-70s.

It is important to emphasize that the electrification growth rate projected for the next 25 years hinges on CER's net-zero scenario. Weaker policy incentives or slower policy roll-out on EV mandates, heat-pump rebates, clean electricity regulations, etc., would result in a lower future demand for electricity.

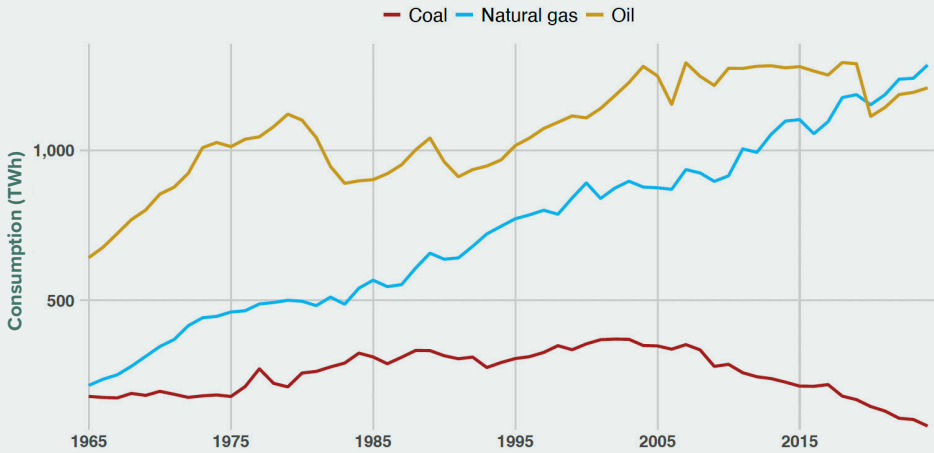
2.1.1 Fossil Fuels

Figure 7: Global Fossil Fuel Consumption by Source, 1800-2024



Source: Our World in Data

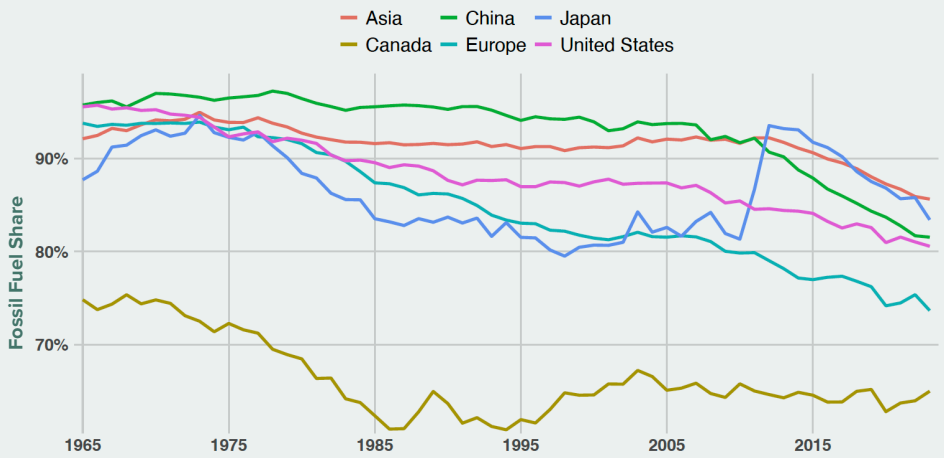
Figure 8: Fossil Fuel Consumption in Canada by Source, 1965-2024



Source: Our World in Data

Figures 7 and **8** display fossil fuel consumption by source (coal, oil, gas) globally and in Canada, measured in terawatt hours (TWh), from 1980 to 2020. Globally, consumption 8 rises steadily across all fuels, while Canada's fossil fuel use shows a flatter trajectory with slight recent decline in coal. The data confirms Canada's gradual transition away from coal. Oil and gas remain dominant energy sources, especially for transport and heating.

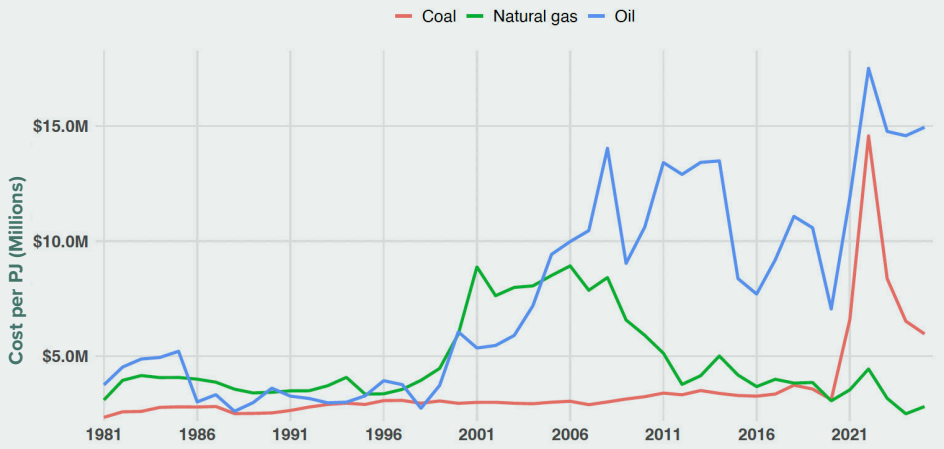
Figure 9: Fossil Fuels as a Share of Final Energy Consumption by Country, 1965–2023



Source: Energy Institute – Statistical Review of World Energy (2025)

Figure 9 shows the share of fossil fuels in final energy consumption for Canada and peer economies. Canada started with an advantage of abundant electricity. However, while Canada's fossil fuel share declined between 1965 and 1985, it has since remained steady at 65%, reflecting persistent reliance on oil and gas. By contrast, Europe shows a gradual decline, while Asia (including China and India) show recent declines. The data highlight the challenge Canada faces. Canada still relies on in reducing fossil fuels despite its clean electricity advantage.

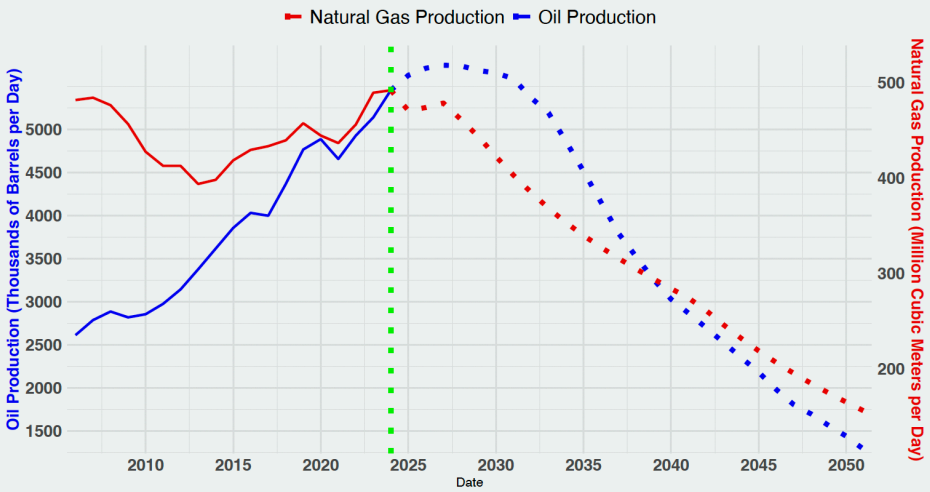
Figure 10: Cost per Petajoule of Energy by Source, 1981–2025



Source: Energy History at Harvard University, Statistics Canada, Canada Energy Regulator, Own calculations

Figure 10 traces the inflation-adjusted cost of delivered energy in Canada by fuel since 1981. There are and shows three clear patterns. Oil is the most expensive option and exhibits two pronounced price spikes in 2008 and 2022, echoing global crude-price shocks (Reuters, 2022). Natural gas prices surged in the early-2000s, collapsed after the 2008 recession (Reuters, 2024). Coal remained the cheapest Canadian energy source for decades, although its prices recently spiked following the 2022 European energy crisis.

Figure 11: Total Production for Oil and Natural Gas (Excluding Liquids)



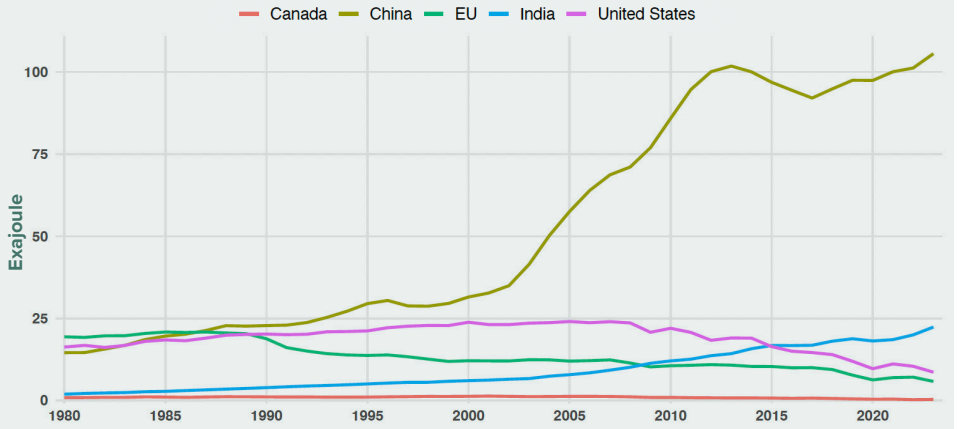
Source: Canada Energy Regulator. Canada's Energy Future Data Appendices.

Figure 11 suggests that Canada has rapidly increased its production of crude oil and it plans to continue doing so for the immediate future. This is primarily due to increased oil prices worldwide and Canada's status as a major oil exporter (see **Figure 17**). Additionally, exports from Canada to the US have increased due to declining US imports from Venezuela and Mexico (Canada Energy Regulator, 2024).

Starting in the late 2020s, following net-zero objectives, the CER developed scenarios showing that Canada's oil production will decrease. Scenarios are not predictions. They are paths to specific outcomes. Oil and gas is exceedingly important to Canada's economy. The labour productivity rate of the oil and gas sector remains the highest among Canadian industries, with oil and gas extraction averaging about $400 of economic output per hour worked. By contrast, the manufacturing sector's productivity is markedly lower—auto manufacturing, for example, sits at roughly $79 per hour, with most manufacturing activities below $75 per hour worked. It seems unlikely that such drastic reductions in production —decreases of more than 50% by the year 2050—will materialize. Indeed, if these forecasts were to be realized, it would take monumental policy initiatives.

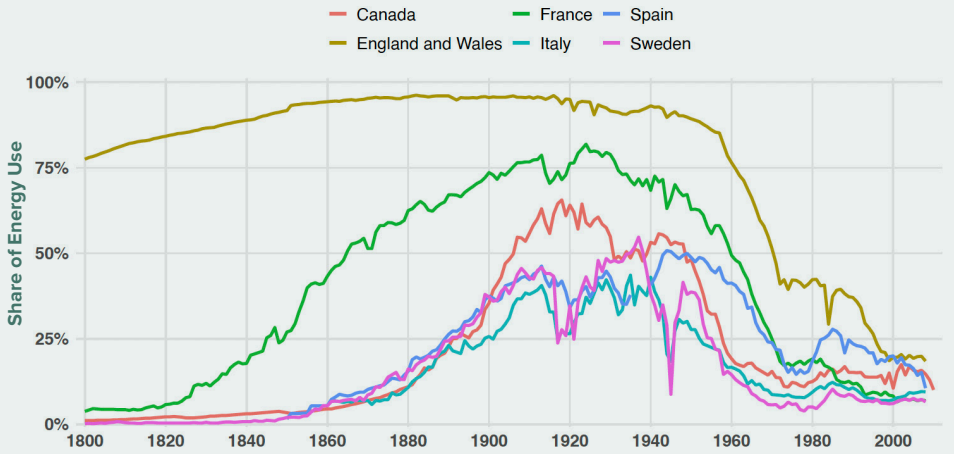
2.1.1.1 Coal

Figure 12: Total Energy Consumption from Coal by Country, 1980-2023



Source: U.S. Energy Information Administration, 2025

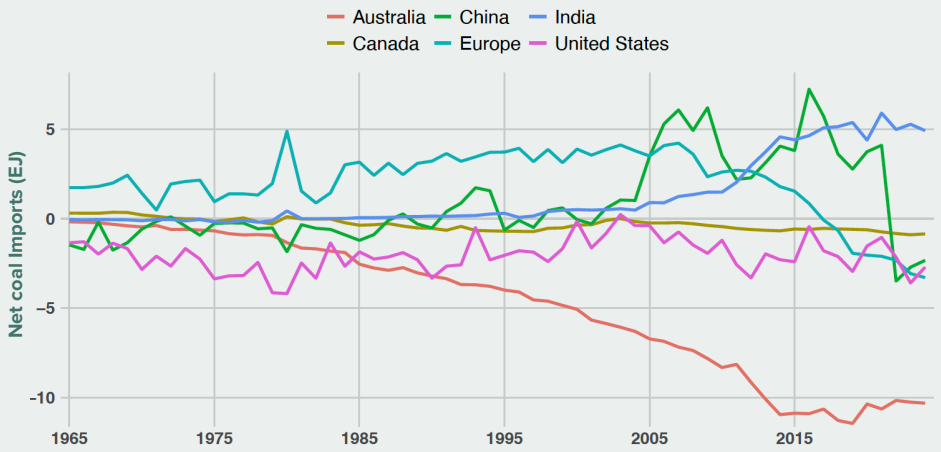
Figure 13: Share of Energy Consumption from Coal by Country, 1800–2008



Source: Energy History at Harvard University

As seen in **Figure 12**, Canada's total energy consumption from coal is significantly lower in comparison to other countries. This is because of Canada's relatively small population and its reliance on other resources for energy consumption such as natural gas, nuclear generated power, and hydro. Moreover, Canada has followed the global trend in reducing its reliance on coal over the past century.

Figure 14: Net Coal Imports by Country, 1965-2024

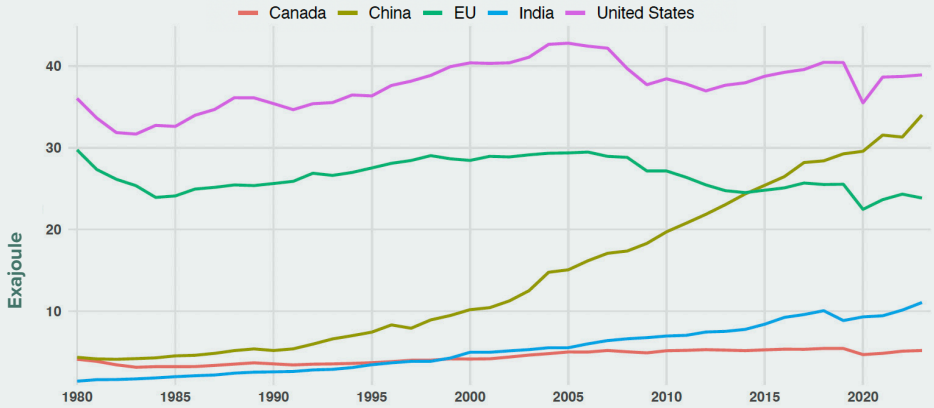


Source: Our World in Data

Figure 14 illustrates the net coal imports of key global economies from 2014 to 2024, measured in exajoules. Canada has maintained near-zero net coal imports throughout the period, consistent with its low reliance on coal and increased domestic alternatives such as hydro, nuclear, and natural gas. In contrast, India and China are net importers, reflecting their substantial dependence on coal to meet growing industrial energy demands. The European Union also remains a net importer but with visible volatility—likely reflecting the dual challenges of increasing changing climate targets and energy security responses. The US, Russia, and primarily Australia, all coal producers, exhibit negative net imports, confirming their status as net exporters. Canada's flat trajectory highlights its structural shift away from coal in the national energy mix.

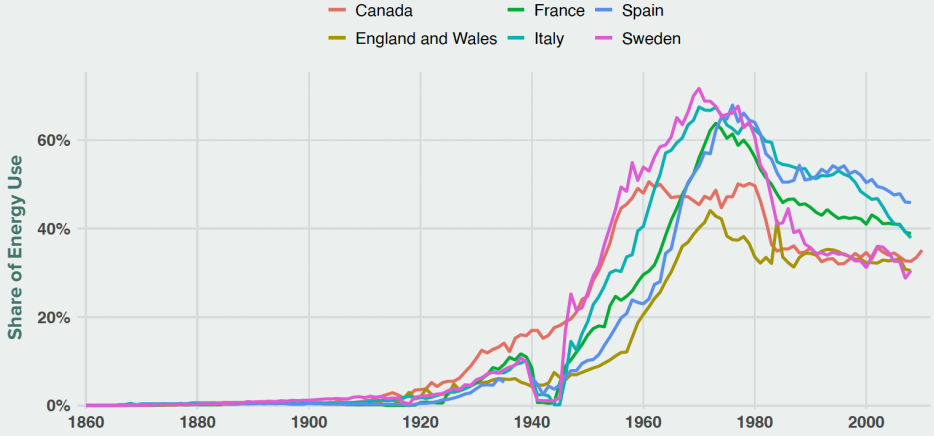
2.1.1.2 Oil

Figure 15: Total Energy Consumption from Oil by Country, 1980-2023



Source: U.S. Energy Information Administration, 2025

Figure 16: Share of Energy Consumption from Oil by Country, 1860–2008

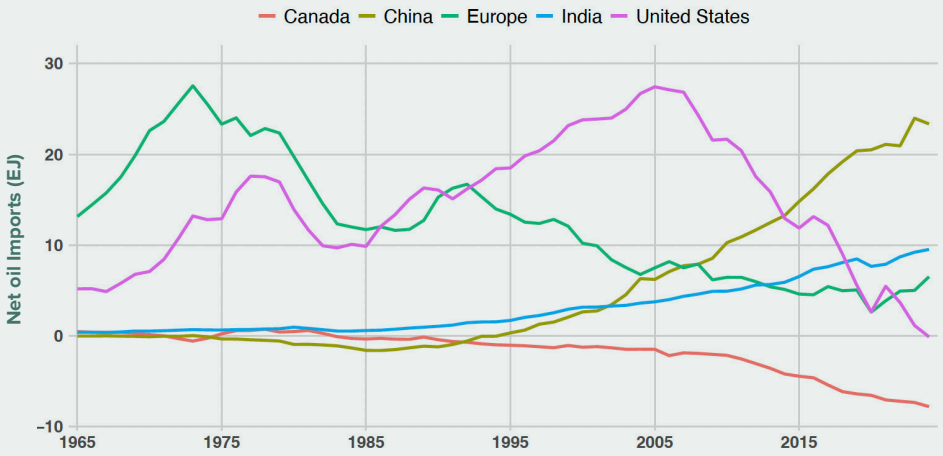


Source: Energy History at Harvard University

Despite rapidly growing exports, **Figure 15** shows Canada's oil consumption has remained flat for several decades. The United States has oscillated around 35 EJ of oil consumption. The European Union has drifted down from 14 roughly 25 EJ to nearer 20 EJ. At the same time, China and India have rocketed upward—China now consumes more than five times Canada's total and is approaching U.S. levels. Recent analysis suggests China's consumption of combustible fuels may peak by 2027 thanks to aggressive electrification and domestic supply pushes, signalling that the steep rise visible on the chart could soon taper (International Energy

Agency, 2025). Looking at oil as a share of energy over two centuries, **Figure 16** shows the arc of oil consumption near-zero use before 1900, a surge after World War II, and a plateau or decline after the 1970s oil shocks. Canada's share climbs to roughly 50% by the early 1980s and then flattens, mirroring the fossil-fuel plateaus highlighted previously.

Figure 17: Net Oil Imports by Country, 1965-2024

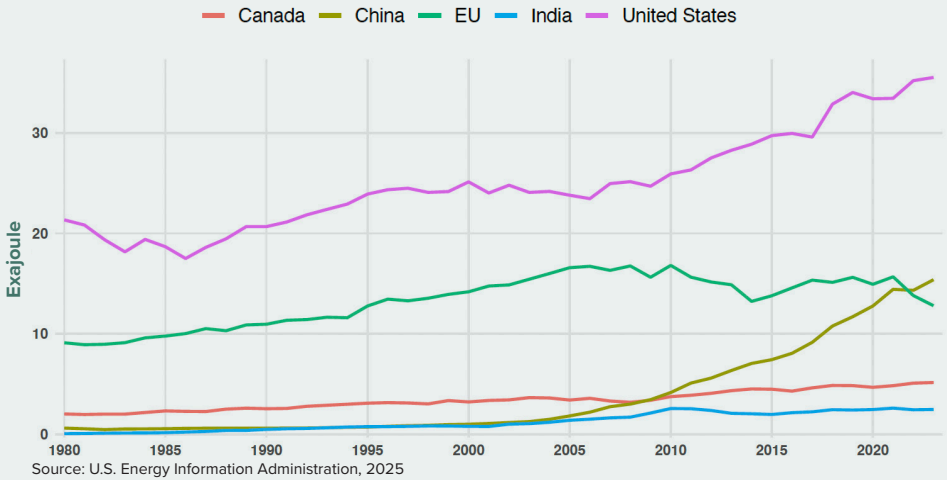


Source: Our World in Data

Figure 17 tracks the net oil imports for major economies, measured in exajoules. Canada is consistently a net oil exporter reinforcing its status as a major global crude producer. The US shows a similar trajectory, increasingly becoming self-reliant. Meanwhile, China, India, and Europe remain net importers, highlighting their continued reliance on foreign oil to meet domestic demand. The data aligns well with known geopolitical and energy trends, underscoring the ongoing divergence in fossil fuel dependence and energy independence, especially in North America.

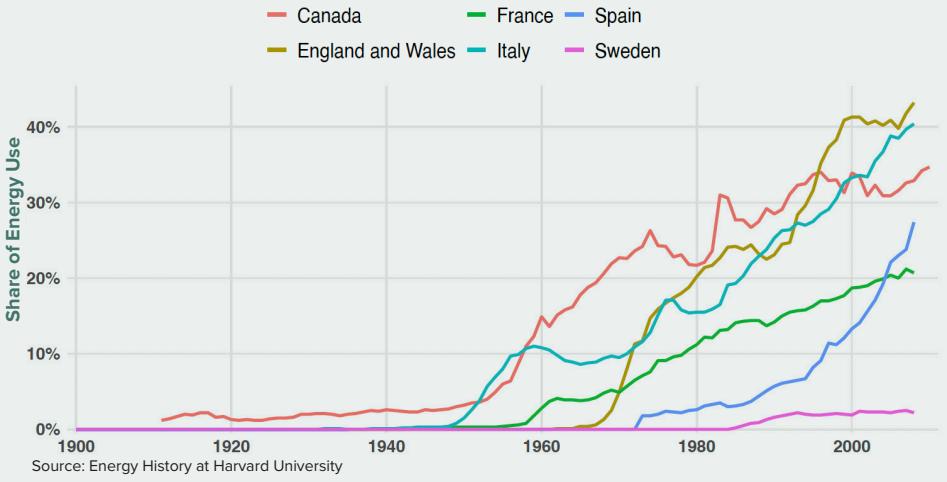
2.1.1.3 Natural Gas

Figure 18: Total Energy Consumption from Natural Gas by Country, 1980-2023



Source: U.S. Energy Information Administration, 2025

Figure 19: Share of Energy Consumption from Natural Gas by Country, 1900–2008



Source: Energy History at Harvard University

Natural gas markets have historically been more fragmented than coal or oil markets. Yet, **Figures 18** and **19** show that gas has largely replaced coal in Canada's fuel stack.

Figure 20: Net Natural Gas Imports by Country, 1965–2024

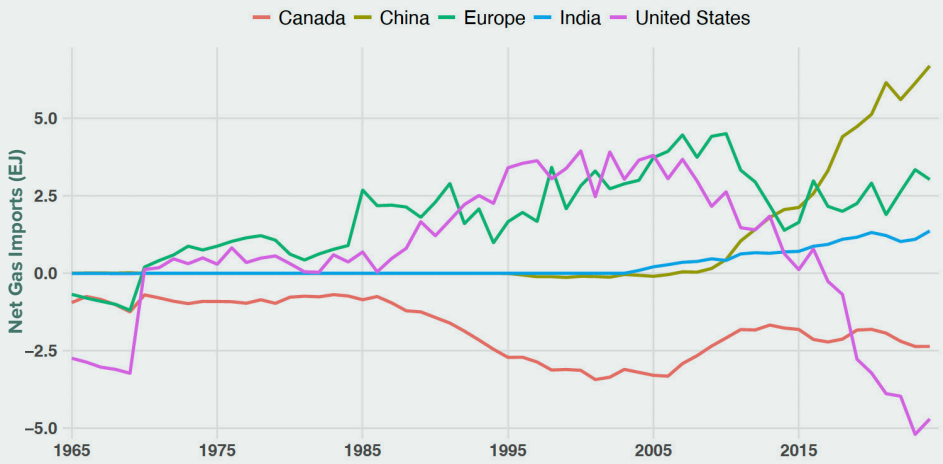


Figure 20 shows net natural gas imports for Canada. Canada is an exporter of natural gas with exports peaking near 3 EJ in the late-1990s before easing as U.S. shale production exploded.

2.1.2 Non-emitting Resources

Figure 21: Non-emitting Share of Canadian Electricity Generation, 2005–2023

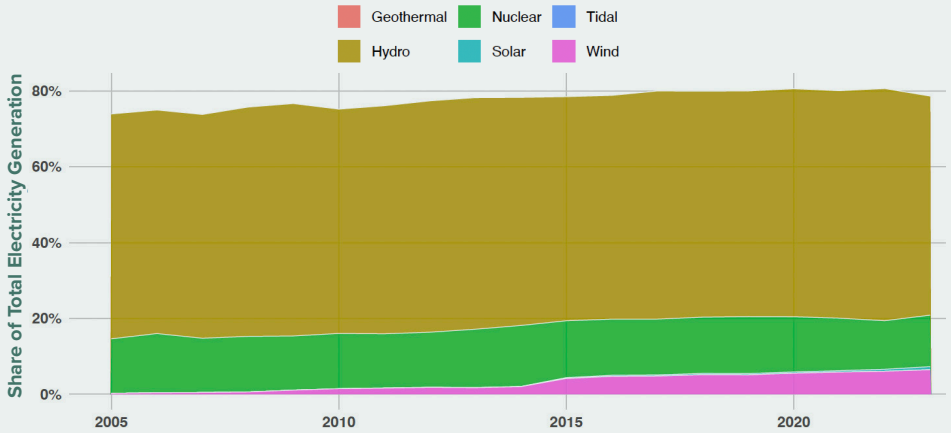
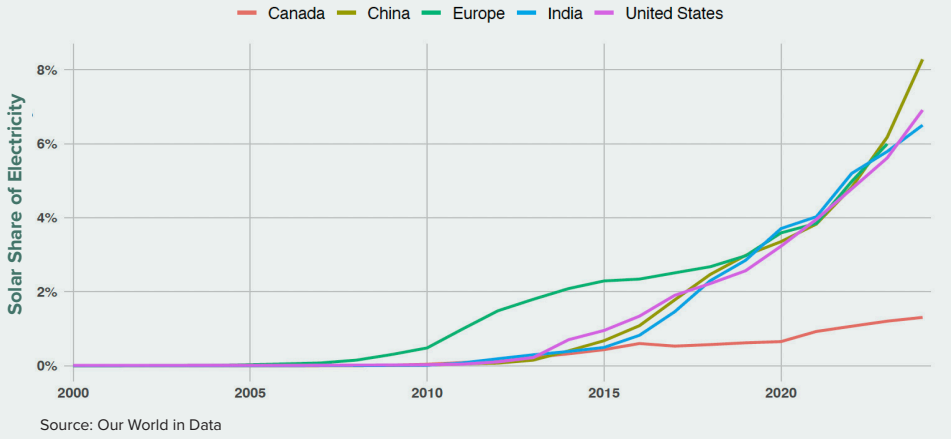


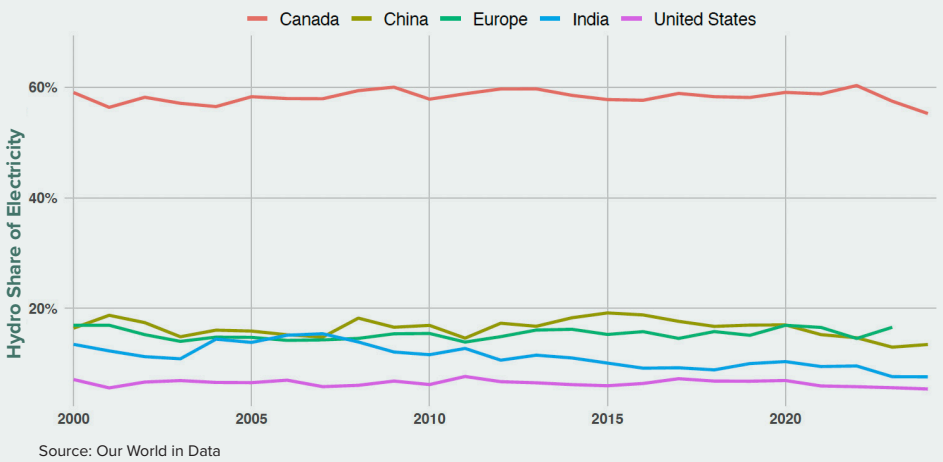
Figure 21 illustrates the contribution of non-emitting sources to Canada's electricity generation from 2005 to 2023. Hydro remains dominant, while wind and solar have shown steady growth since 2010. The total non-emitting share has reached 80%, positioning Canada among the global leaders. However, future gains will likely depend on continued investment in nuclear, wind, solar, and storage, especially outside of hydro-heavy provinces.

Figure 22: Solar Share of Electricity Generation by Country, 2000–2024



In **Figure 22**, we see the share of solar power in total electricity generation from 2000 to 2025 across major regions, including Canada. While the European Union and China have led the global shift with solar surpassing 6% of electricity generation, Canada's growth has remained comparatively modest.

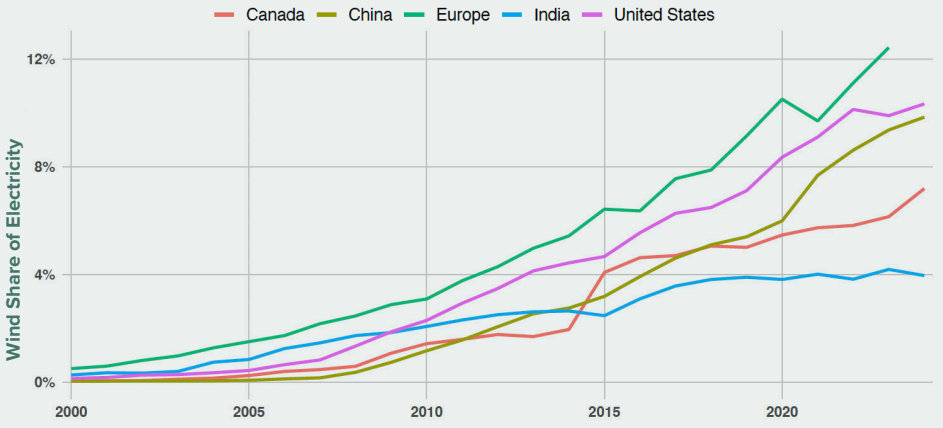
Figure 23: Hydro Share of Electricity Generation by Country, 2000–2024



Source: Our World in Data

Hydro supplied about 56% of all Canadian electricity in 2024. Canada's high overall hydro electricity share and export surplus highlights both the country's enduring clean-power advantage and its exposure to hydro-climate volatility—an issue most peers have already faced as their own hydro shares edged down.

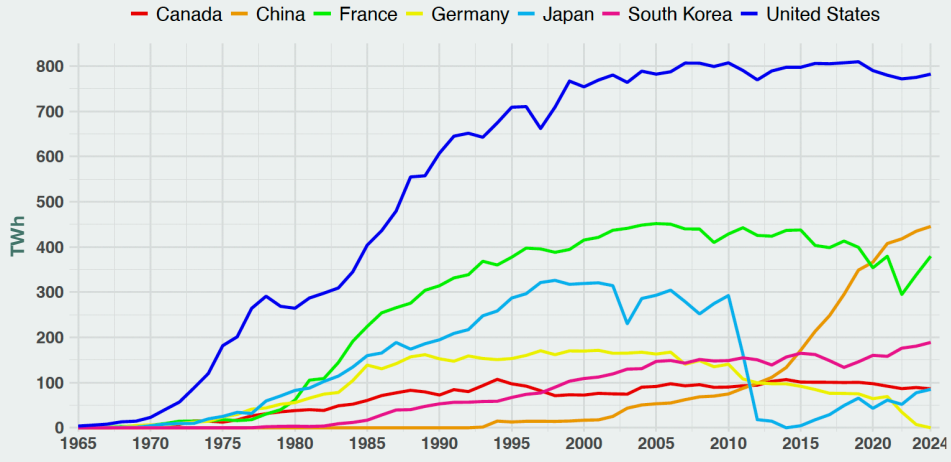
Figure 24: Wind Share of Electricity Generation by Country, 2000–2024



Source: Our World in Data

Figure 24 shows wind's steady climb from niche to meaningful source of electricity. In Europe, wind generates over one-tenth of its electricity, while the United States and China follow close behind in the high single-digits. Canada's share rises from effectively zero to about 7%. Canada trails its peers but marks one of the fastest percentage-point gains in its power mix.

Figure 25: Nuclear Power Generation by Country, 1965–2024

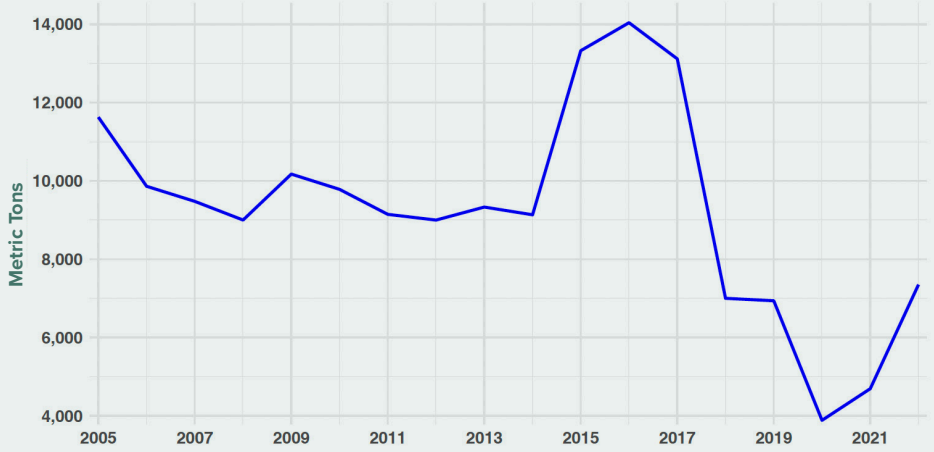


Source: Energy Institute – Statistical Review of World Energy (2024)

Figure 25 presents data on nuclear power generation for key G7 countries, plus China and South Korea. While Canada generates less nuclear power relative to its peers in absolute terms, its per-capita production is high. Roughly 15% of its electricity generation comes from nuclear (see **Figure 21**).

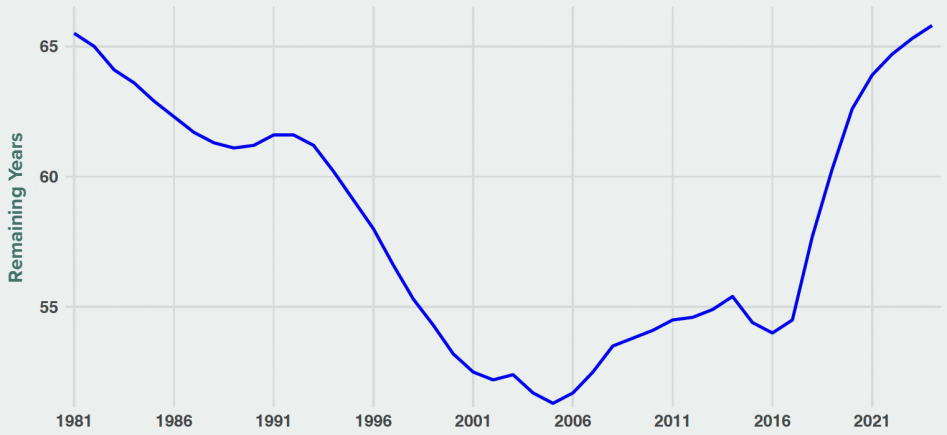
Canada is also a major exporter of uranium. In 2022, about 80% of Canada's uranium production was exported for nuclear power generation abroad (Natural Resources Canada, 2024b). However, uranium production fell sharply between 2016 and the early 2020s, as seen in **Figure 26**. The resurgence of nuclear has spurred a rebound.

Figure 26: Canada Uranium Production, 2005–2022



Source: Statista

Figure 27: Canada's Average Remaining Useful Life of Nuclear Production Plants (Estimate), 1981–2024



Source: Statistics Canada. Table 36-10-0611-01 Infrastructure Economic Accounts, average age and remaining useful service life ratio by asset and asset function

Figure 27 shows a steep decrease in the average remaining useful life of nuclear plants in Canada from 1981 to 2005. Since then, the average remaining useful life of nuclear plants has reversed trajectory, caused by the refurbishment of reactors at Bruce and Darlington. This trend will continue with the new small modular reactions at the Darlington site in Ontario and the refurbishment of the Pickering power plant.

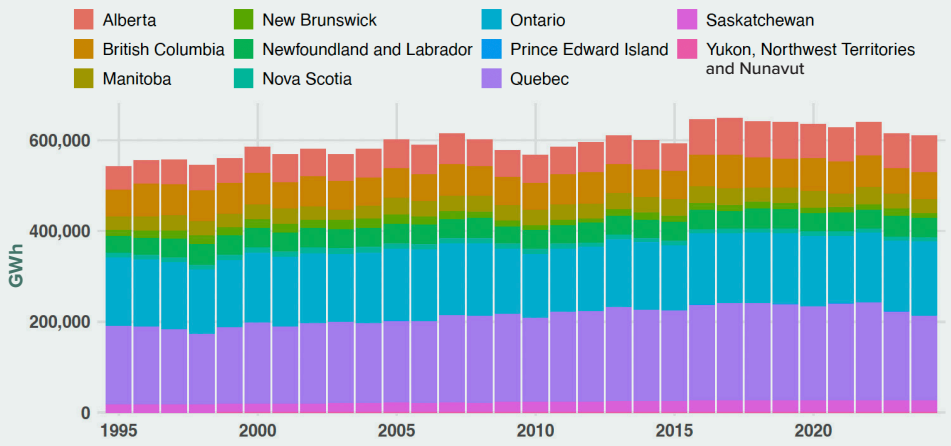
2.2 Across the Provinces

Figure 28 displays the total annual electricity generated in Canada over the past 30 years, broken down by province. Despite its status as Canada's most populous province, Ontario trails Quebec in electricity generation. Alongside these two provinces, Alberta, New Brunswick, and British Columbia also account for significant shares of Canada's power production.

Figures 29-31 show the composition of the electricity generated in each Canadian province and territory. These data relied on the combination of three different Statistics Canada tables covering different periods, which explains the shifts in categories observed in 2008 and 2022. Prior to 2008, power production from hydraulic and nuclear sources was bundled. Since 2021, the contribution of fossil fuels to the power production is not observable separately from the total production. As a result, after 2021, the "Other" category starts to include generation from fossil fuels.

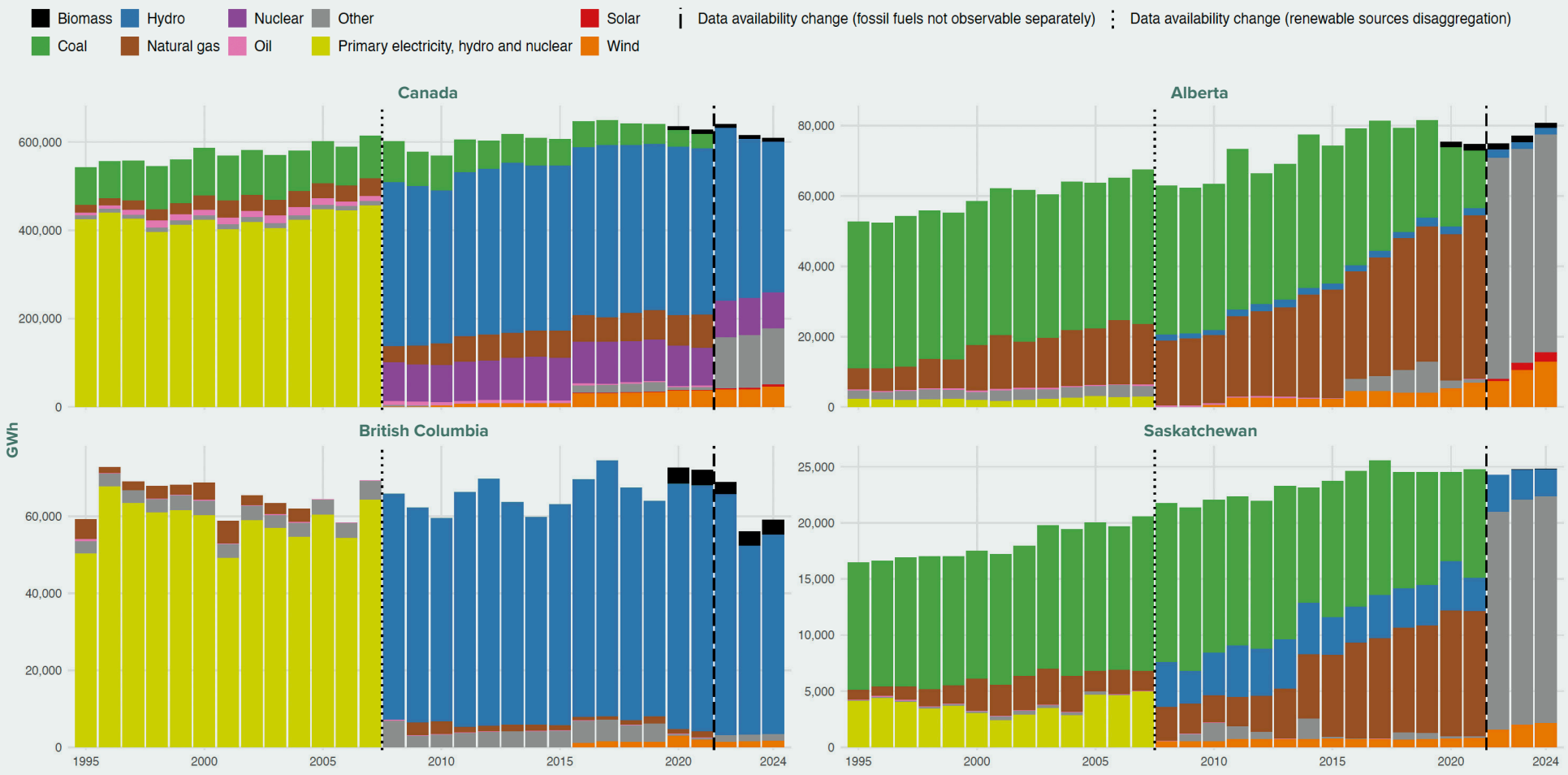
Figure 28: Canada Total Electricity Generation by Province, 1995–2024

Total generation from combustible fuels and renewable sources



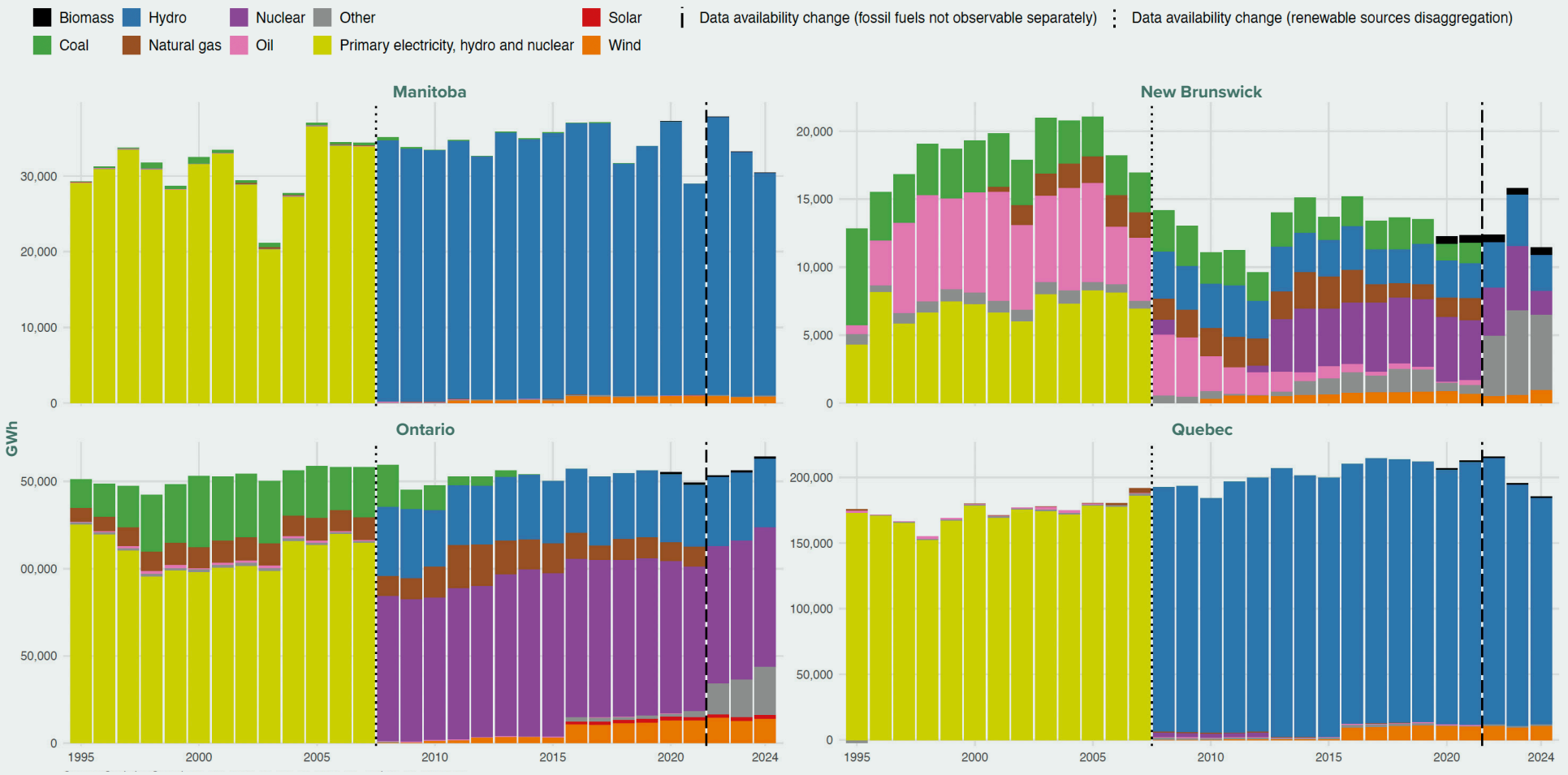
Source: Statistics Canada 25-10-0028-01, 25-10-0015-01, and 25-10-0030-01

Figure 29: Canada Provincial Electricity Generation by Source, 1995–2024 (Canada + Western Provinces)



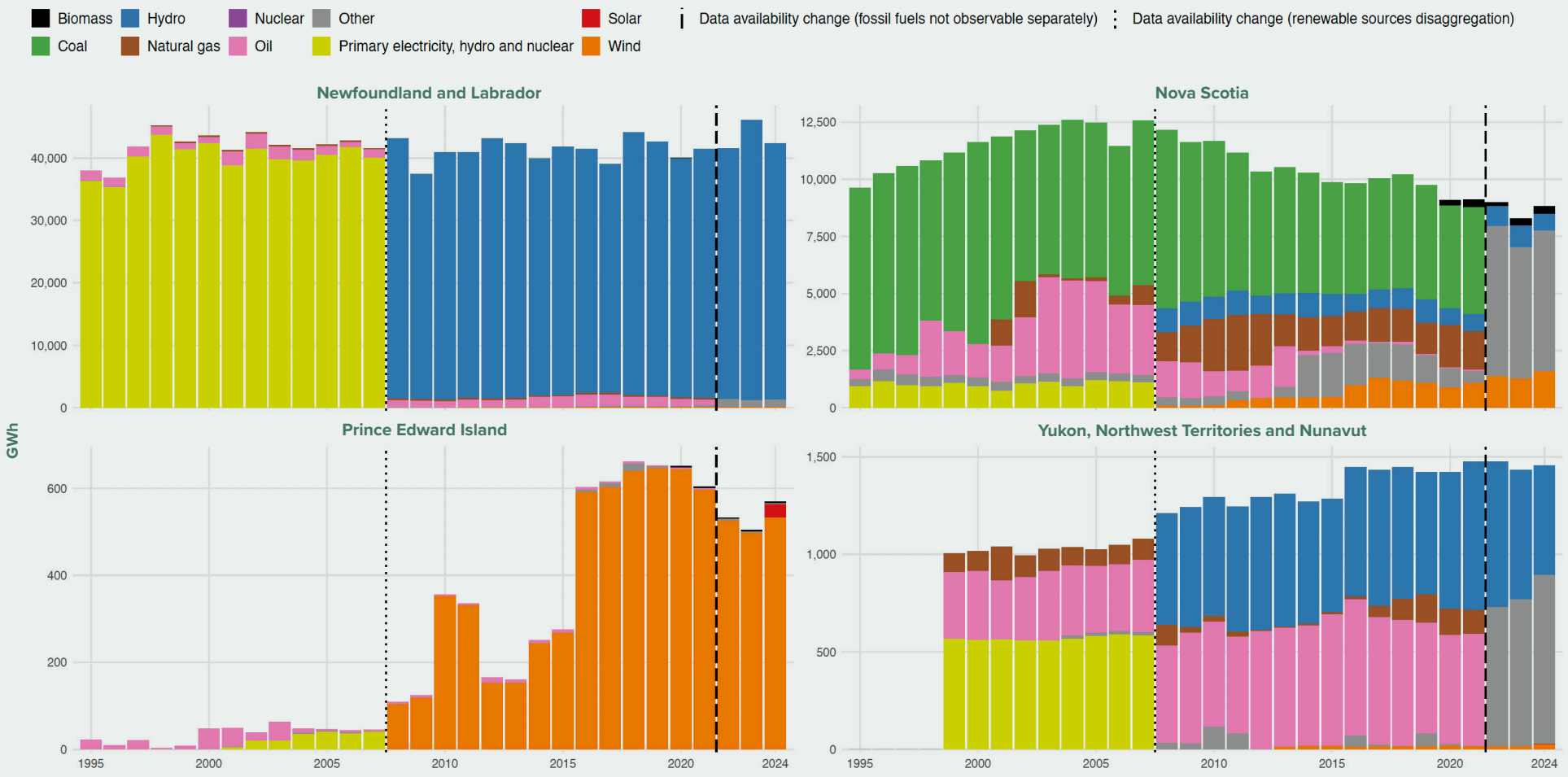
Source: Statistics Canada 25-10-0028-01, 25-10-0015-01, and 25-10-0030-01

Figure 30: Canada Provincial Electricity Generation by Source, 1995–2024 (Manitoba, Ontario, Quebec, New Brunswick)



Source: Statistics Canada 25-10-0028-01, 25-10-0015-01, and 25-10-0030-01

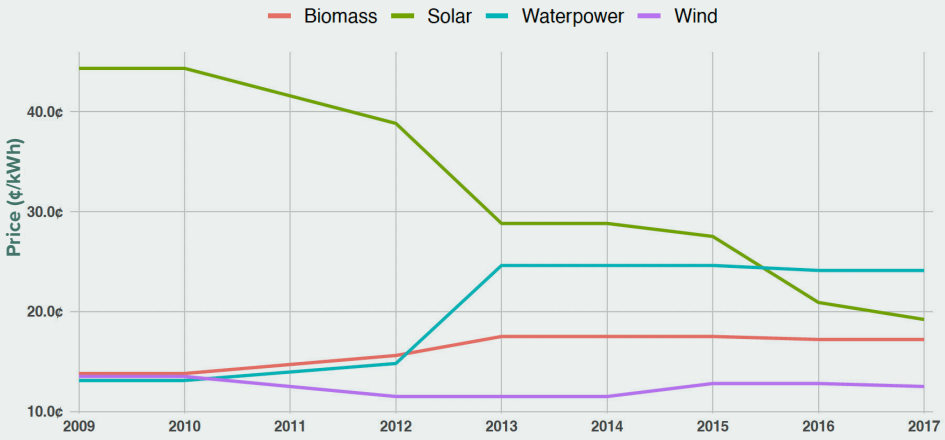
Figure 31: Canada Provincial Electricity Generation by Source, 1995–2024 (Atlantic & North)



Source: Statistics Canada 25-10-0028-01, 25-10-0015-01, and 25-10-0030-01

Figure 32: Ontario FIT Program Prices by Renewable Source

Feed–In Tariff (FIT) contract prices in cents per kWh, 2009–2017



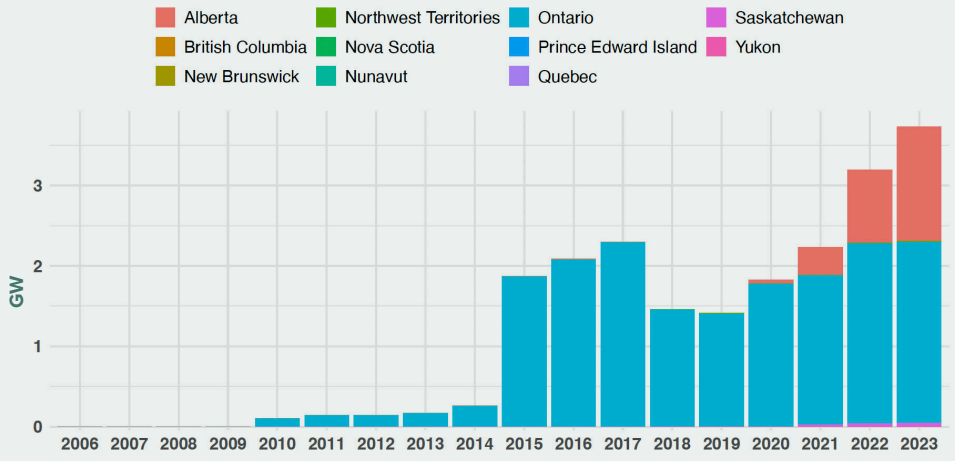
Source: Ontario Independent Electricity System Operator (IESO)

Figure 32 contains the pricing schedules under Ontario's Feed-In Tariff (FIT) between 2009 and 2017. The program provided long-term, fixed price contracts between generators and the IESO, economically playing the same role as private power-purchasing agreements. The chart shows non-rooftop solar contracts declining from between the 2009 launch and 2017, following a series of price reductions that track PV-module cost declines. By contrast, on-shore wind, biomass and small hydro remain stable.

2.1.2 Non-emitting Resources

2.2.1.1. Solar

Figure 33: Canada Solar Generation Capacity by Province, 2006–2023



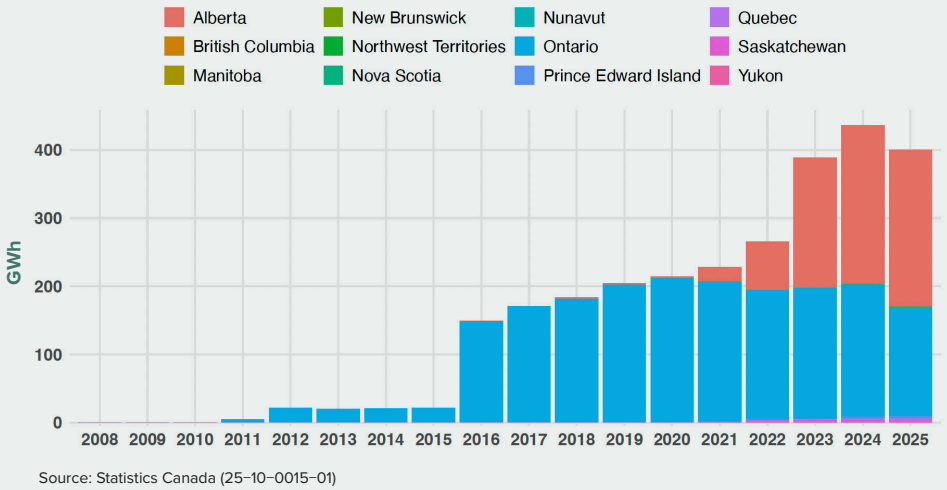
Source: Statistics Canada (25–10–0022–01)

Figure 33 presents Canada's installed solar power capacity additions in gigawatts (GW) from 2006 to 2023. In 2018, the Ontario government directed the IESO to cancel 750 un-built wind and solar contracts, many of them solar projects; those megawatts had previously been booked as "installed" in error and were removed from the 2018 inventory (Government of Ontario, 2018). So, although the plot covers the 2006-2023 year range, only values from 2018 onward should be used for consistent year-to-year comparisons of actual operating capacity.

Overall, there is an upward trajectory over this period, reflecting increased investment in solar energy, falling costs of photovoltaic systems, and federal/provincial incentives. The growth is modest by global standards, but significant within Canada's traditionally hydro-heavy electricity mix. Until 2020, the gains are seen almost entirely in Ontario, with Alberta also increasing its solar capacity since 2020.[1]

[1] It should be noted, however, that about 20% of these data points were not available for all provinces in all years due to confidentiality reasons, and missing values were filled by interpolation.

Figure 34: Canada Average Monthly Solar Power Generation by Province, 2008–2025

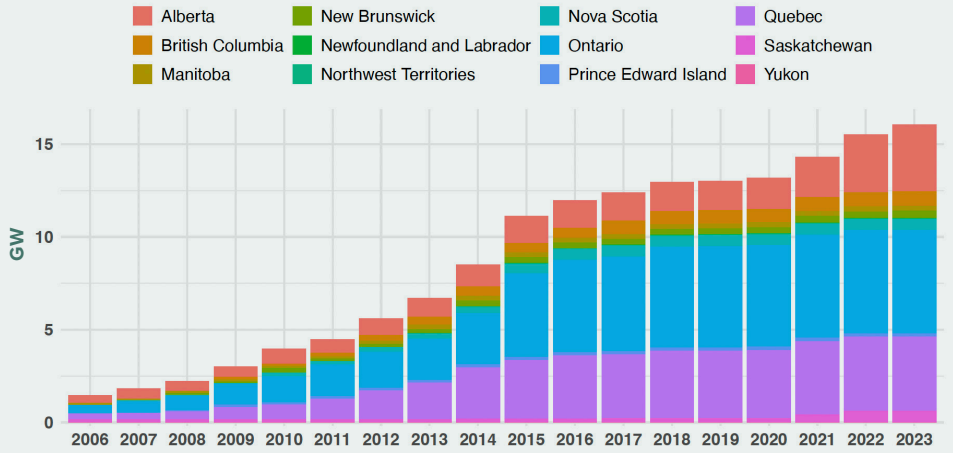


Source: Statistics Canada (25-10-0015-01)

Figure 34 tells a similar story, but for solar generation. It is notable that despite its lower production capacity, since 2024 Alberta has surpassed Ontario in solar power generation. (The value for 2025 is year-to-date.)

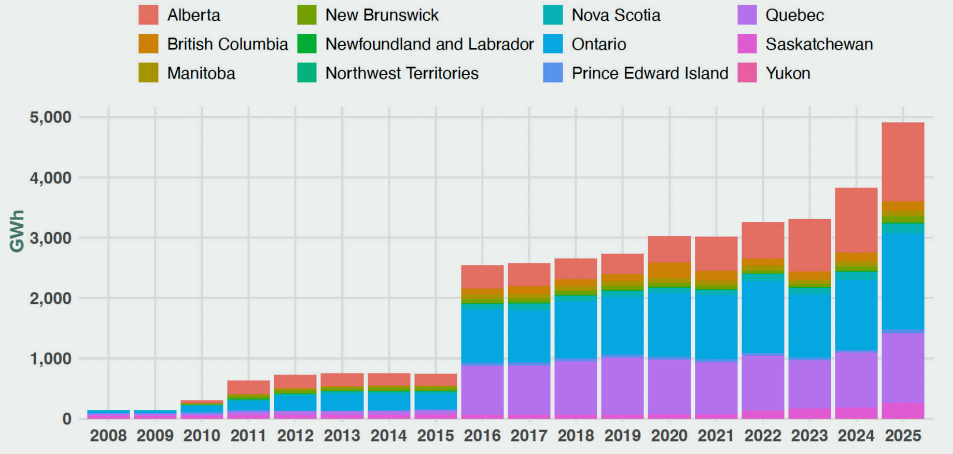
2.2.1.2. Wind

Figure 35: Canada Wind Generation Capacity by Province, 2006–2023



Source: Statistics Canada (25-10-0022-01)

Figure 36: Canada Average Monthly Wind Power Generation by Province, 2008–2025

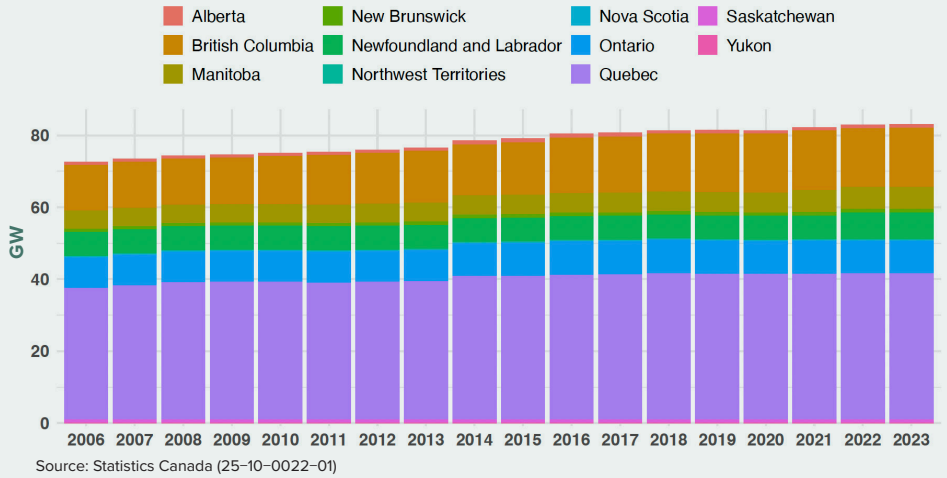


Source: Statistics Canada (25-10-0015-01)

Figures 35 and 36 display wind power capacity and generation by province in Canada. The overall upward trajectory is notable, with gains primarily experienced in Ontario, Quebec, and Alberta. (The 2012 values for wind generation capacity were not available, and were thus filled by interpolation. The value for 2025 is year-to-date.)

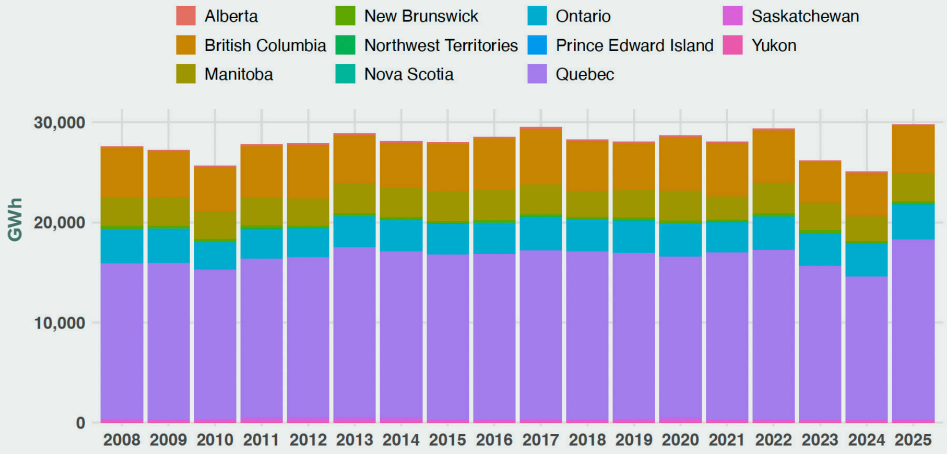
2.2.1.3. Hydro

Figure 37: Canada Hydraulic Generation Capacity by Province, 2006–2023



Source: Statistics Canada (25-10-0022-01)

Figure 38: Canada Average Monthly Hydraulic Power Generation by Province, 2008–2025

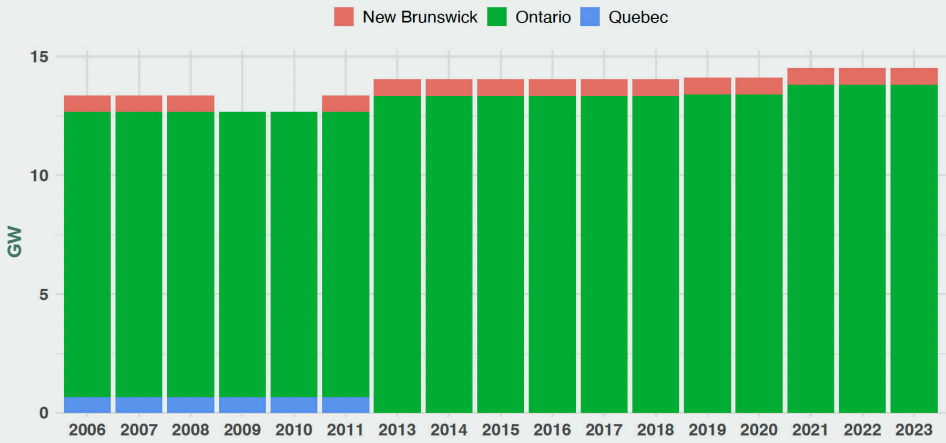


Source: Statistics Canada (25-10-0015-01)

Canada has been historically reliant on hydraulic power generation, and this trend has been maintained in the past two decades as seen in **Figures 37-38**. The bulk of capacity and generation comes from Quebec, with Ontario and British Columbia also being significant contributors. (As in the datasets for wind power, 2012 values were not available in this case and were filled by interpolation. The value for 2025 is year-to-date.)

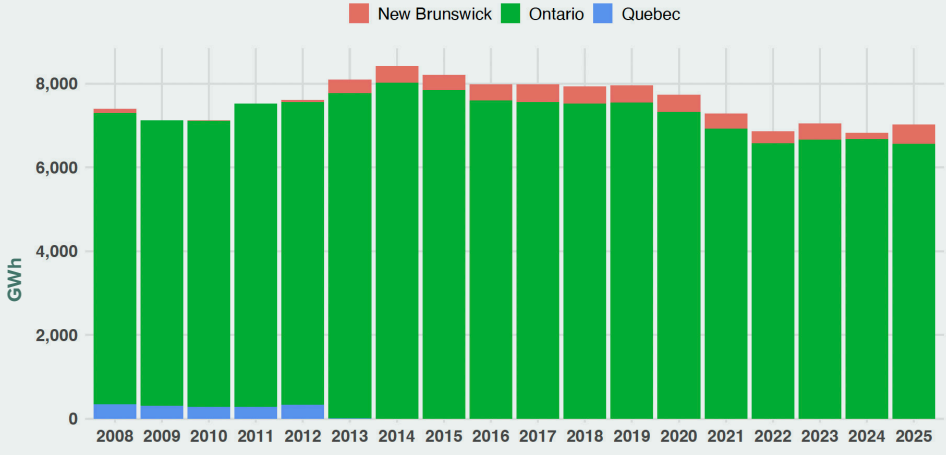
2.2.1.4. Nuclear

Figure 39: Canada Nuclear Generation Capacity by Province, 2006–2023



Source: Statistics Canada (25-10-0022-01)

Figure 40: Canada Average Monthly Nuclear Power Generation by Province, 2008–2025

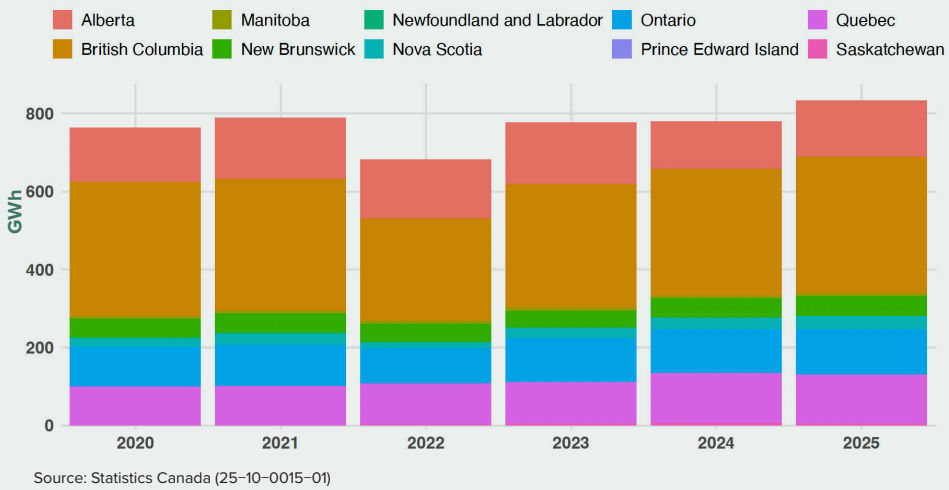


Source: Statistics Canada (25-10-0015-01)

As previously discussed, nuclear power accounts for roughly 15% of Canada's power generation, with almost the entire capacity and generation being located in Ontario. This is because Canada has 19 operating reactors, 18 of which are in Ontario with one in New Brunswick.

2.2.1.5. Biomass

Figure 41: Canada Average Monthly Biomass Power Generation by Province, 2020–2025

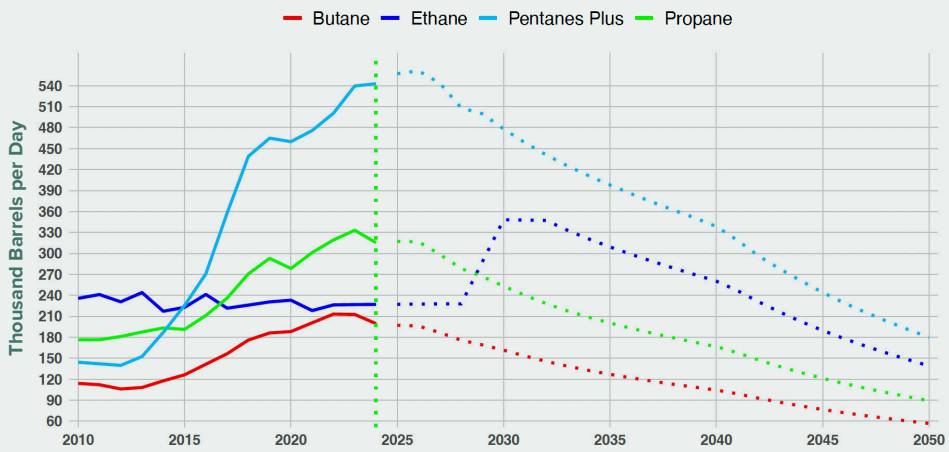


Source: Statistics Canada (25-10-0015-01)

Figure 41 shows the role of biomass in electricity generation across Canada. Biomass contributes roughly 300 GWh in British Columbia and 100 GWh in each of Alberta, Ontario and Quebec.

3. PIPELINES, NATURAL GAS LIQUIDS AND FOSSIL-FUEL INFRASTRUCTURE

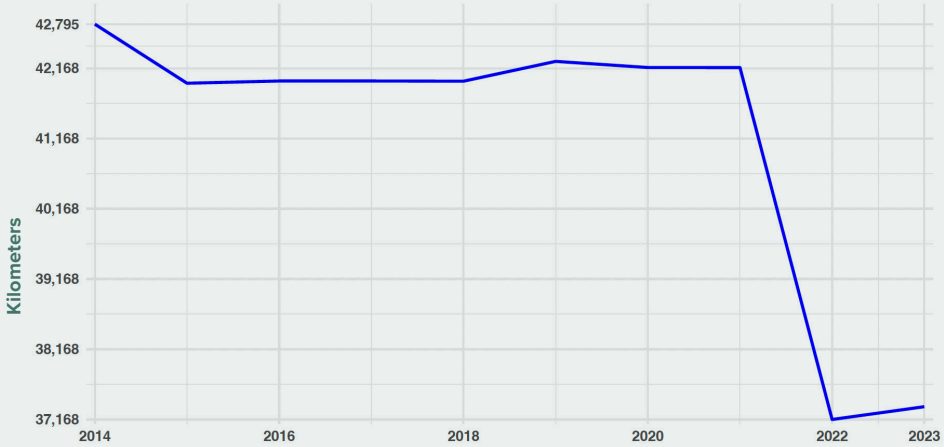
Figure 42: Production of Natural Gas Liquids in Canada, 2010–2050



Source: Canada Energy Regulator. Canada's Energy Future Data Appendices.

Figure 42 shows a steep production increase in the production of natural gas liquids (NGLs) in Canada. This increase has been driven by Pentanes Plus (C5+), which is blended with bitumen and heavy crude. More modest increases are observed for the remaining NLG's during this period. Projections from the Canada Energy Regulator indicate a decrease in the production of these LNG's after 2025, in line with Canada's goal of net-zero emissions by 2050. As with the projections for oil and bitumen production, whether the forecast reduction materializes remains to be seen.

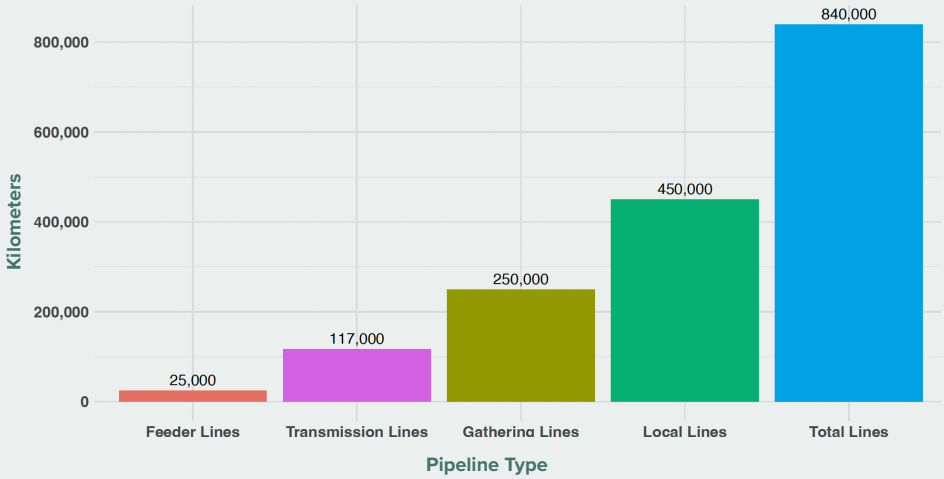
Figure 43: Total Pipeline Length in Europe, 2014–2023



Source: Eurostat

Figure 43 shows Europe's total pipeline length remained steady until 2022, where there was a 13.15% decrease in the total length of pipelines. This was caused by the Russia-Ukraine war, resulting in disruptions of natural gas trade between Europe and countries in neighbouring regions. Indeed, according to Nakhle (2025), "by 2023, the share of Russian pipeline gas in Europe shrank to 45 percent of total gas pipeline imports into the continent."

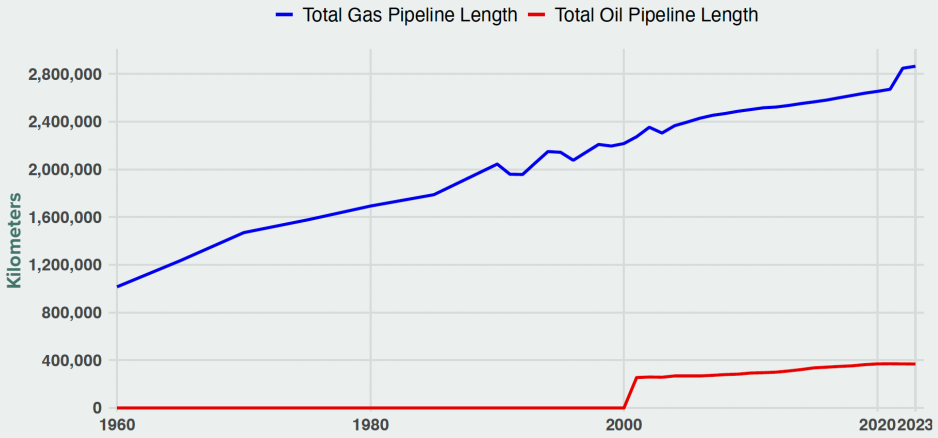
Figure 44: Breakdown of Oil and Gas Pipeline Types in Canada



Source: Natural Resources Canada, 2025

Figure 44 highlights that oil and gas pipelines in Canada are predominantly local (distributional lines), with the amount of gathering lines also being significant. Canada has extensive natural gas infrastructure which delivers gas to residences, businesses and other industries, supporting Canada's large gas share.

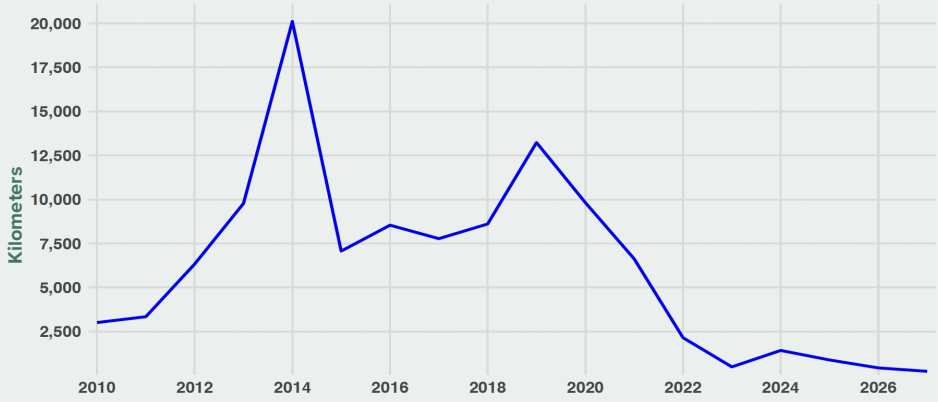
Figure 45: Total Pipeline Length in the United States, 1960–2023



Source: U.S. Department of Transportation, Pipeline and Hazardous Materials Safety Administration

Figure 45 shows the total lengths of gas and oil pipelines. This includes all types of lines such as feeder lines, transmission lines, etc. Gas pipeline length has grown at a steady rate, and oil pipelines experiencing significantly slower growth rates with a major spike around the year 2000.

Figure 46: U.S. Crude Oil, Petroleum Products, and Hydrocarbon Gas Liquids Pipeline Additions, 2010–2026

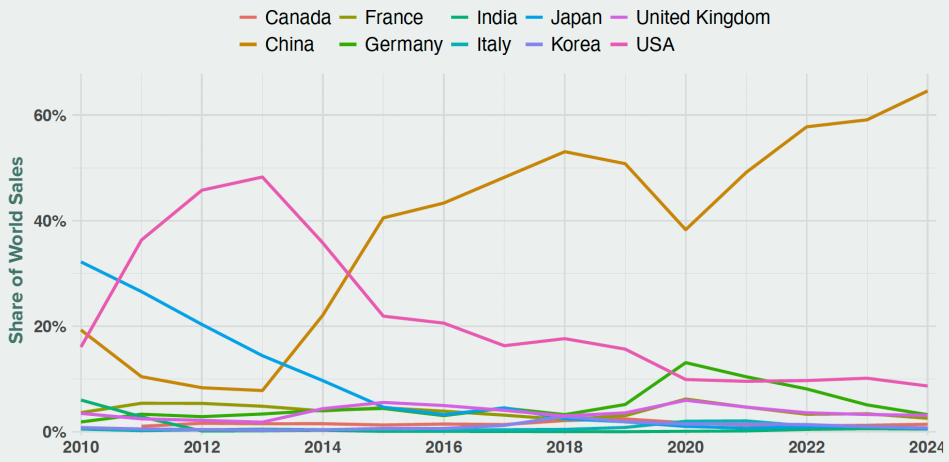


Source: U.S. Energy Information Administration, Liquids Pipeline Projects Database

Based on **Figure 46**, pipeline additions for crude oil, petroleum products and hydrocarbon gas liquids have declined, and are projected to continue to decline until 2027. According to the American Energy Alliance, the decline in pipeline additions can be explained by the Covid-19 pandemic as well as the increase in regulations for new pipeline construction (Stevens, 2022).

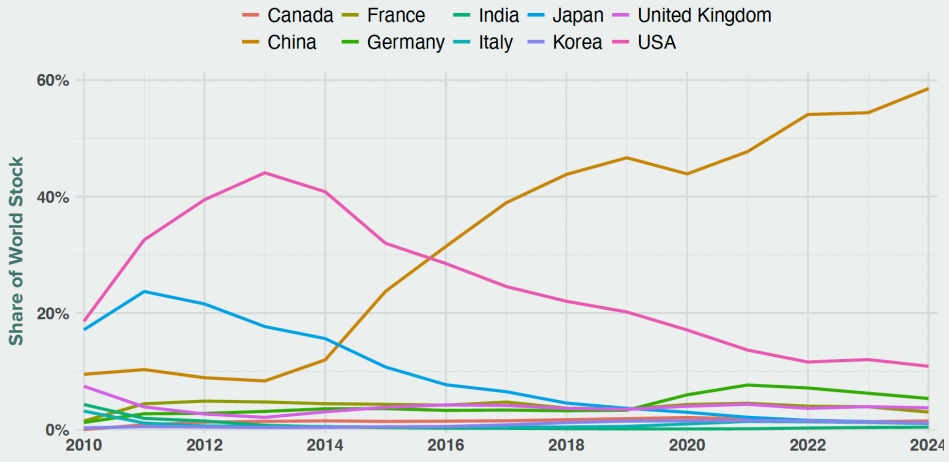
4. EV MARKET AND TRANSPORT

Figure 47: Electric Passenger Vehicle Share of Global Sales by Country, 2010–2024



Source: International Energy Agency

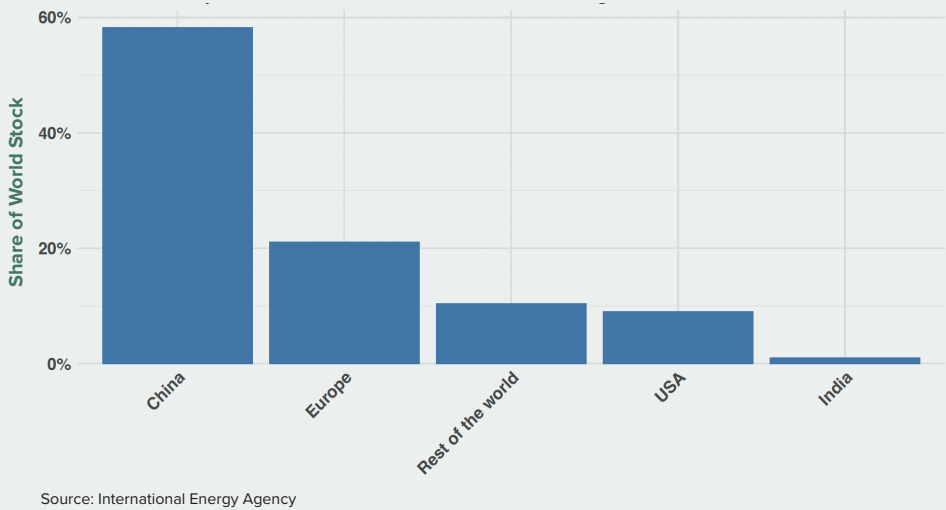
Figure 48: Electric Passenger Vehicle Share of Global Stock by Country, 2010–2024



Source: International Energy Agency

Figures 47 and **48** demonstrate that China now dominates the global EV market and continues to expand their share of total EV sales around the world. Nearly 7 in 10 electric cars are sold in China, and over 6 in 10 electric vehicles currently in use are in China. Canada, partly due to its significantly smaller population and partly due to limited options, accounts for a very small fraction of global EV car sales and stock.

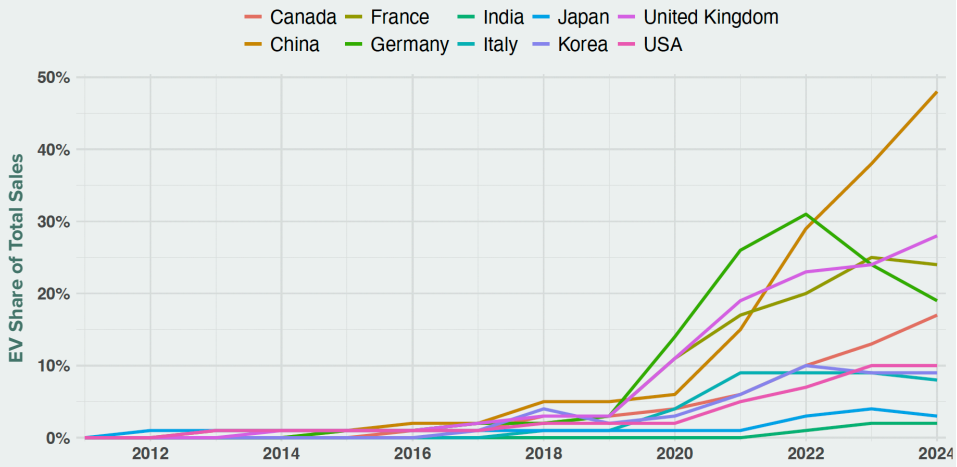
Figure 49: Projected Share of Global Electric Passenger Vehicle Stock in 2030



Source: International Energy Agency

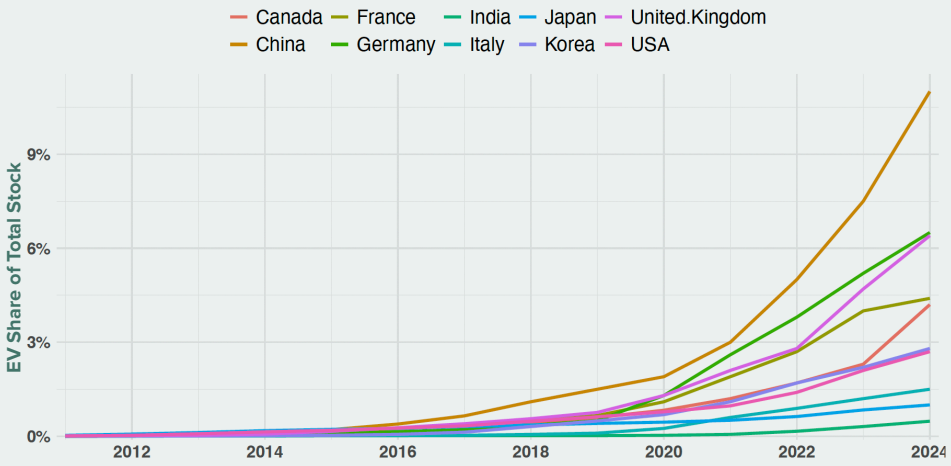
Figure 49 presents IEA's projections of the share of global EV stock by selected regions in 2030. The projections closely align with current shares, suggesting that the EV market will remain stable.

Figure 50: EV Sales as a Share of Total Vehicle Sales, 2011–2024



Source: International Energy Agency

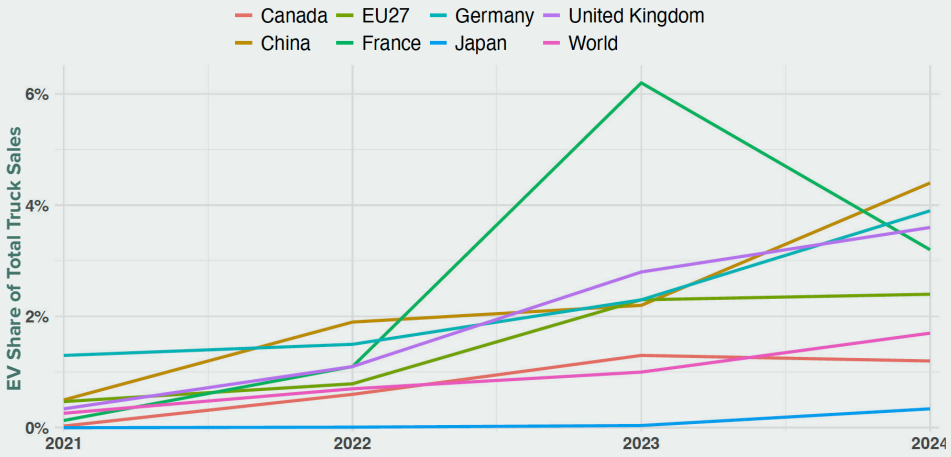
Figure 51: EV Stock as a Share of Total Vehicle Stock, 2011–2024



Source: International Energy Agency

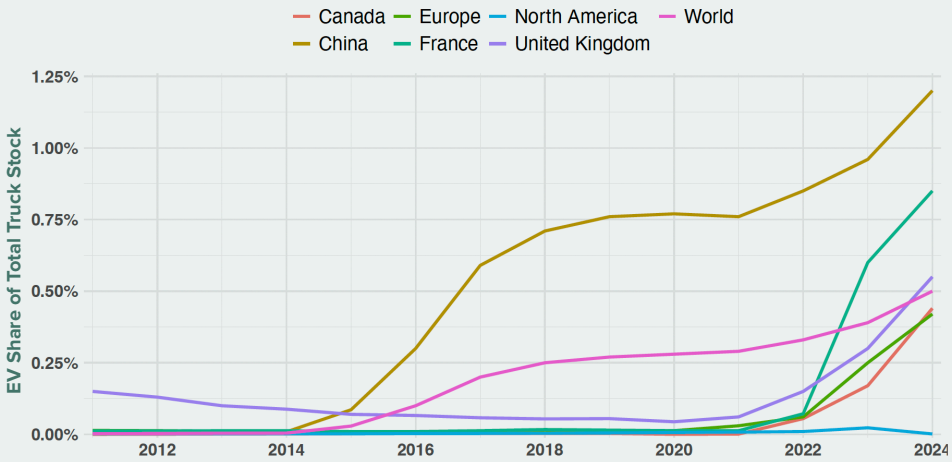
Figures 50 and **51** showcase that electric vehicles are becoming a larger part of the biggest car markets around the world, especially in countries like China, France, Germany, and the UK. In Canada, EVs now represent roughly 1 in 6 new vehicle sales and about 1 in 25 vehicles on the road.

Figure 52: EV Truck Sales as a Share of Total Truck Sales, 2021–2024



Source: International Energy Agency

Figure 53: EV Truck Stock as a Share of Total Truck Stock, 2011–2024

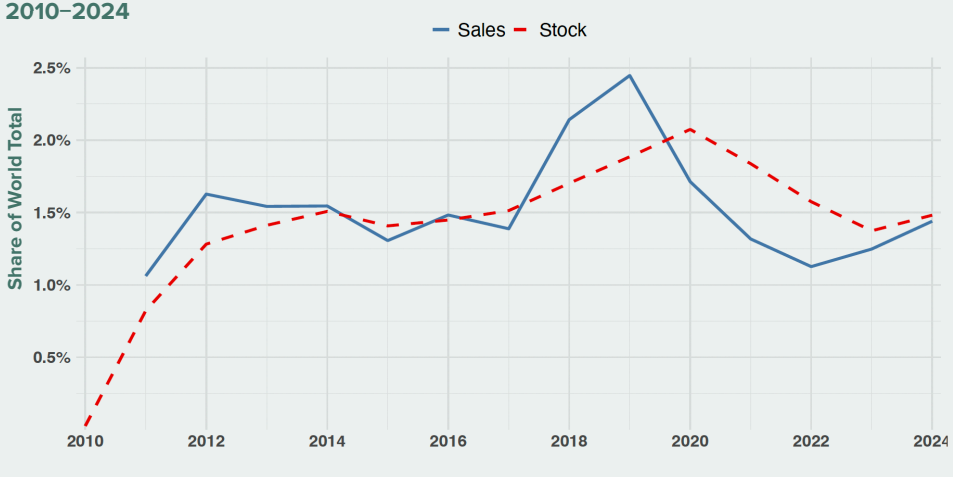


Source: International Energy Agency

The transition to electric trucks, as suggested by **Figures 52** and **53**, is in its infancy, with EVs making up a small fraction of total truck sales and stock globally. Growth is most notable in China and parts of Europe, while North America remains at very low levels of adoption.

France stands out for its significant increase in EV truck sales in 2023. This surge was the product of a rare alignment of generous national subsidies, looming urban clean-air deadlines, improving total-cost-of-ownership (TCO) economics, a wave of large corporate orders, and the arrival of French-built heavy e-trucks from Renault's new production line.

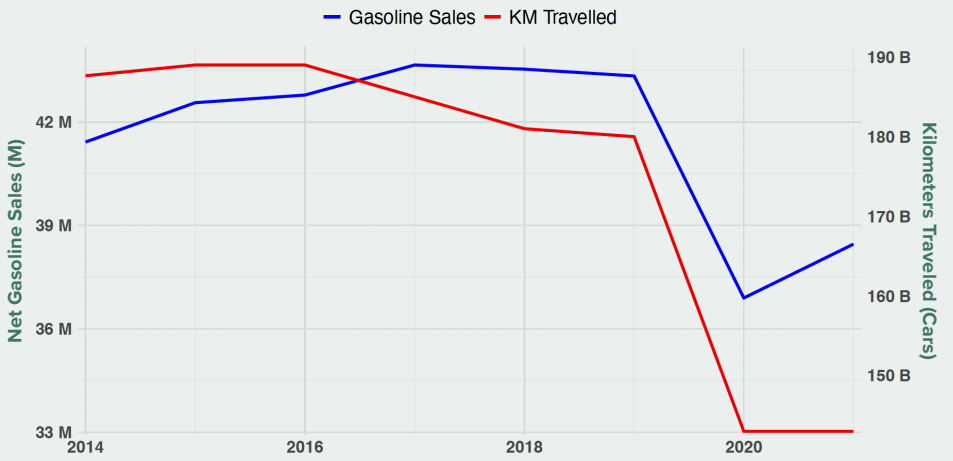
Figure 54: Canada's Share of Global Electric Passenger Vehicle Sales and Stock, 2010–2024



Source: International Energy Agency

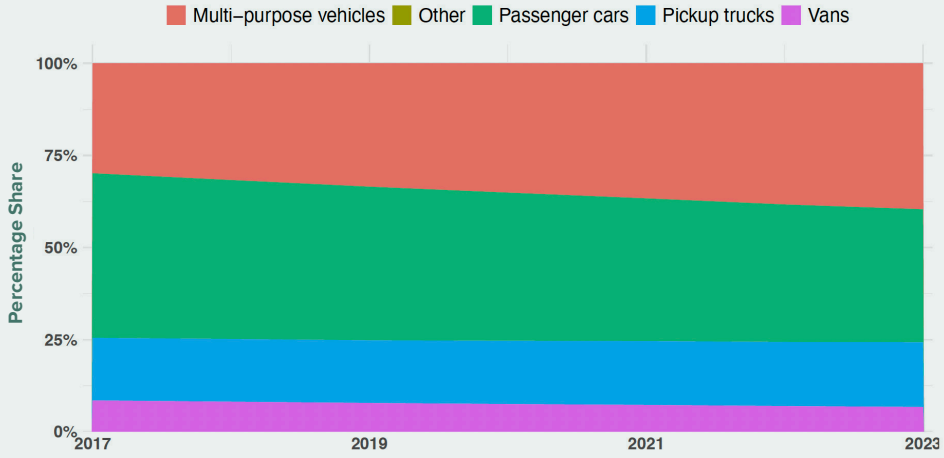
Figure 54 presents Canada's share of global EV sales and stock of vehicles climbed from under 0.5% in 2010 to roughly 2% of worldwide passenger-EV sales in 2018-19. Sales eased back to about 1.3% in 2023-24, with the stock share following the same path. This trajectory mirrors Canada's relatively small light-vehicle market and later introduction of national purchase incentives (iZEV in 2019). Canada's EV sales now sit almost exactly in line with its 1.3% share of global car sales and overall GDP.

Figure 55: Canada Gasoline Consumption and Kilometers Traveled (Cars), 2014–2021



Source: Statistics Canada, Natural Resources Canada

Figure 56: Canada Shares of Gasoline and Diesel Vehicle Registrations by Type, 2017–2023

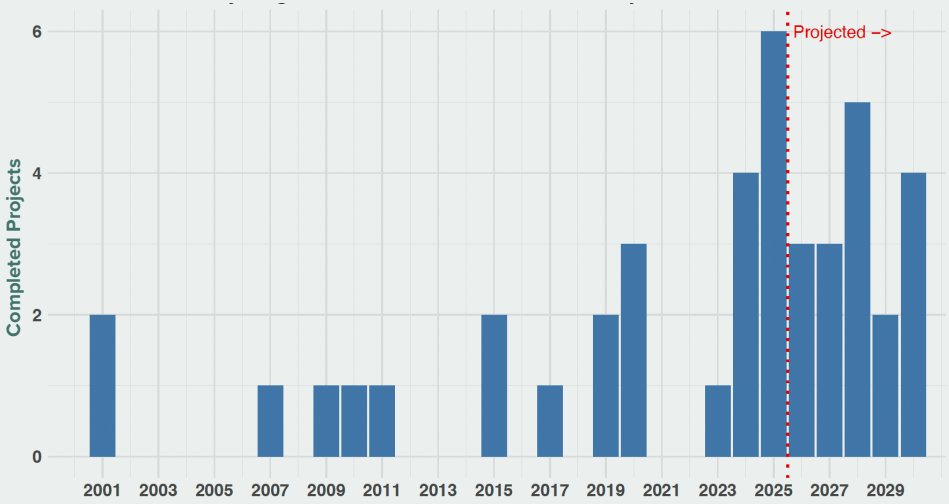


Source: Statistics Canada (23–10–0308–01)

Figures 55 and **56** illustrate how total gasoline sales and kilometers traveled by cars fell significantly throughout COVID. However, the trend pre-covid was one of worsening gas-efficiency total km/total gasoline sales notably as the Canadian passenger vehicle market has experienced growth in multi-purpose vehicles, such as SUVs, at the expense of passengers cars, which tend to be more fuel-efficient.

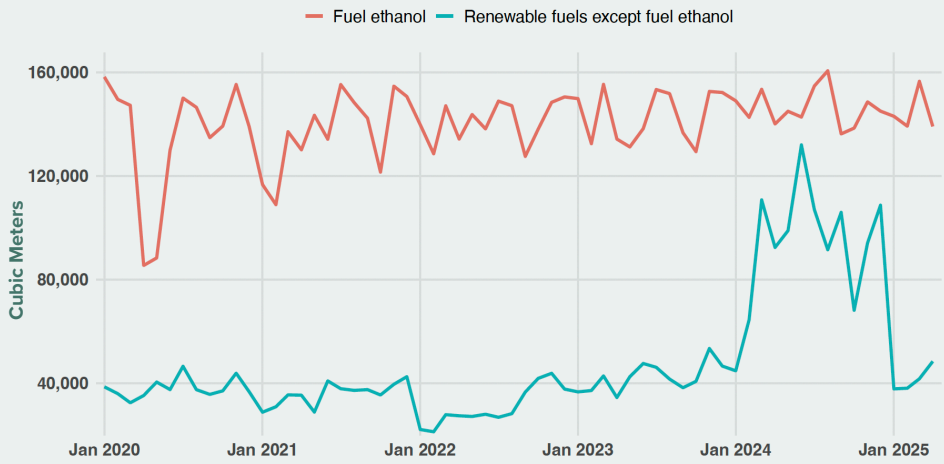
5. HYDROGEN AND RENEWABLE FUELS

Figure 57: Hydrogen Production Infrastructure Projects, 2001–2030



Source: IEA, Hydrogen Production and Infrastructure Projects Database, IEA, Paris

Figure 58: Monthly Renewable Fuel Production in Canada by Type, 2020–2025



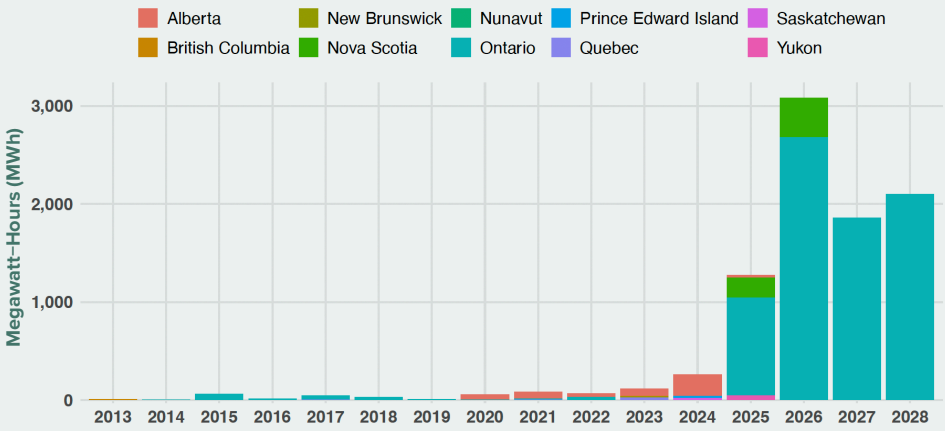
Source: Statistics Canada (25-10-0082-01)

Figure 57 shows the number of hydrogen production infrastructure projects developed or projected in Canada. According to the Hydrogen Strategy for Canada Progress Report from May 2024, there have been approximately 80 low-carbon hydrogen production projects announced.

In contrast to the hydrogen fuel market, **Figure 58** suggests that fuel ethanol is a mature market in Canada. Output hovers between 100,000 and 120,000 cubic meters a month reflecting the long-standing federal blend requirements and stable corn-ethanol capacity built since the late 2000s. Other renewable fuels—dominated by renewable diesel, biodiesel and sustainable aviation fuel—rise after mid-2023. The timing aligns with Ottawa's Clean Fuel Regulations (CFR), which started binding on gasoline and diesel suppliers in mid-2023, and with new provincial blend mandates (e.g., B.C. and Manitoba) that raise the floor for renewable-diesel content (Government of Canada, 2024b).

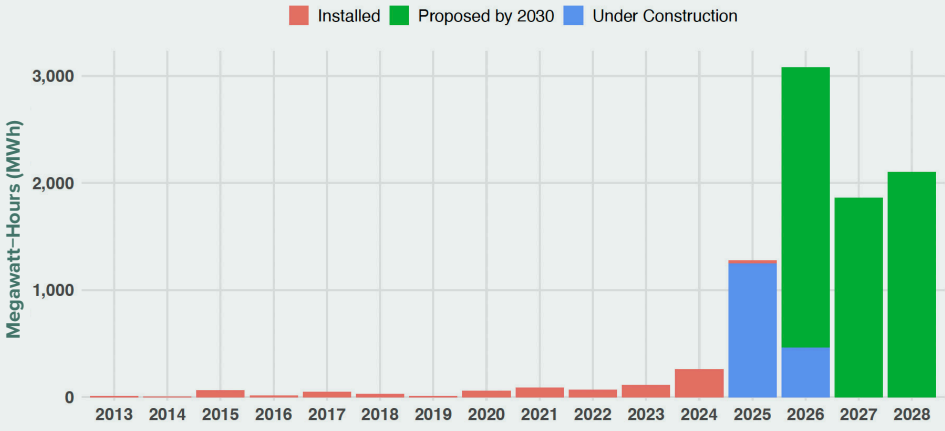
6. STORAGE AND BATTERY SUPPLY CHAIN

Figure 59: Canada Energy Storage Capacity by Commercial Operation Year and Province, 2013–2028



Source: Canada Energy Regulator

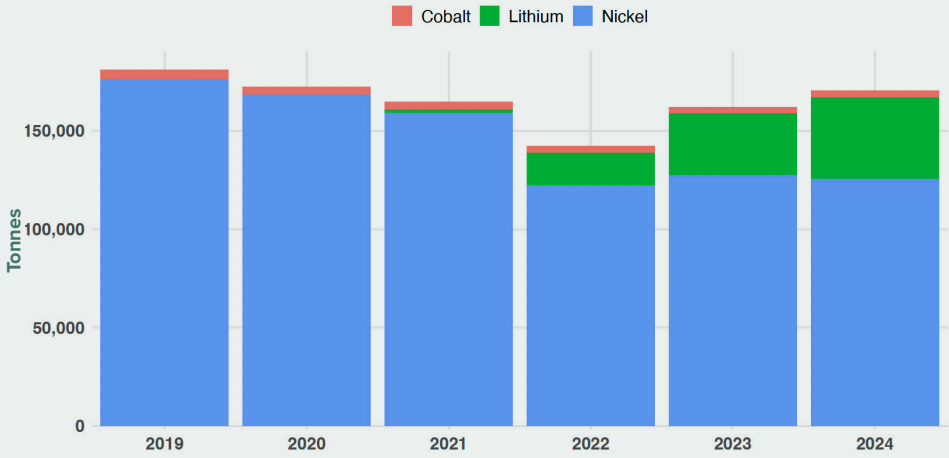
Figure 60: Canada Energy Storage Capacity by Commercial Operation Year and Project Status, 2013–2028



Source: Canada Energy Regulator

Figures 59 and **60** present the energy storage capacity added in Canada since 2013, based on the commercial operation year of storage projects. These are primarily battery energy storage systems projects. Projects are overwhelmingly grid-scale and designed to store excess energy. The majority of them are in Ontario, especially those planned for completion by 2030. Alberta also has a significant portion of installed storage facilities.

Figure 61: Canada Critical Mineral Production, 2019–2024

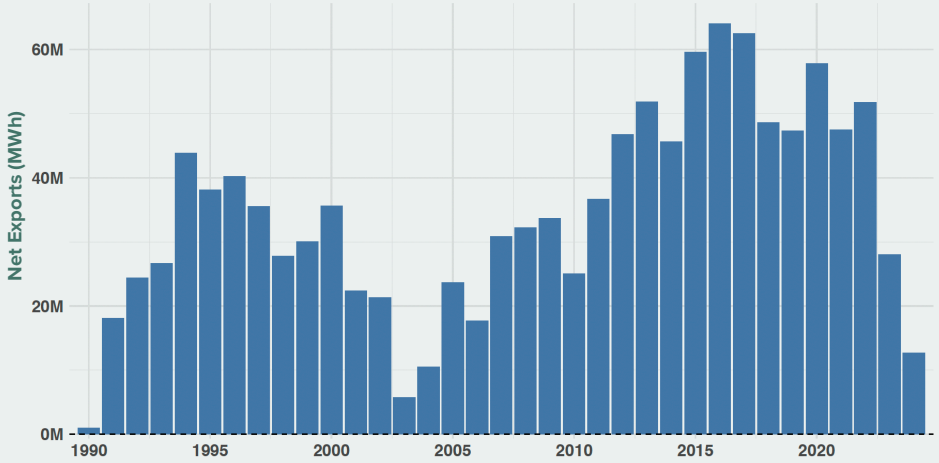


Source: Statistics Canada (16-10-0022-01)

Figure 61 demonstrates how nickel dominates Canada's battery-metal output, while cobalt and lithium have relatively smaller but growing volumes. Overall volumes are still modest compared with global leaders, but they are now rising with the $40 billion in EV- and battery-supply-chain investments announced since 2020 (Government of Canada, 2024a).

7. MACROECONOMIC AND INDUSTRIAL COMPETITIVENESS

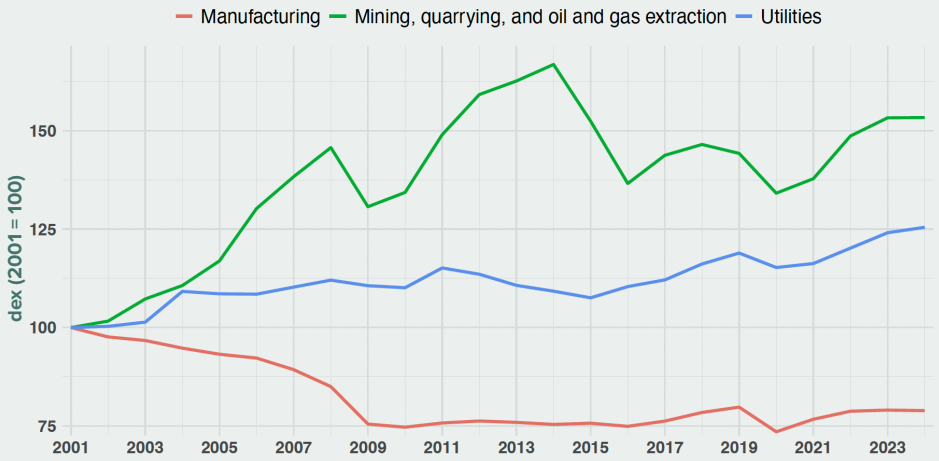
Figure 62: Canadian Net Electricity Exports, 1990–2024



Source: Government of Canada

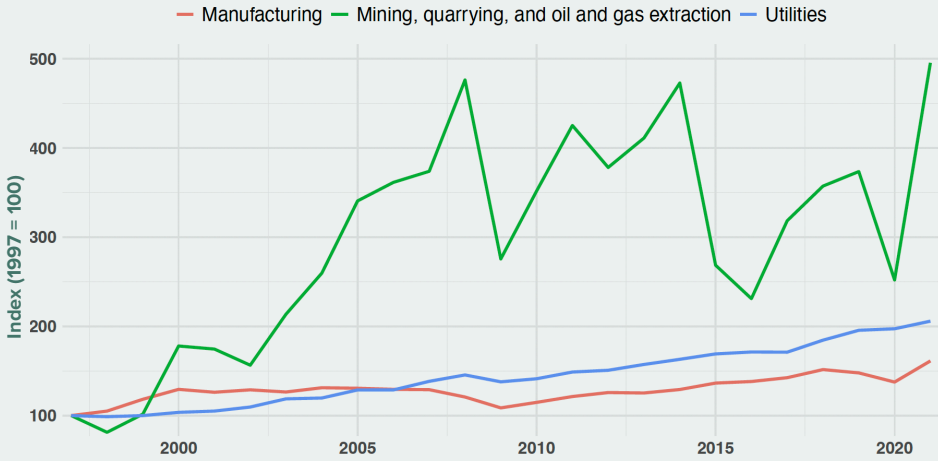
Hydro, wind, and nuclear continue to form the backbone of Canada's clean electricity generation, with growing contributions from solar. Given this mix, Canada remains a consistent net exporter of electricity, as shown in **Figure 62**.

Figure 63: Canadian Employment Trends by Sector, 2001–2024



Source: Statistics Canada

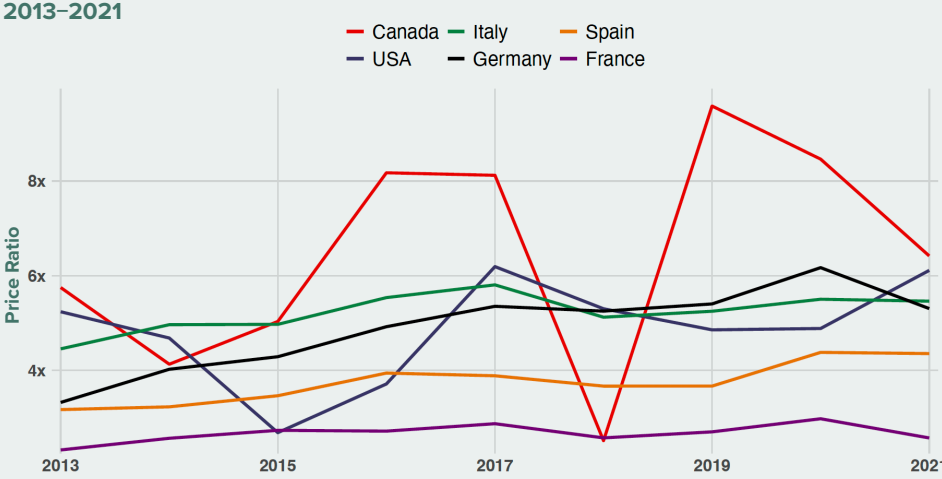
Figure 64: Canadian GDP at Basic Prices by Industry, 1997–2021



Source: Statistics Canada

Figures 63 and **64** show that employment in Canada's utilities and resource extraction sectors has risen over the past two decades, accompanied by higher output. Conversely, manufacturing employment has declined since the early 2000s, even as manufacturing output increased.

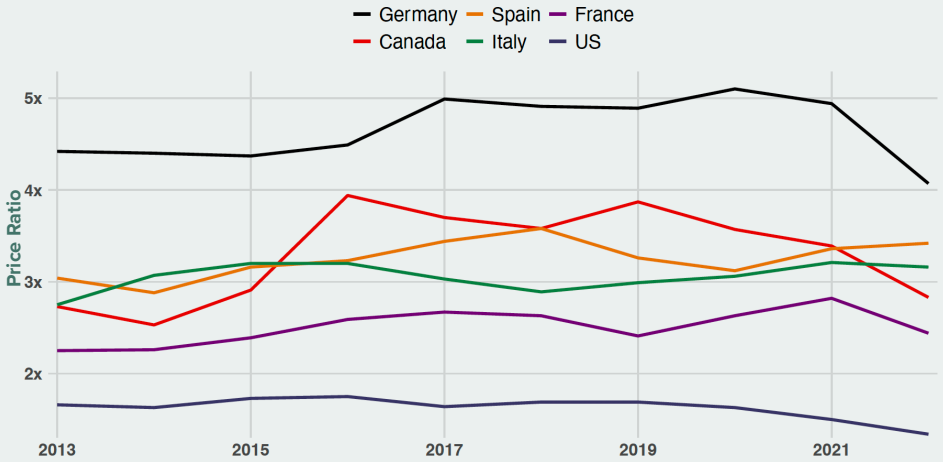
Figure 65: Ratio of Industrial Electricity Price to Gas Price (Average, per kWh), 2013–2021



Source: Federal Reserve Economic Data, Natural Resources Canada, Eurostat

Figure 65 shows the industrial electricity-to-gas price ratio has fluctuated considerably since 2013. From 2013 to 2017, Canada's ratio falls because its hydro-dominated generation kept industrial electricity tariffs flat. By 2021, the ratio rebounds as Canadian gas prices recovered amid post-pandemic market tightness and rising carbon levies. By contrast, most European countries—notably France, Italy, Germany and Spain—saw ratios holding relatively stable over 2013–21, reflecting higher industrial electricity tariffs driven by carbon levies, network charges and import-dependency.

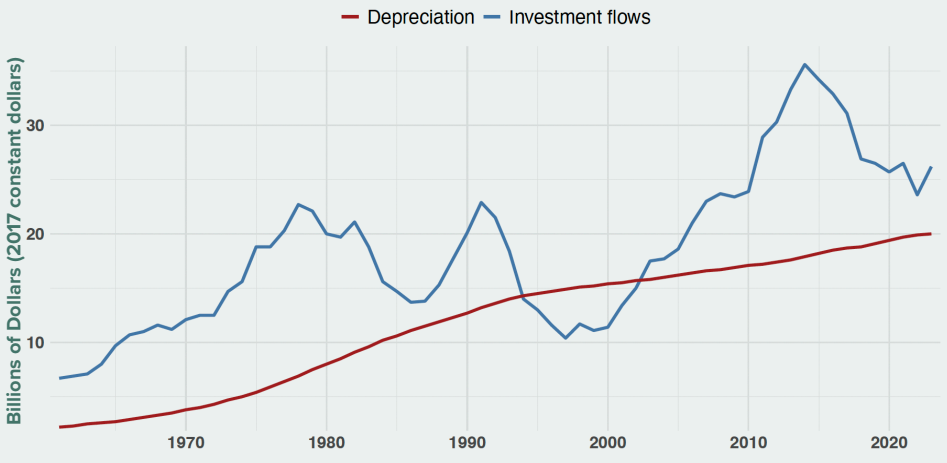
Figure 66: Ratio of Residential Electricity Price to Gas Price (Average, per kWh), 2013–2022



Source: Federal Reserve Economic Data, Natural Resources Canada, Eurostat

By contrast, as seen in **Figure 66**, the residential electricity-to-gas price ratio has remained relatively constant since 2013. Across all these markets the ratio's stability reflects the fact that both electricity and gas retail tariffs are adjusted through regular reviews, so that price movements tend to track each other closely over time.

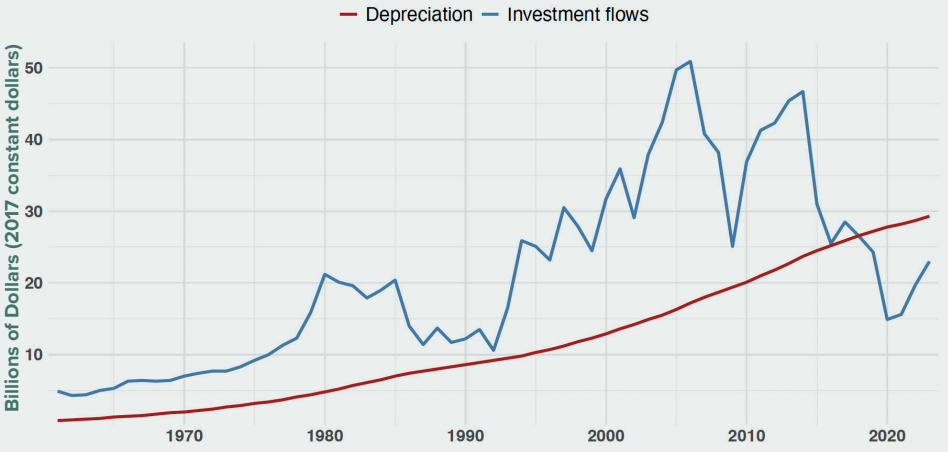
Figure 67: Investment and Depreciation in the Canadian Utilities Sector, 1961–2023



Source: Statistics Canada (36-10-0096-01)

Figure 67 shows a smooth climb in both gross investment and depreciation. Since the early-2000s, investment runs only slightly ahead of depreciation, signalling a regulated cost-of-service model in which provincially owned electricity and pipeline companies renew assets just fast enough to keep pace with depreciation while expanding hydro, wind and transmission capacity for decarbonization.

Figure 68: Investment and Depreciation in the Canadian Oil and Gas Extraction Sector, 1961–2023

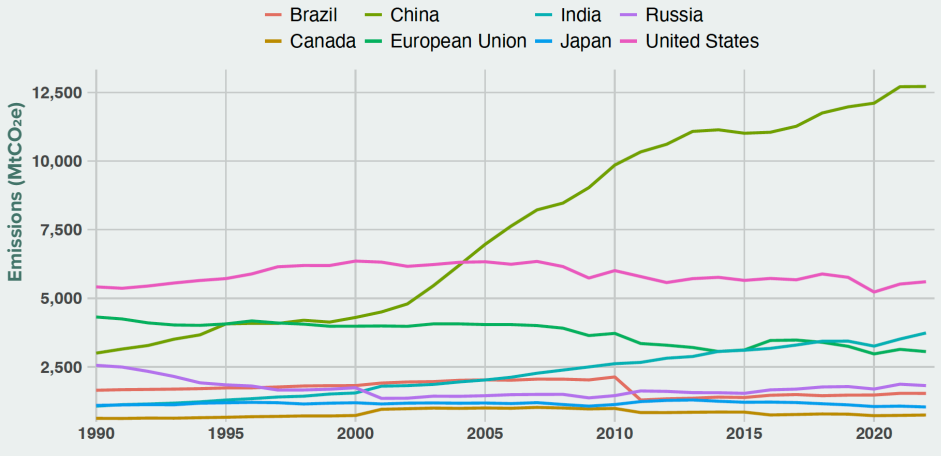


Source: Statistics Canada (36-10-0096-01)

Figure 68 demonstrates that investment surges during commodity booms (late-1970s, 2006-14 oilsands build-out) and declines after the 2014 oil-price crash and again in 2020. Total depreciation expense rise steadily, reflecting past capital stock.

8. EMISSIONS, CARBON CAPTURE AND INDUSTRIAL DECARBONIZATION

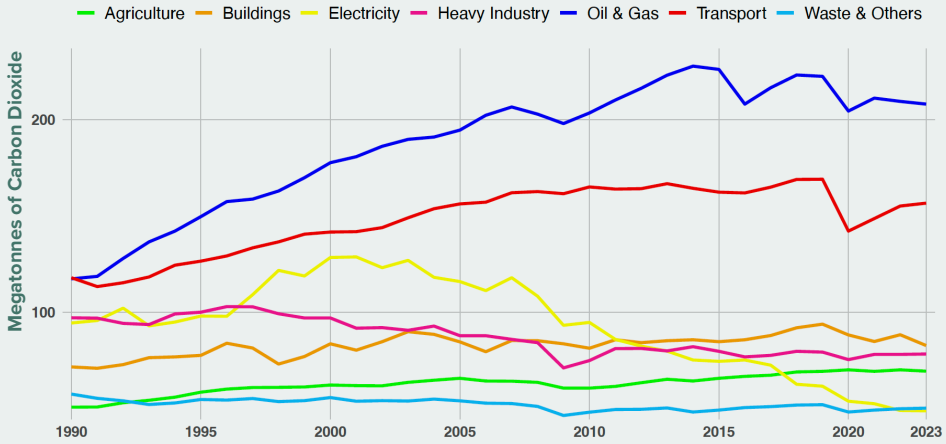
Figure 69: GHG Emissions from Energy by Country, 1990–2022



Source: Climate Watch Historical GHG Emissions

Figure 69 depicts energy-related greenhouse gas (GHG) emissions for key global emitters. Canada's emissions appear relatively stable over the period, with only modest reductions since 2005 — a trend consistent with gradual policy actions and industrial structure. In contrast, emissions from China and India have grown sharply due to rapid industrialization. The US and EU show long-term declines, primarily due to efficiency gains, fuel switching, and climate policies.

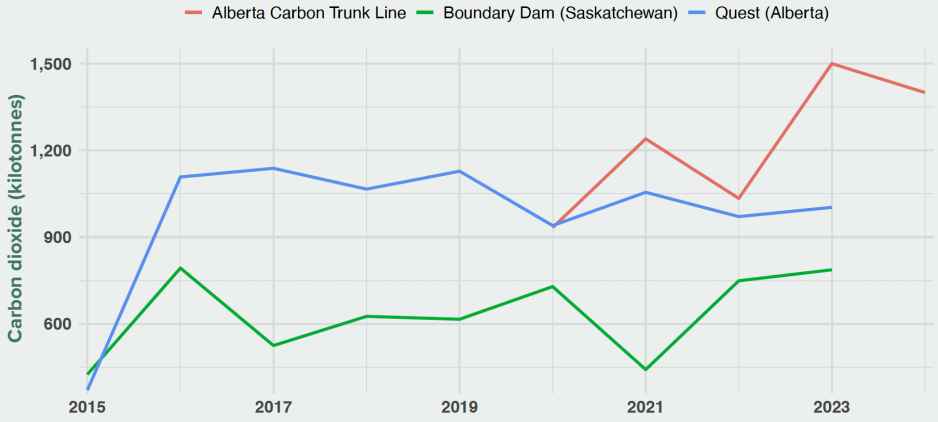
Figure 70: Canada GHG Emissions by Sector Over Time, 1990–2023



Source: Environment and Climate Change Canada (2025), Canadian Environmental Sustainability Indicators: Greenhouse Gas Emissions

Figure 70 shows data on Canadian GHG emissions by sector. This plot illustrates a steadily increasing trend (notwithstanding the decrease due to the pandemic). Overall, emissions caused by electricity have steadily declined. There is also a small decline in oil and gas emissions partially caused by improved process efficiency.

Figure 71: Annual Carbon Dioxide Injected at Three Canadian CCS Facilities, 2015–2024



Source: Alberta Government, Exchange Monitor, Saskatchewan Today, Canadian Energy Centre, Alberta Energy Regulator

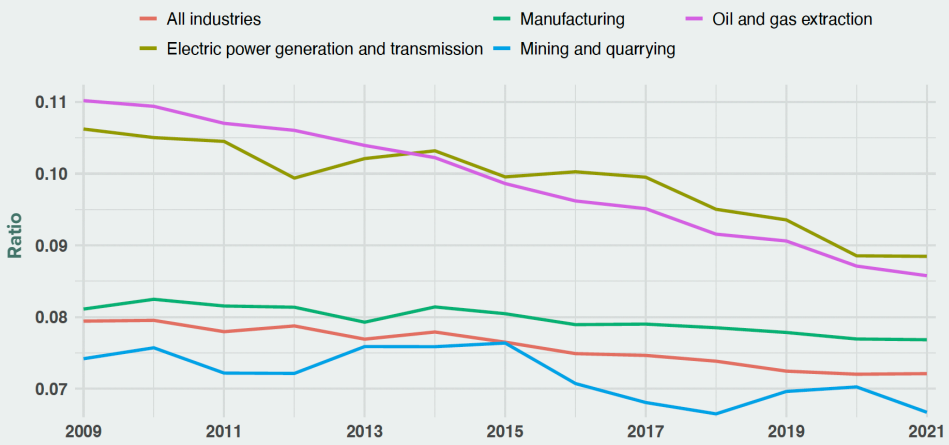
Figure 71 presents the annual carbon dioxide injected at three of the biggest Carbon Capture and Storage (CCS) facilities in Canada. Overall, the figure shows that this group of facilities reliably removes about 3-4Mt of carbon dioxide per year. This represents less than 1% of Canada's total GHG emissions.

The Quest CCS project is a facility located at Shell's Scotford Upgrader near Edmonton, Alberta. It captures and stores over one million tonnes of carbon dioxide annually from the upgrader's hydrogen manufacturing units (Shell Canada, 2025). Meanwhile, the Alberta Carbon Trunk Line project involves a 240km pipeline that transports captured carbon dioxide from industrial sources to enhanced oil recovery sites in central Alberta (Government of Alberta, 2025). Finally, the Boundary Dam Unit 3 CCS project was the world's first commercial-scale, lignite-fired power plant equipped with CCS, and has been operating since 2014 (Natural Resources Canada, 2025).

Another notable CCS project in Canada is the Weyburn-Midale Carbon Dioxide Project. Although there is no easily available annual data for the injection of carbon dioxide at this facility, between 2000 and 2016 the facility was said to have injected over 30,000 kilotonnes of carbon dioxide into the Weyburn and Midale oilfields (MIT, 2016).

Figure 72: Canada Emissions–to–Energy Use Ratio by Industry, 2009–2021

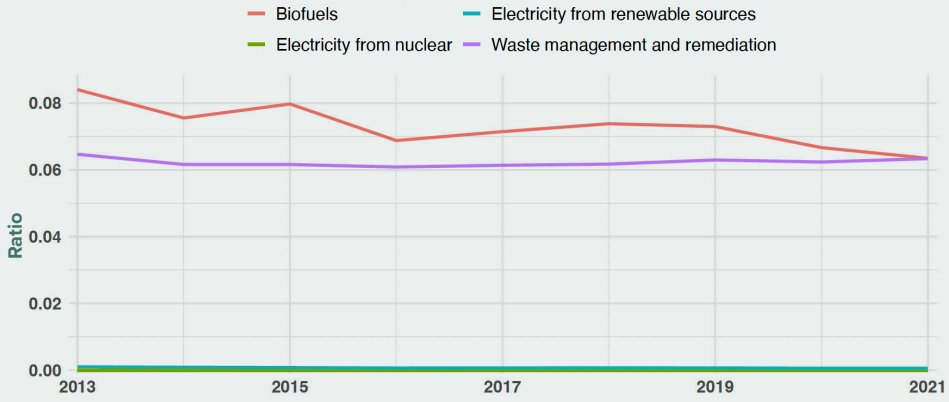
Gigajoules per $1,000 of output divided by Tonnes of GHG emissions per $1,000 of output



Source: Statistics Canada (38–10–0096–01)

Figure 73: Canada Emissions–to–Energy Use Ratio by Environmental and Clean Activity, 2013–2021

Terajoules of energy divided by Kilotonnes of GHG emissions



Source: Statistics Canada (38–10–0139–01)

Figure 72 shows a slow downward trend in the amount of emissions per unit of output across a range of high-polluting industries in Canada. The slow, steady gains on this panel suggest that traditional industries can chip away at carbon intensity through efficiency and incremental abatement, but deep cuts must come from fuel-switching—especially replacing fossil steam and process heat with clean electricity.

At the same time, **Figure 73** shows that nuclear and renewable electricity deliver three-to-four times more energy per tonne of GHG than biofuels and waste management, underscoring why continued grid-decarbonization is central to Canada's net-zero plans.

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