Country Analysis Brief: Canada

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Overview

Table 1. Canada's energy overview, 2022

	Crude oil and other petroleum liquids	Natural gas	Coal	Nuclear	Hydro	Other renewables	Total
Primary energy consumption (quads)	4.85	4.83	0.24	0.93	1.23	0.19	12.27
Primary energy consumption (percentage)	39.5%	39.4%	2.0%	7.6%	10.0%	1.6%	100.0%
Primary energy production (quads)	11.15	6.98	0.87	0.93	1.10	0.52	21.55
Primary energy production (percentage)	51.7%	32.4%	4.0%	4.3%	5.1%	2.4%	100.0%
Electricity generation (terawatthours)	4.44	68.61	36.83	82.30	392.35	53.46	638.00
Electricity generation (percentage)	0.7%	10.8%	5.8%	12.9%	61.5%	8.4%	100.0%

Data source: U.S. Energy Information Administration, International Energy Statistics; the International Energy Agency, *World Energy Statistics 2022*; and Energy Institute, *Statistical Review of World Energy 2023*
Note: *Other renewables* contain solar, wind, and biomass and waste. Quads=quadrillion British thermal units

- Canada is a major energy producer, consumer, and exporter with a diverse and dynamic energy sector. Historically, hydroelectric power dominated Canada's energy mix, but oil and natural gas production have grown. The majority of Canada's oil and natural gas output is in Alberta; in contrast, hydroelectric and renewable energy make up a larger share of energy output in Quebec and British Columbia.
- Primary energy production in Canada grew at an average annual rate of 2.6% between 2012 and 2022; Canada's share increased from 3.2% to 3.6% of total global energy production.[1] Crude oil production followed by natural gas production mainly drove this growth. By 2022, oil production accounted for 51.7% of Canada's total energy production, followed by natural gas at 32.4% (Table 1). As of 2022, Canada was the world's sixth-largest energy producer.
- Canada's energy consumption has remained stable despite inflation-adjusted GDP per capita growth, mainly because of improvements in energy efficiency (Figure 3). Between 2012 and 2022, natural gas use increased at an annual growth rate of 2.6%, making it the primary source of energy with the largest growth contribution.
- According to the Canadian Centre for Energy Information (CCEI), the energy sector contributes significantly to government revenues. Between 2017 and 2021, the energy sector accounted for 4.6% of total industry tax revenue. The oil and natural gas extraction industry accounts for about 83% of government petroleum-related revenues.

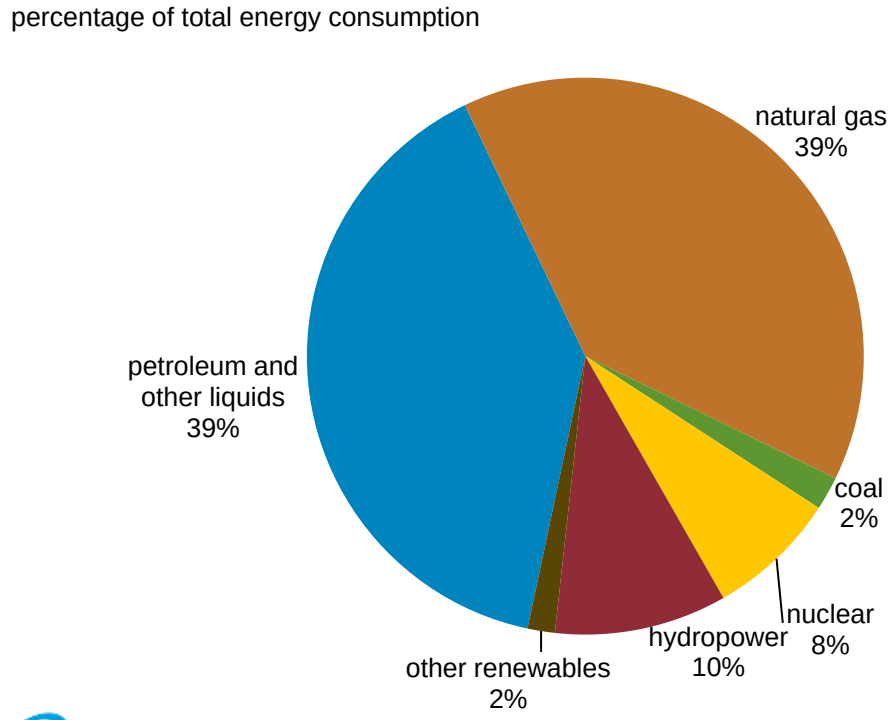
In 2022, the combination of rising oil and natural gas prices and higher production volumes contributed to the overall increase in revenue for the oil and natural gas extraction industry.[2, 3] According to CCEI, Canada's energy sector accounted for approximately 11.8% of the nominal gross domestic product (GDP) and approximately 3.5% of total employment in 2022.[4]

- Canada's distribution bottlenecks hinder crude oil flow outside the domestic refining market, including to refiners on the U.S. Gulf Coast. The Trans Mountain Expansion (TMX) Project on the Trans Mountain Pipeline aims to increase Canada's crude oil exports to the worldwide market through Pacific coast ports. The expansion will more or less triple the pipeline's present capacity of 300,000 barrels per day (b/d) for transporting crude oil from Alberta's oil sands to Canada's Pacific coast, where it will be exported to markets in Asia or the United States. The TMX pipeline began operations in May 2024.[5, 6, 7]
- Canada has many policy measures to support the transition to lower carbon fuels, including carbon pricing, clean fuel regulations, coal phaseout, nuclear power plant expansion, methane regulations, energy-efficiency programs, and the decarbonization of the transportation sector.[8] Canada's energy-related carbon dioxide (CO_2) emissions from oil and coal consumption have declined, while natural gas has increased between 2012 and 2022 (Figure 5).[9] However, as of 2022, oil remains the largest source of energy-related CO_2 emissions with 51% of the total. In December 2023, Canada's government proposed a cap-and-trade system to reduce greenhouse gas emissions in the oil and natural gas sector to achieve net-zero emissions by 2050. If signed into law, the cap-and-trade system would be implemented in 2030, limiting emissions to between 131 metric tons (mt) of CO_2 equivalent per year and 137 mt of CO_2 equivalent per year, down from 171 mt of CO_2 equivalent per year in 2019.[10]

Figure 1. Map of Canada

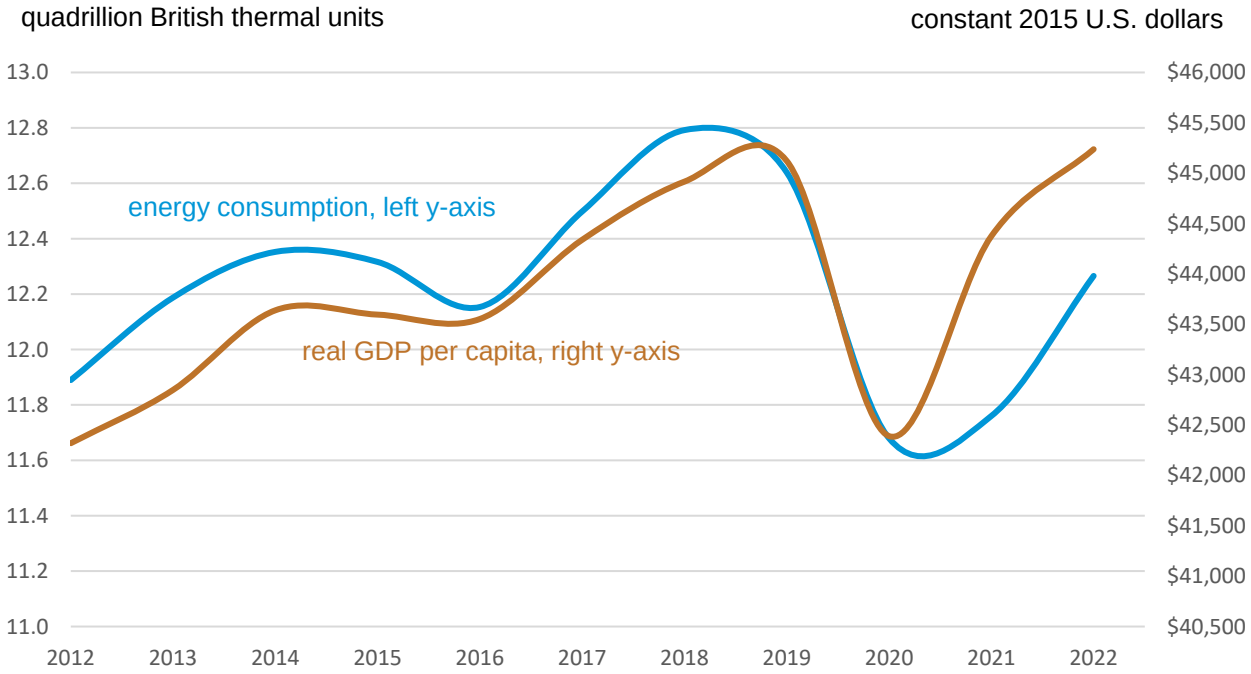
Data source: U.S. Central Intelligence Agency, CIA World Factbook—Canada

Figure 2. Canada's total energy consumption by fuel type, 2022



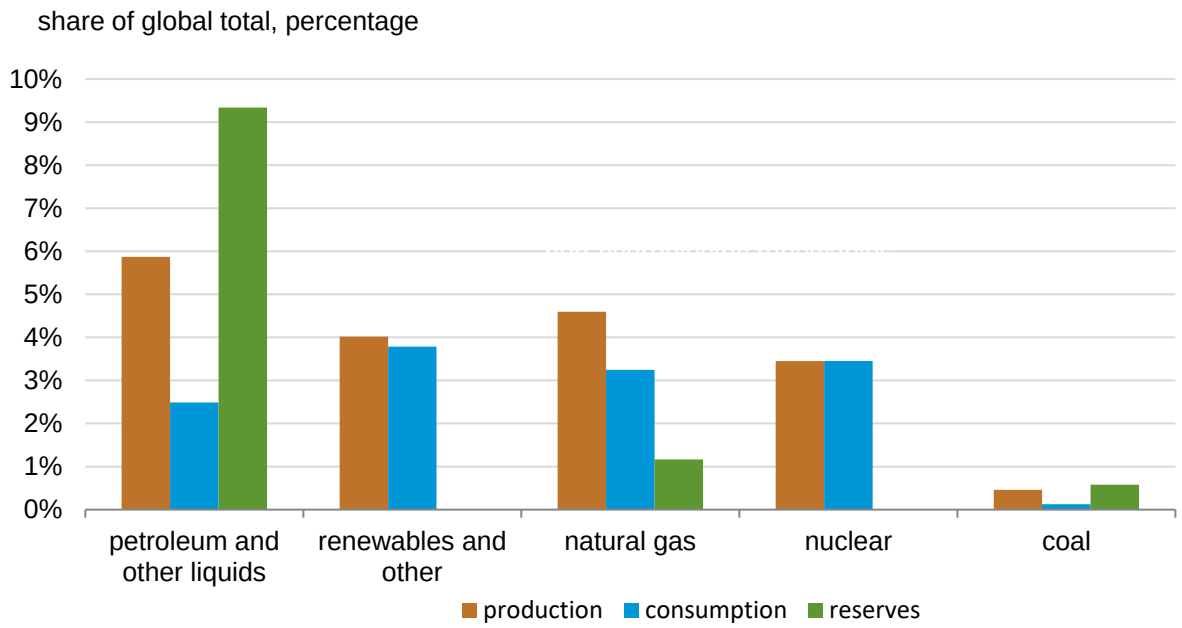
Data source: U.S. Energy Information Administration, International Energy Statistics; Energy Institute, *Statistical Review of World Energy 2023*

Figure 3. Canada's total energy consumption and inflation-adjusted GDP per capita, 2012–2022



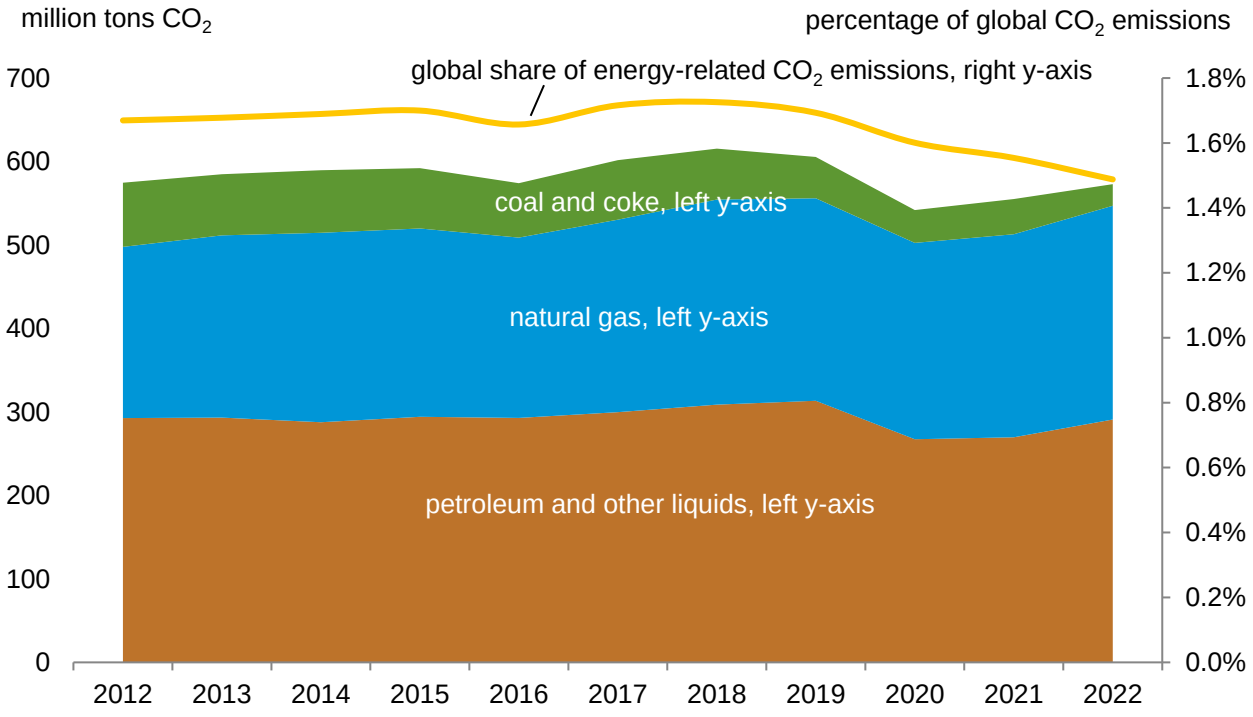
Data source: U.S. Energy Information Administration, International Energy Statistics; World Bank, *World Development Indicators*

Figure 4. Canada's energy production, consumption, and reserves, by source, 2022



Data source: U.S. Energy Information Administration, International Energy Statistics
Note: *Renewables and other* contain hydropower, geothermal, tide, wave, fuel cell, solar, wind, and biomass and waste.

Figure 5. Canada's energy-related CO_2 emissions, 2012–2022



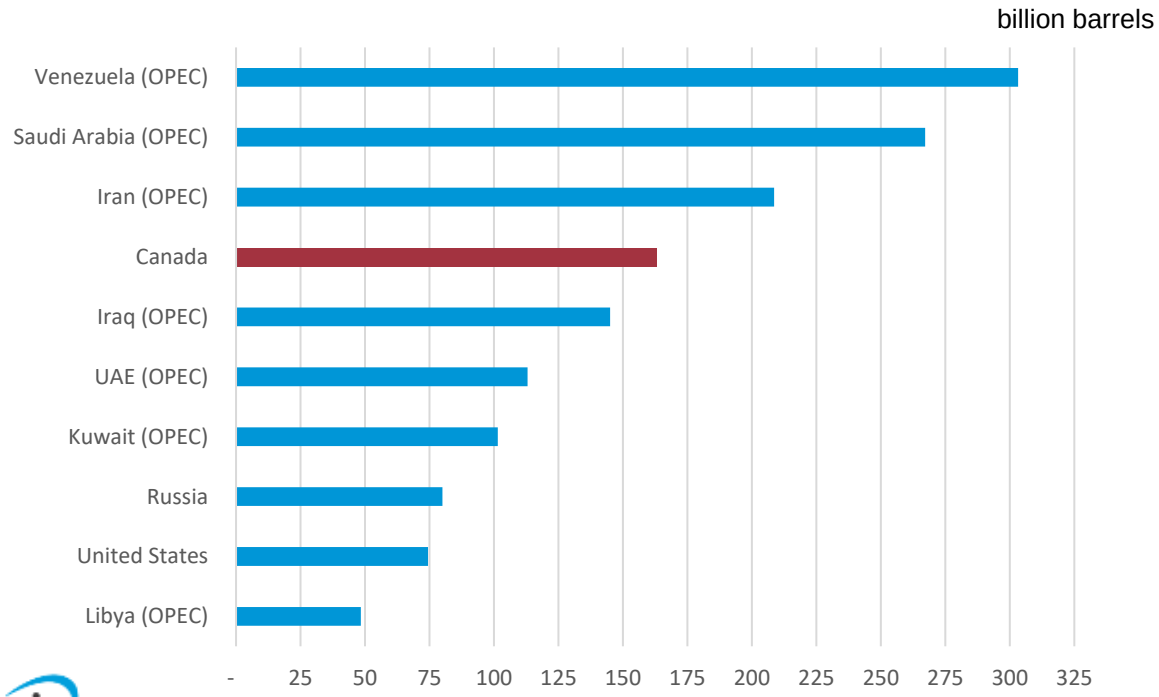
Data source: U.S. Energy Information Administration, International Energy Statistics

Petroleum and Other Liquids

- Canada had proved oil reserves of 163 billion barrels as of January 2024, ranking fourth in the world behind Venezuela, Saudi Arabia, and Iran (Figure 6).[11] Oil sands account for 97% of the country's total oil reserves.[12] These large deposits are spread across three regions in Alberta and Saskatchewan: Athabasca, Peace River, and Cold Lake.
- In 2023, Canada was the world's fourth-largest petroleum and other liquids producer and was a liquid fuels net exporter. Nearly all of Canada's energy exports are destined for the United States. Many U.S. refineries are configured to process heavy oils like those produced in Canada's oil sands.
- In 2023, 5.8 million b/d of petroleum and other liquid fuels were produced in Canada, growing at an average annual rate of 3.8% between 2013 and 2023. Crude oil (including condensate) contributed 2.9% to the growth, and the remaining 0.9% growth was from natural gas liquids (NGLs). Liquid fuels production in Canada has increased because of increasing production from Alberta's oil sands and upgraded synthetic crude oil.[13] Approximately 83% of crude oil production in Canada in 2022 originated in Alberta. In 2022, oil sands production accounted for 65% of total crude oil production, and conventional, offshore, and tight oil accounted for the remaining 35%.[14]
- Offshore production in Canada is concentrated in the eastern provinces and accounts for less than 5% of total production. Severe weather and difficult deep-water conditions have hampered the progress of three projects in Newfoundland, Labrador, and Nova Scotia. These challenges exacerbate both technical difficulties and exploration and production costs.
- Western Canadian Sedimentary Basin (WCSB) producers have traditionally focused on natural gas production, but because of a lack of midstream infrastructure and export capacity, the focus has shifted to producing liquid fuels for use as domestic diluents in nearby oil sands projects. Alberta's extra-heavy crude oil must be mixed with lighter liquids, such as plant condensate or pentanes before it can flow through pipelines and reach downstream facilities.
- Canada's petroleum and other liquids consumption was 2.5 million b/d in 2023, of which 32% was motor gasoline, 24% was distillate fuel oil, and 7% was liquefied petroleum gases. The main petroleum and other liquids consuming sectors were transportation (60%), non-energy use (24%), and industry (7%).
- Pipelines account for 88% of the crude oil transportation modes. The Canadian Energy Regulator (CER) regulates Canada's pipelines. Canada's oil operating capacity is 4.3 million b/d as of 2021. Canada's pipelines transport crude oil from the western provinces to refineries in the United States and Quebec and Ontario and to export terminals. Four primary crude oil export pipelines are in Western Canada: Enbridge Canada Main Pipeline, Keystone Pipeline, Trans Mountain Pipeline, and Express Pipeline. Together, these pipelines can ship 96% of all withdrawals from the WCSB. Enbridge Canadian Mainline, which is owned by Enbridge Pipelines Inc., accounts for approximately 58% of all Canada's oil exports.[15, 16, 17]
- As of 2023, Canada had 14 refineries and a nameplate crude oil processing capacity of 1.7 million b/d (Table 2). These refineries process crude oil into various products, such as gasoline, diesel, and home heating oil, that are essential for transportation and heating. The refineries are in six provinces, and the largest concentrations are in Alberta and Ontario, which account for 49% of the total capacity. Most of the crude oil is refined into motor gasoline and diesel fuel.[18, 19]

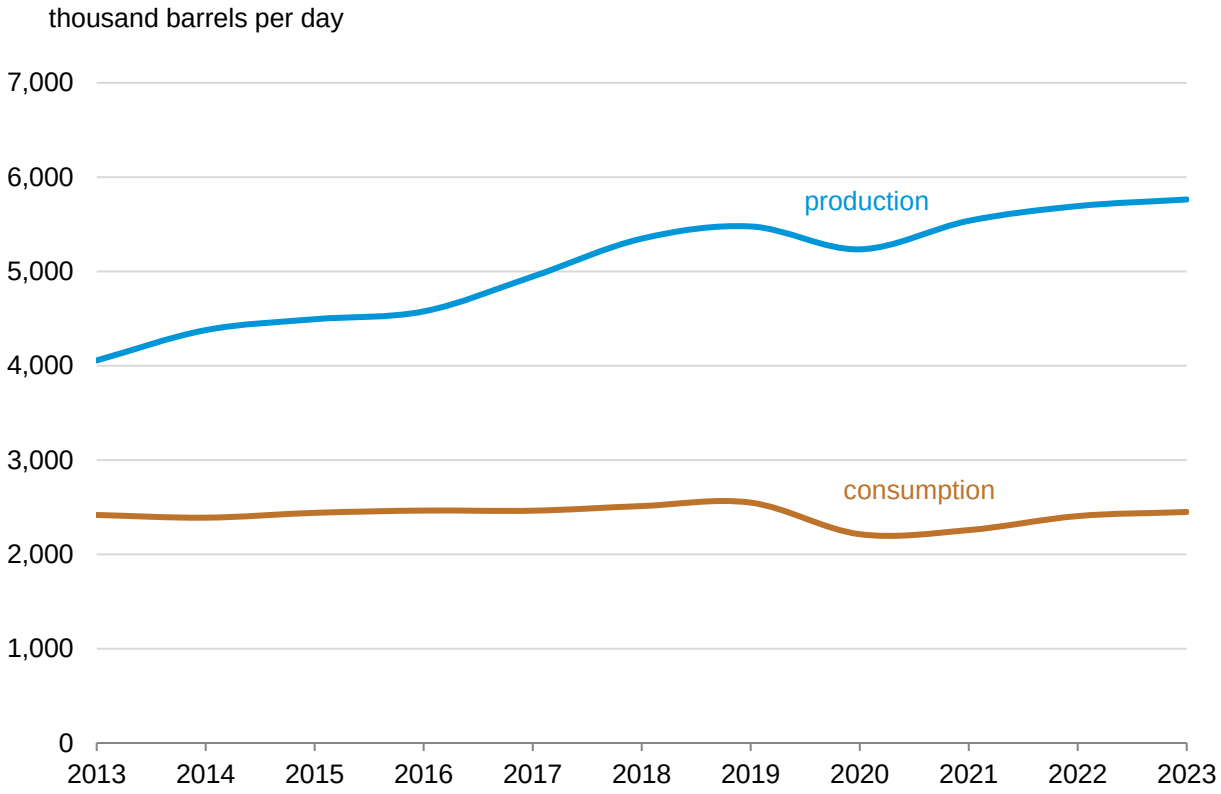
- Canada’s refineries supply petroleum to domestic and export markets, and the United States is the main destination for Canada’s refined products. In Canada, more crude oil is produced than refined domestically, but it imported an average 57% of its total crude oil trade between 2019 and 2023 because eastern refineries are not connected to domestic crude oil production supplies.[20] The nine refineries in Western Canada have a combined capacity of 653,000 b/d, or 38% of Canada’s total nameplate refining capacity.
- Oil sands are a mixture of sand, water, and bitumen. Bitumen is a crude oil extracted from the ground that is too thick to transport via pipelines. Bitumen can be either upgraded into a lighter synthetic crude oil or diluted with light hydrocarbon condensate, which is referred to as diluted bitumen or *dilbit*.[21]
- Upgraders are partial refiners that convert the residue of the bitumen and remove all the sulfur, making the synthetic crude oil easier to process. This process makes it ideal for less sophisticated refineries, like those in Canada. About half of the synthetic crude oil produced in Alberta is sold domestically, and the rest is exported to the United States.[22]
- Dilbit contains around 60% bitumen, which produces a lot of residue during distillation. Dilbit refineries require a lot of residue conversion capacity, which Canada's refineries do not have. As a result, nearly 95% of Alberta's dilbit is exported to the United States, leaving very little dilbit to be used in Canada.[23]

Figure 6. Canada’s crude oil proved reserves ranking, 2023



Data source: *Oil & Gas Journal*, 2023 Worldwide Reserves and Production

Figure 7. Canada's total petroleum and other liquids production and consumption, 2013–2023



Data source: U.S. Energy Information Administration, International Energy Statistics

Table 2. Canada's oil refineries, 2023

Refinery	Operator	Nameplate crude oil distillation capacity (thousand barrels per day)	Location
Saint John Refinery	Irving Oil Ltd.	320	Saint John, New Brunswick
The Jean Gaulin Refinery	Valero Energy Corp.	219	Levis, Quebec
Strathcona Refinery	Imperial Oil Ltd.	186	Strathcona, Alberta
Edmonton Refinery	Suncor Energy Inc.	146	Edmonton, Alberta
Montreal Refinery	Suncor Energy Inc.	137	Montreal, Quebec
Co-op Refinery Complex	Federated Co-operatives Limited	130	Regina, Saskatchewan
Sarnia Refinery	Imperial Oil Ltd.	113	Sarnia, Ontario
Nanticoke Refinery	Imperial Oil Ltd.	107	Nanticoke, Ontario
Scotford Refinery	Shell Canada Ltd.	95	Scotford, Alberta
Sarnia Refinery	Suncor Energy Inc.	85	Sarnia, Ontario
Corunna Refinery	Shell Canada Ltd.	81	Sarnia, Ontario

Burnaby Refinery	Parkland Fuel Corp.	55	Burnaby, British Columbia
The Cenovus Lloydminster Refinery	Husky Energy Inc.	29	Lloydminster, Alberta
Prince George Refinery	Tidewater Midstream & Infrastructure Ltd.	12	Prince George, British Columbia
Total		**1,715**	

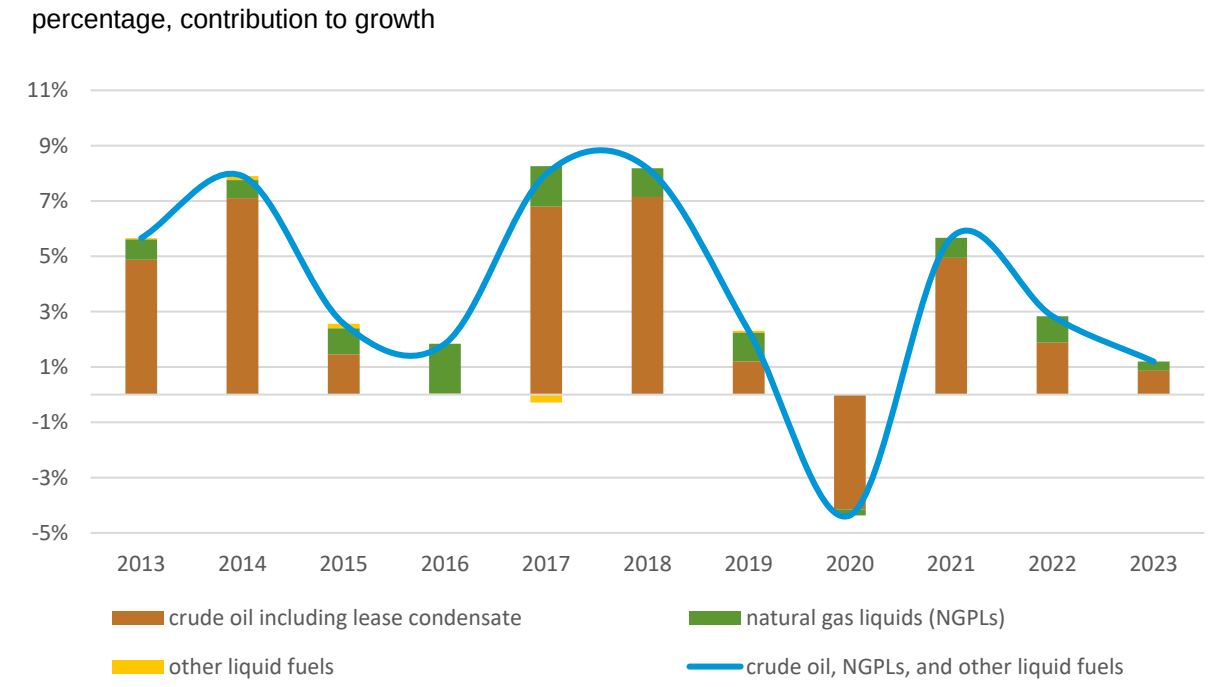
Data source: *Oil & Gas Journal,* 2023 Worldwide Refining Survey

Table 3. Canada's operating oil pipelines, 2021

Name	Operator	Capacity (thousand barrels per day)
Enbridge Canadian Mainline	Enbridge Inc	2,890
Keystone Pipeline	TC Energy	591
Express Pipeline	Express Pipeline LLC	310
Trans Mountain Pipeline	Trans Mountain Corporation (TMC)	300
Milk River Pipeline	Inter Pipeline Ltd. (IPL)	98
Aurora Pipeline	Aurora Pipeline Company Ltd.	45
Wascana Pipeline	Plains Midstream Canada ULC (PMC)	40
Total		**4,274**

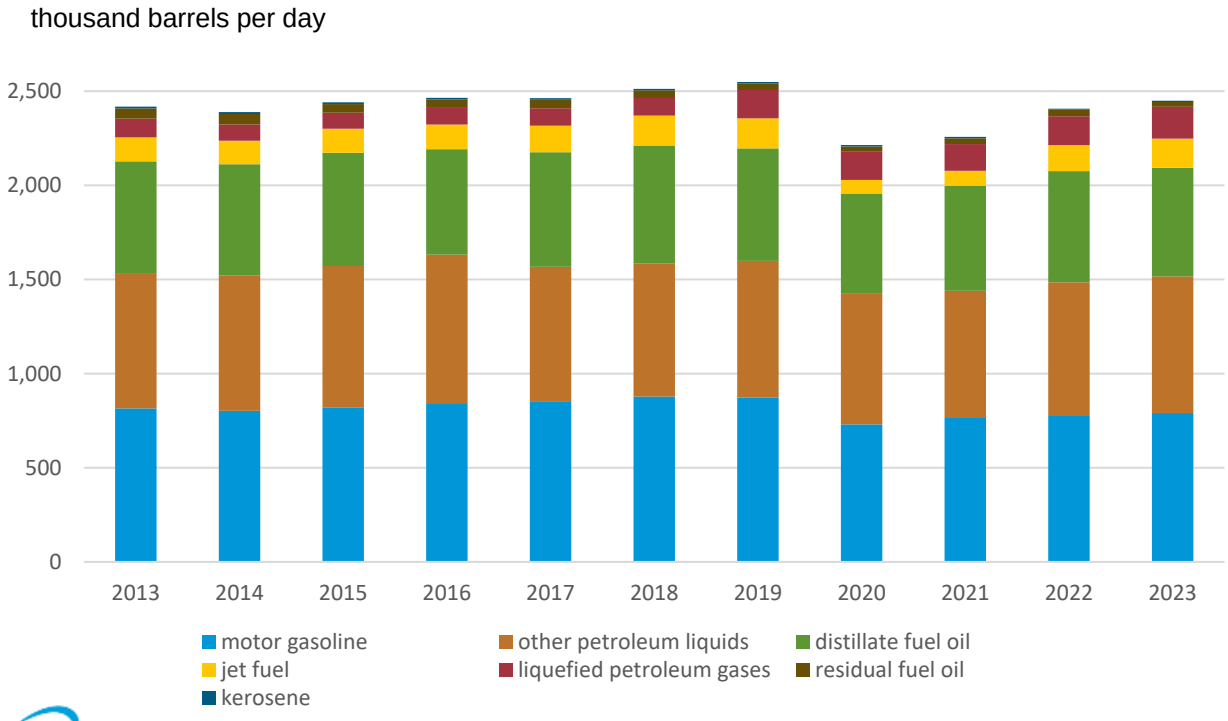
Data source: Canada Energy Regulator—REGDOCS

Figure 8. Canada's petroleum and other liquids production growth, year-over-year, 2013–2023



Data source: U.S. Energy Information Administration, International Energy Statistics

Figure 9. Canada's refined petroleum products consumption, 2013–2023

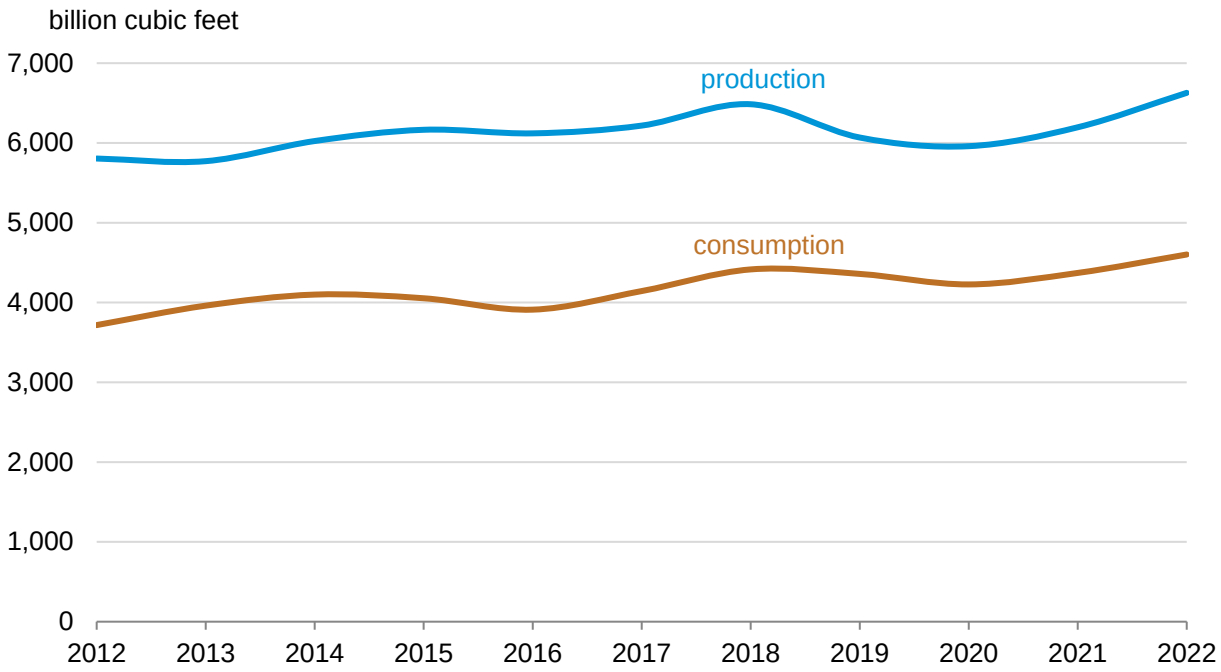


Data source: U.S. Energy Information Administration, International Energy Statistics

Natural Gas and LNG

- Canada's proved natural gas reserves are estimated to be 87 trillion cubic feet (Tcf) as of January 2024.[24] Most of these reserves are found in the Western Canadian Sedimentary Basin (WCSB). Natural gas reserves are also present in other regions of Canada, such as offshore fields off the eastern coast of Newfoundland and Nova Scotia, the Arctic region, and the Pacific coast. In March 2016, the Canadian Energy Regulator published a study on the Liard Basin located in northwest Canada that spans the borders of British Columbia, Yukon, and the Northwest Territories. The study found that it contains 219 Tcf of marketable unconventional natural gas, making it the world's ninth-largest shale gas resource.
- Canada is the world's fifth-largest natural gas producer, following the United States, Russia, Iran, China, and Qatar, and produced 6.6 Tcf of dry natural gas in 2022.[25] Most natural gas production in Canada takes place in the WCSB, mainly concentrated in British Columbia and Alberta, which accounted for 98.7% of the total output in 2022.
- Natural gas production in Canada increased from 5.8 Tcf in 2012 to 6.6 Tcf in 2022, despite a decline in the number of wells drilled. The productivity of individual wells increased because of technological advancements in horizontal drilling and hydraulic fracturing.[26]
- Natural gas consumption in Canada has increased by an average of 2% per year between 2012 and 2022. Natural gas consumption was 4.6 Tcf in 2022; 32% was used by industry, 27% by residential customers, and 26% by commercial and public services. Natural gas consumption is highest in Alberta (44%), followed by Ontario (30%), and British Columbia (BC) (9%).[27]
- Canada currently has eight LNG export projects in different stages of development. Together, these projects have a potential production capacity of 2.5 Tcf of LNG. Although most export projects are in British Columbia, one export project has been proposed that includes Newfoundland and Labrador. Canada also has four LNG liquefaction plants and two LNG import plants that serve the domestic market, although most of them operate at low volumes. LNG Canada in Kitimat (BC) is set to become Canada's first large-scale LNG export facility, and it has a target to start exporting by 2025. Most of the other projects will begin operations between 2027 and 2030.[28]
- The NOVA Inventory Transfer (NIT) is a pricing point for natural gas produced in the WCSB. It's a trading hub in Alberta linked to several export markets and storage facilities. Other reference points include Dawn, Ontario, and Station 2 on the Enbridge BC Pipeline. The Canada Energy Regulator (CER) has approved many natural gas pipeline projects in the last five years, including Nova Gas Transmission Ltd. System's projects to add capacity in key areas. Westcoast Energy has also proposed upgrades to its Enbridge BC Pipeline because of growing BC production. In late October 2023, TC Energy announced that it had completed construction of the Coastal GasLink earlier that month.[29, 30]
- New natural gas-fired power plants in Canada are replacing coal-fired plants. The Canadian government has pledged to phase out coal use for power generation by 2030. In its place, 18 natural gas-fired facilities are in the planning and approval stages, and four are currently under construction. These facilities include the Suncor Oilsands Cogeneration Base Plant with a power generation capacity of 800 megawatts (MW), ATCO Strathcona Cogeneration Plant in Alberta (116 MW), and the Great Plains Power Station in Saskatchewan (360 MW).

Figure 10. Canada's dry natural gas production and consumption, 2012–2022



Data source: U.S. Energy Information Administration, International Energy Statistics

Table 4. Canada's operating natural gas pipelines, 2020

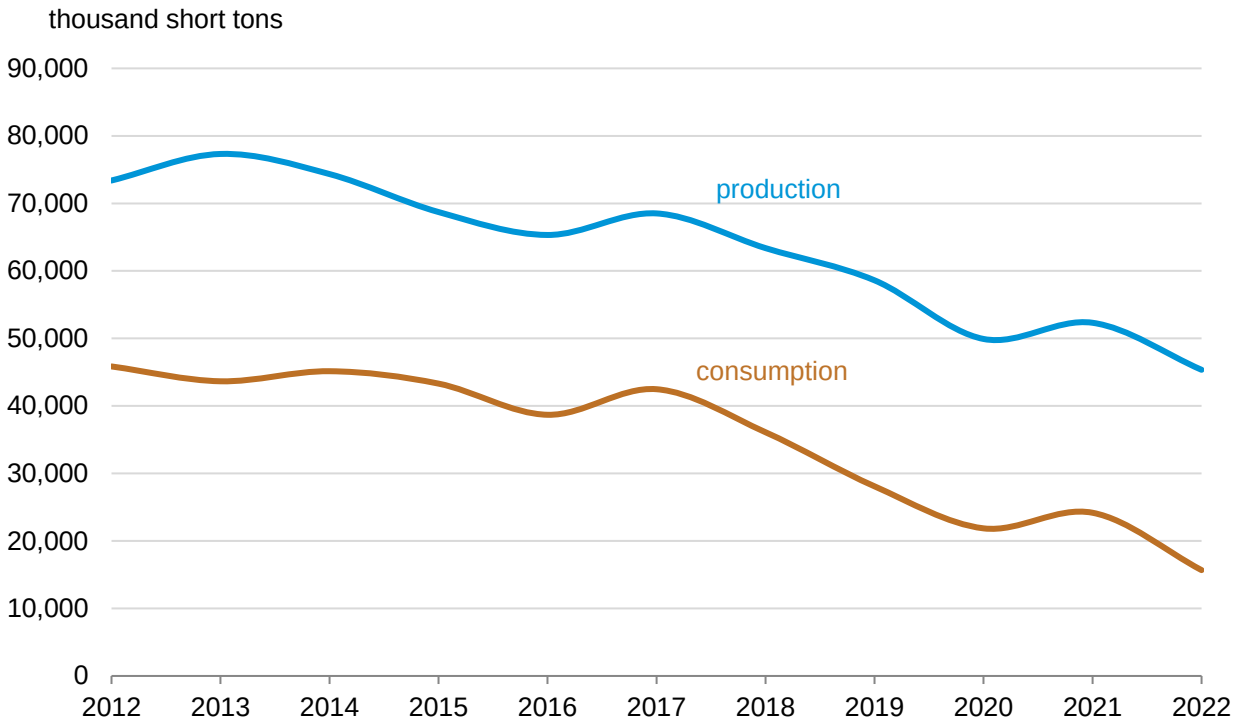
Name	Capacity utilization (percentage)	Capacity (billion cubic feet per day)
NGTL System—Upstream of James River—Intra-Canada	88%	11.2
TC Canadian Mainline—Prairies—Intra-Canada	47%	6.2
Foothills System—Kingsgate—Export	78%	2.9
NGTL System—West Gate—Intra-Canada	89%	2.8
Foothills System—Monchy—Export	26%	2.2
Alliance Pipeline—Border—Export	82%	1.6
Enbridge BC Pipeline—Huntingdon—Export	53%	1.6
TC Canadian Mainline—Iroquois—Export	29%	1.2
TC Canadian Mainline—Niagara—Import	95%	0.7
M&NP Pipeline—St. Stephen—Import	34%	0.5
Total		**30.9**

Data source: Canada Energy Regulator—Pipeline Profiles

Coal

- Canada’s large coal reserves totaled 7.3 billion short tons in 2021.[31] The majority of the reserves consist of anthracite and bituminous coal. The rest of the reserves are subbituminous and lignite. More than 90% of Canada's coal reserves are in the western provinces, which provides a strategic advantage because of its proximity to West Coast ports for export.[32]
- Because the national electricity grid has reduced its coal use, Canada's overall coal production has also declined, reaching 45.4 million short tons in 2021, compared with a peak of 86.7 million short tons in 1997. Metallurgical coal, used for steel manufacturing, accounted for 61% of Canada’s coal production in 2022.[33] British Columbia produces 57% of the coal in Canada, followed by Alberta (25%) and Saskatchewan (17%).[34]
- As of 2022, Canada’s coal accounts for 4% of the country’s total energy supply and 2% of total consumption, making Canada a net exporter of coal (Table 1). Canada’s exports are primarily metallurgical coal. Lignite coal, used to generate electricity, accounted for 45% of Canada’s coal consumption in 2022, mostly for electricity generation in Alberta and Saskatchewan.[35]
- In 2022, Nova Scotia, New Brunswick, Saskatchewan, and Alberta were still using thermal coal plants to generate electricity. Ontario stopped using coal-fired power plants in 2014, and Manitoba followed suit in 2019. Alberta has announced that it will phase out coal-fired power plants by 2024, and Nova Scotia and New Brunswick have confirmed plans to phase out coal by 2030.[36]
- In 2018, Canada’s government committed to phasing out coal use for electricity generation by 2030, except for power plants that can meet certain emissions standards through carbon capture and storage technology. The federal government has established strict emissions requirements that require coal-fired power plants to either close at the end of their lifecycle or to install carbon capture and storage (CCS) technology.
- The lignite-fired Boundary Dam Power Station in Saskatchewan is currently the only power plant in Canada using CCS technology. The site began carbon capture and storage in 2014, making it the first of its kind in the world.[37]

Figure 11. Canada's coal production and consumption, 2012–2022



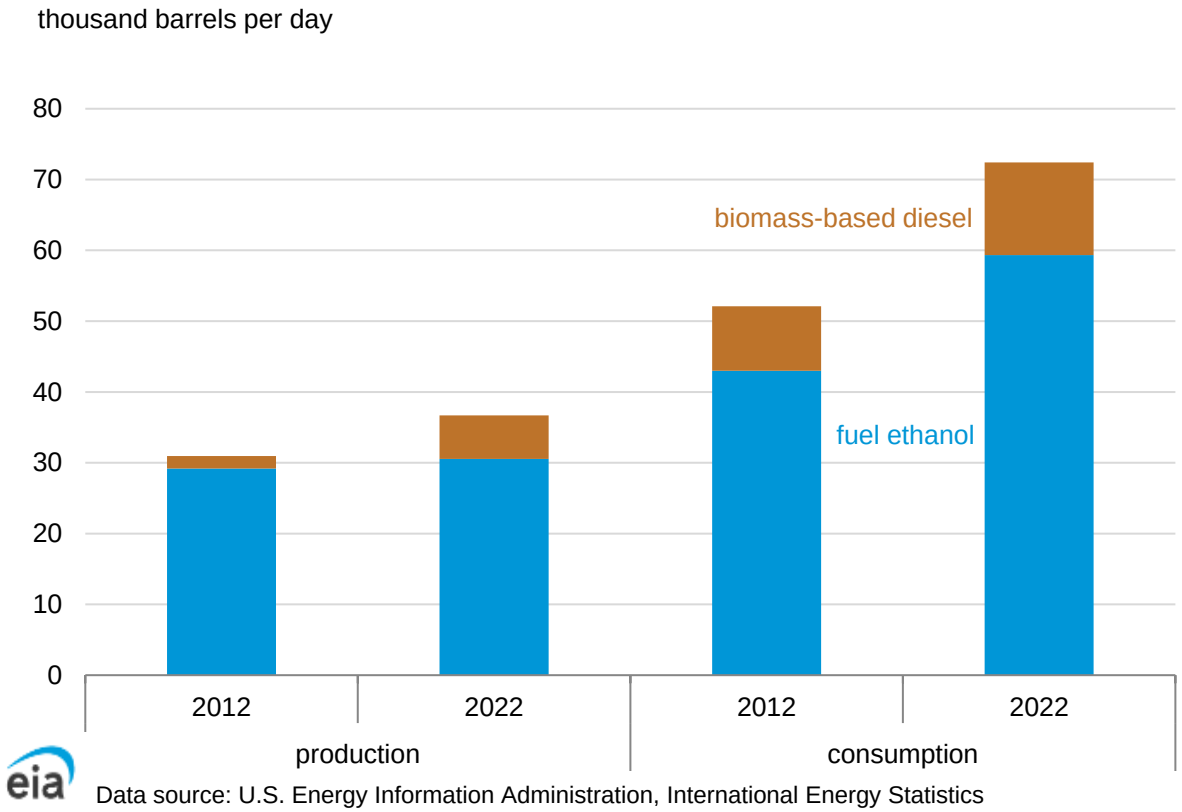
Data source: U.S. Energy Information Administration, International Energy Statistics

Biofuels

- In Canada, biofuels are primarily produced from corn and wheat for ethanol and from canola and soybean for biodiesel. Canada produced 31,000 b/d of fuel ethanol and 6,000 b/d of biomass-based diesel in 2022, meeting 51% and 47% of the domestic demand, respectively.[38, 39]
- Biofuel production in Canada increased by an annual average of 1.6% between 2012 and 2022, with biomass-based diesel contributing 1.2% and fuel ethanol contributing 0.4% of the increase. Ethanol is the top biofuel in Canada, accounting for 83% of biofuel production and 82% of biofuel consumption in 2022.
- The demand for biofuels, particularly ethanol and renewable diesel, is rising because of regulations; biofuel consumption grew at an average annual rate of 7.6% between 2012 and 2022. As of 2022, Canada was the world's seventh-largest biofuel consumer. Industry accounted for 58% of total biofuel consumption, followed by transportation (22%) and residential use (20%).[40]
- Renewable diesel, a biomass-based fuel that can be blended with or used as a replacement fuel for petroleum diesel, is becoming increasingly popular. In June 2023, Tidewater Midstream's stand-alone renewable diesel facility, the first of its kind in Canada, began operating. Covenant Energy in Saskatchewan has announced plans to move forward with a renewable diesel facility on the edge of Lloydminster, and Imperial Oil has committed to constructing a renewable diesel facility near Edmonton.[41]

- Several provinces, such as British Columbia and Ontario, have implemented biofuel requirements. These policies require a certain percentage of biofuels, typically ethanol in gasoline and biodiesel in diesel, to be blended into conventional fuels. Starting January 2023, Quebec required gasoline to contain 10% renewable content and diesel to contain 15%.[42]
- Canada's biofuels market is driven by federal and provincial regulations, such as the Renewable Fuels Regulations, the Clean Fuel Standard, and the low-carbon fuel standards in British Columbia and Quebec.
- The Clean Fuel Regulation (CFR), implemented in 2022, requires the carbon intensity of transportation fuels to be reduced and promotes biofuels. In June 2021, the Net Zero Canada Act became law, committing the government to achieving net zero emissions by 2050.[43]

Figure 12. Canada's biofuels production and consumption, 2012–2022



Data source: U.S. Energy Information Administration, International Energy Statistics

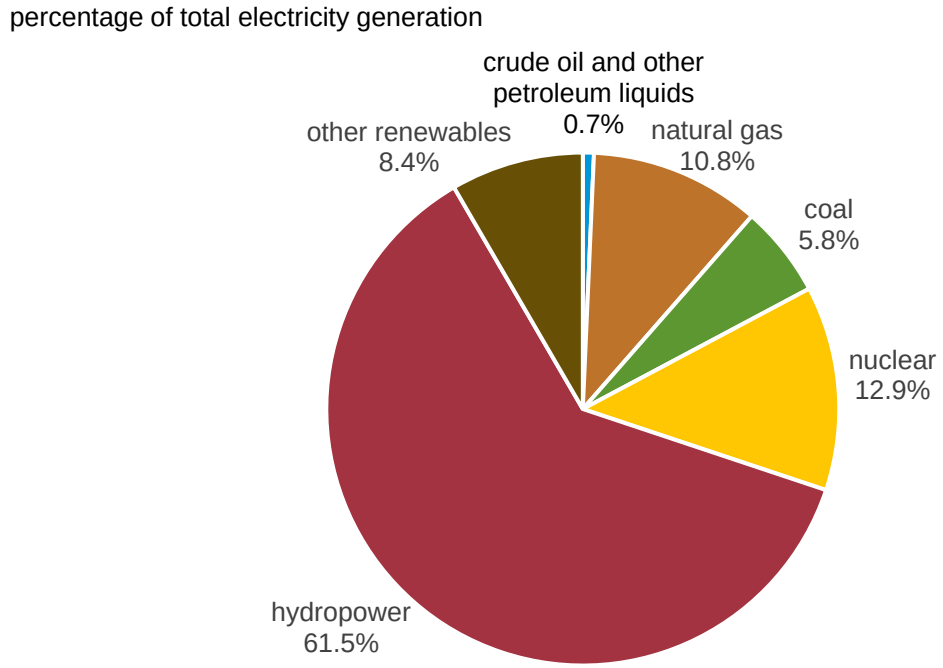
Electricity

- Canada is the world's seventh-largest electricity generator, at an average 638 billion kilowatthours (kWh) in 2022, and renewables accounted for 70% of electricity generation. Canada's electric power sector contributed about 1.7% to the country's 2022 gross domestic product (at current prices) and accounted for 0.5% of Canada's total employment.[44] Hydropower contributed 62% of Canada's electricity generation in 2022 and has been Canada's primary source of electricity generation for over a century. China and Brazil are the only countries that produce more hydropower than Canada on a kilowatthour basis. Apart from hydropower, nuclear and natural gas plants are the primary sources of electricity in Canada (Table 1).
- Canada is the world's seventh-largest electricity consumer on a per capita basis, at 14,500 kilowatthours (kWh) per person in 2022 (Figure 16). Canada's ranking is mainly because of the presence of energy-intensive industries, cold climate, and affordable electricity prices. In 2021, the largest electricity-consuming sector in Canada was industry (35%), followed by residential (34%), and commercial and public services (28%).[45] Most electricity is used in Quebec (37%), Ontario (26%), British Columbia (12%), and Alberta (11%).[46]
- Canada's electricity market is divided into provincial markets; each province has its regulatory authority overseeing generation, distribution, and pricing. Provinces with surplus electricity can sell it to neighboring provinces through a network of transmission lines. This connectivity enhances reliability and efficiency.
- Canada has three electricity grids: Western Grid, Eastern Grid, and Quebec Grid. The border between Alberta and Saskatchewan is where the Eastern and Western grids meet. Canada's electricity grids are connected to the U.S. grids by 37 major transmission lines spanning from New England to the Pacific Northwest. The Canada Energy Regulatory Commission (CER) characterizes Canada's electricity grid as "fragmented," with few interconnections between different locations. Major grid connections mostly link the provinces to the United States, and electricity flows from north to south. Nunavut is the only region in Canada without an electricity grid; it relies on local diesel generation.
- All of Canada's provinces and territories except Nunavut and Prince Edward Island generate hydropower. Quebec, Manitoba, British Columbia, Ontario, and Newfoundland and Labrador use the most hydropower to meet their electricity needs, combined accounting for 97% of Canada's total hydropower capacity. A large 1,100-MW hydropower project, Site-C in British Columbia, is underway and is expected to be completed in 2025. Provinces like Alberta have a mix of energy sources, including natural gas and coal, while others, such as Ontario, have a significant nuclear power presence.
- Nuclear energy contributes in powering Canada's electricity supply. As of 2022, nuclear power plants accounted for 13% of the country's total electricity generation. The 19 commercial reactors in the country provide a net capacity of 14,629 MW. Ontario holds 95% of Canada's nuclear power capacity, and the remaining 5% is in New Brunswick. In recent years, Canada has focused on updating and improving its existing reactors, as well as developing small modular reactors (SMRs), in part to address climate change, meet regional energy demand, and promote economic development.[47, 48]
- Federal and provincial commitments to reduce carbon emissions from the electric power sector by 2030 and increase renewable energy have driven the development of

non-hydro renewable energy in Canada. Between 2012 and 2022, non-hydroelectric renewable electricity generation significantly increased. On average, it grew by 9.8% per year. Wind energy contributed 8.1% to this growth, solar power contributed 1.4%, and biomass and waste contributed 0.2%. Canada has favorable market conditions for wind energy and has abundant high-quality wind resources, especially offshore and along coastlines, making it an ideal location for wind electricity.[49] Most solar power is in Ontario, but provinces such as British Columbia, Saskatchewan, and Alberta are also developing solar capacity.

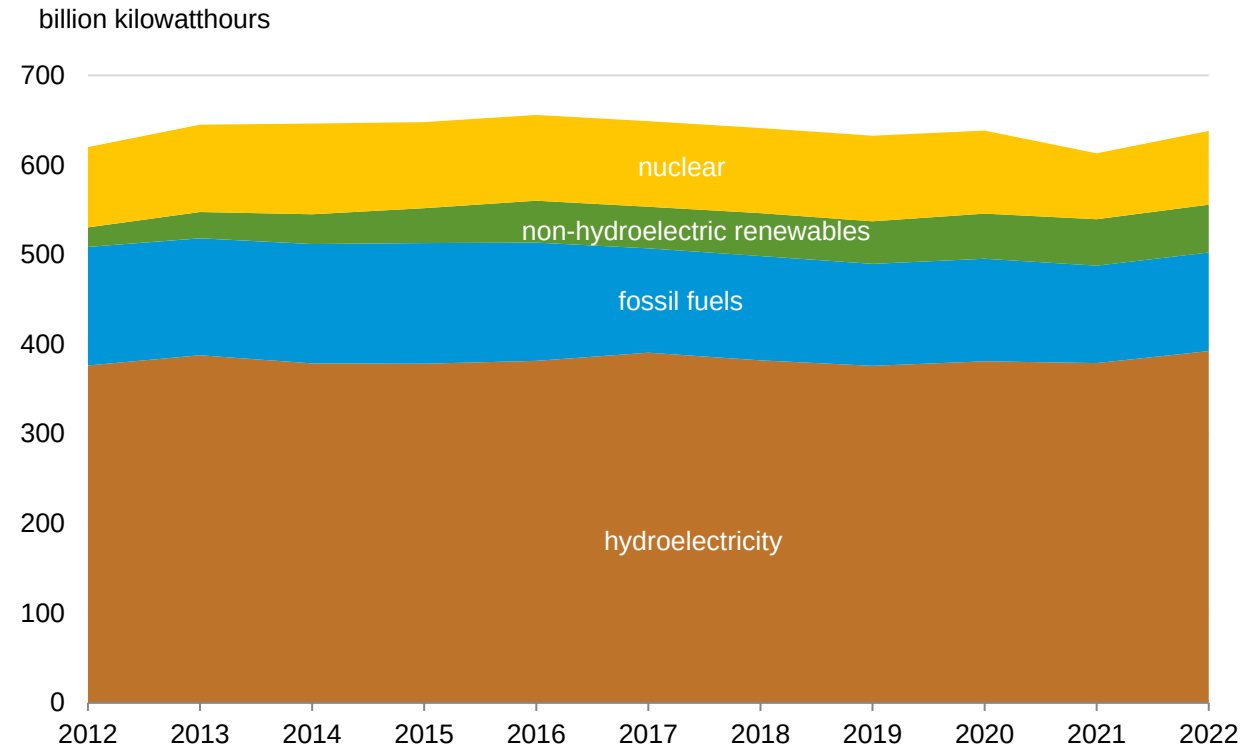
- Between 2000 and 2021, emissions from power generation decreased by 43% because of Ontario's and Québec's successful phaseout of coal-fired generation.[50, 51] Renewable and natural gas power plants will replace coal-fired power generation by 2030.[52] SaskPower, Saskatchewan's main utility company, plans to increase the share of renewables in its portfolio from 25% to 50% by 2030, investing in wind, solar, geothermal, hydropower, and biomass.

Figure 13. Canada's electricity generation supply, 2022



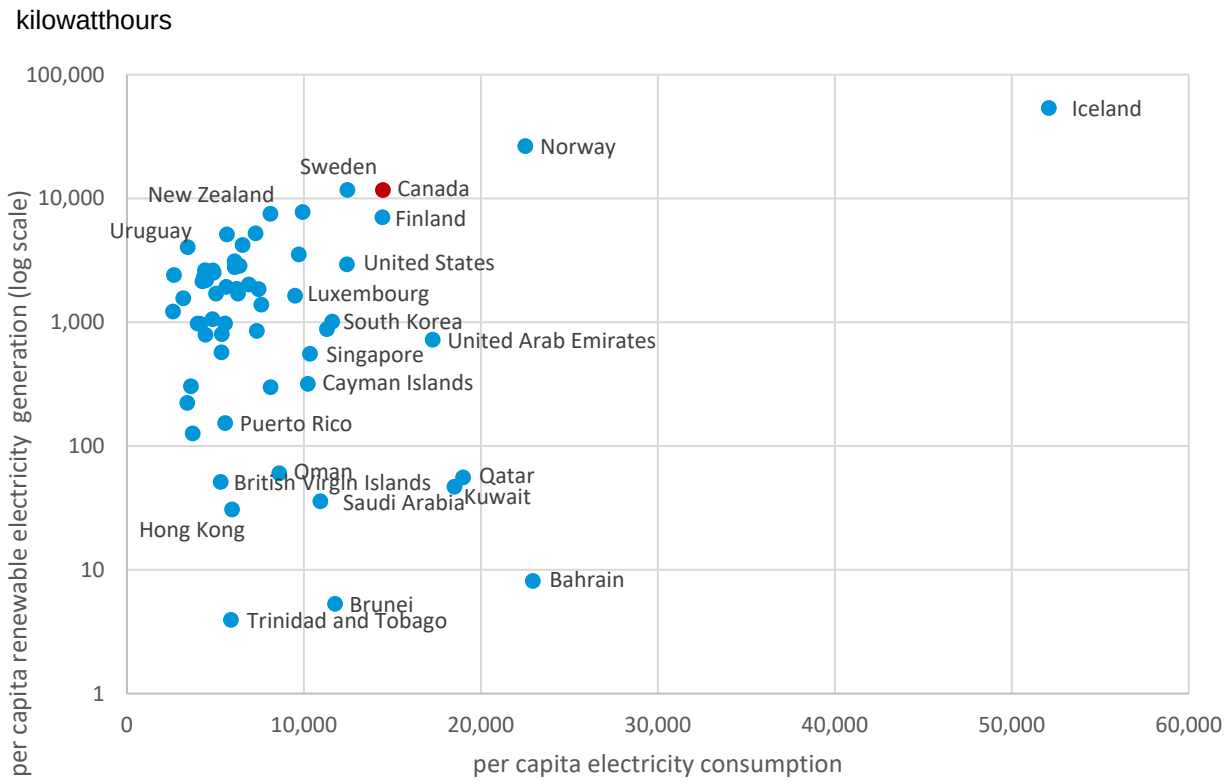
Data source: U.S. Energy Information Administration, International Energy Statistics; and International Energy Agency, Electricity Information 2022
Note: *Other renewables* contain solar, wind, and biomass and waste sources.

Figure 14. Canada's electricity generation by source, 2012–2022



Data source: U.S. Energy Information Administration, International Energy Statistics

Figure 15. Comparison of Canada's renewable generation and energy consumption with other high-income countries, 2022



Data source: U.S. Energy Information Administration, International Energy Statistics
Note: A *high-income economy* is defined by the World Bank as a country with a gross national income per capita of US $13,845 or more in 2022, calculated using the Atlas method. The World Bank's Atlas method is a data compilation methodology that converts a country's local currency estimates to U.S. dollars for cross-country comparisons.

Table 5. Canada's operating hydroelectric plants, 2022

Name	Owner	Start year	Capacity (megawatts)	Type	Location
Pine Falls hydroelectric plant	Manitoba Hydro	1952	9,084	Conventional storage	Manitoba
Robert-Bourassa hydroelectric plant	Hydro Québec	1979	5,616	Conventional storage	Quebec
Churchill Falls hydroelectric plant	Nalcor Energy and Hydro-Quebec	1971	5,428	Conventional storage	Newfoundland and Labrador
La Grande 4 hydroelectric plant	Hydro Québec	1984	2,779	Conventional storage	Quebec
Mica hydroelectric plant	BC Hydro	1973	2,746	Conventional storage	British Columbia
Gordon M Shrum hydroelectric plant	BC Hydro	1968	2,730	Conventional storage	British Columbia
Revelstoke hydroelectric plant	BC Hydro	1984	2,480	Conventional storage	British Columbia

La Grande 3 hydroelectric plant	Hydro Québec	1982	2,417	Conventional storage	Quebec
La Grande 2A hydroelectric plant	Hydro Québec	1991	2,106	Conventional storage	Quebec
Beauharnois hydroelectric plant	Hydro Québec	1932	1,912	Run-of-river	Quebec
Manic 5 hydroelectric plant	Hydro Québec	1970	1,596	Conventional storage	Quebec
Sir Adam Beck 2 hydroelectric plant	Ontario Power Generation	1954	1,499	Conventional storage	Ontario
La Grande 1 hydroelectric plant	Hydro Québec	1994	1,436	Run-of-river	Quebec
Limestone hydroelectric plant	Manitoba Hydro	1990	1,350	Run-of-river	Manitoba
Manic 3 hydroelectric plant	Hydro Québec	1975	1,326	Run-of-river	Quebec
Kettle hydroelectric plant	Manitoba Hydro	1970	1,253	Run-of-river	Manitoba
Manic 2 hydroelectric plant	Hydro Québec	1965	1,229	Run-of-river	Quebec
Bersimis 1 hydroelectric plant	Hydro Québec	1956	1,178	Conventional storage	Quebec
Shipshaw hydroelectric plant	Rio Tinto Group	1943	1,145	Conventional storage	Quebec
Manic 5PA hydroelectric plant	Hydro Québec	1989	1,064	Conventional storage	Quebec
Other conventional storage	Other conventional storage	1968 (average)	21,209	**64** conventional storage	**17** Quebec; **15** British Columbia; **32** other
Other run-of-river	Other run-of-river	1964 (average)	12,318	**42** run-of-river	**26** Quebec; **7** Ontario; **9** other
Other unknown	Other unknown	1943 (average)	1,052	**5** unknown	**2** Quebec; **3** other
Other pumped storage	Other pumped storage	1957 (average)	174	**1** pumped storage	**1** Ontario
Total			**85,127**		

Data source: Global Energy Monitor, Global Hydropower Tracker, May 2023

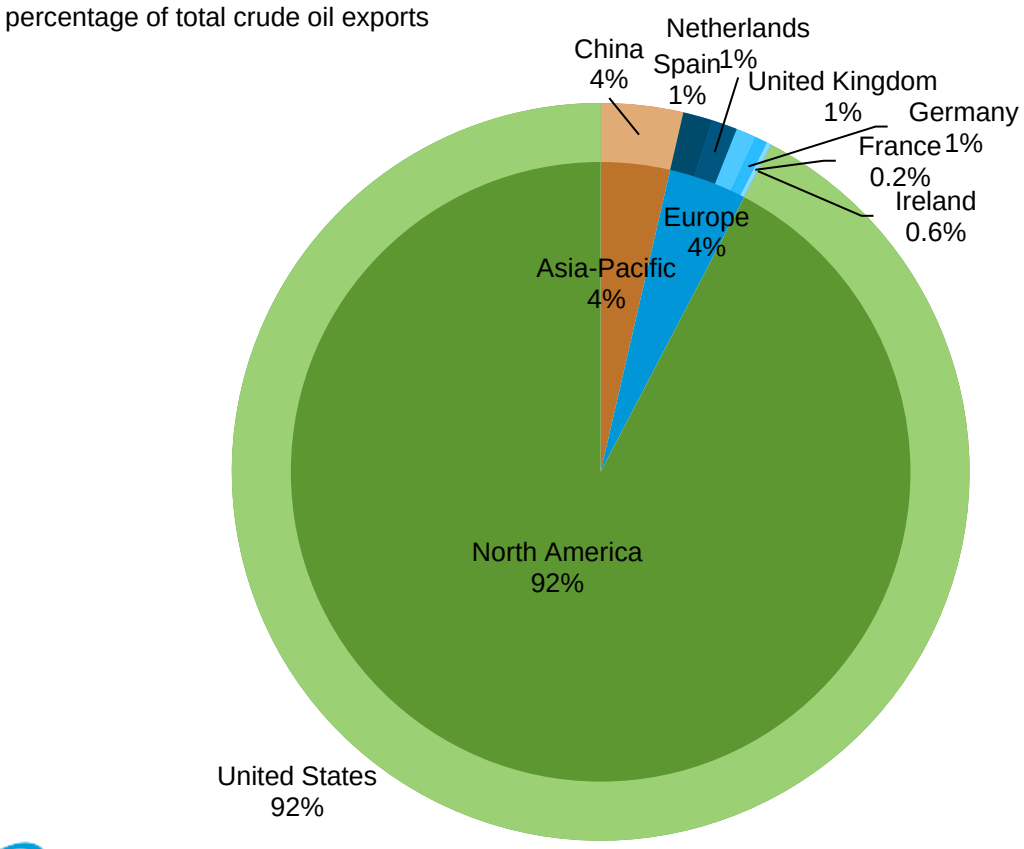
Energy Trade

- Canada exports more energy than it imports (net exporter), and its largest and most important trading partner is the United States. Canada's 2022 energy exports amounted to $240.5 billion, equivalent to 33% of the country's total goods exports, and 90% of those energy exports were destined for the United States. The energy goods exported include crude oil, natural gas, refined petroleum products, electricity, and coal. Among these, oil and natural gas made up 90% of the total energy exports.[53] Canada's energy imports were $65.3 billion in 2022, amounting to 9% of Canada's total goods imports.
- In 2023, 92% of Canada's crude oil exports went to the United States. Inland regions of the United States, particularly the Midwest (PADD 2) and Rocky Mountain (PADD 4) regions, are highly integrated with Canada's oil markets, and Canada's crude oil makes up a significant portion of U.S. refinery inputs in these regions. For this reason, Canada is the top crude oil supplier to the United States, providing 60% of U.S. crude oil imports in

2023. U.S. imports of refined products from Canada accounted for 18% of total U.S. petroleum product imports.

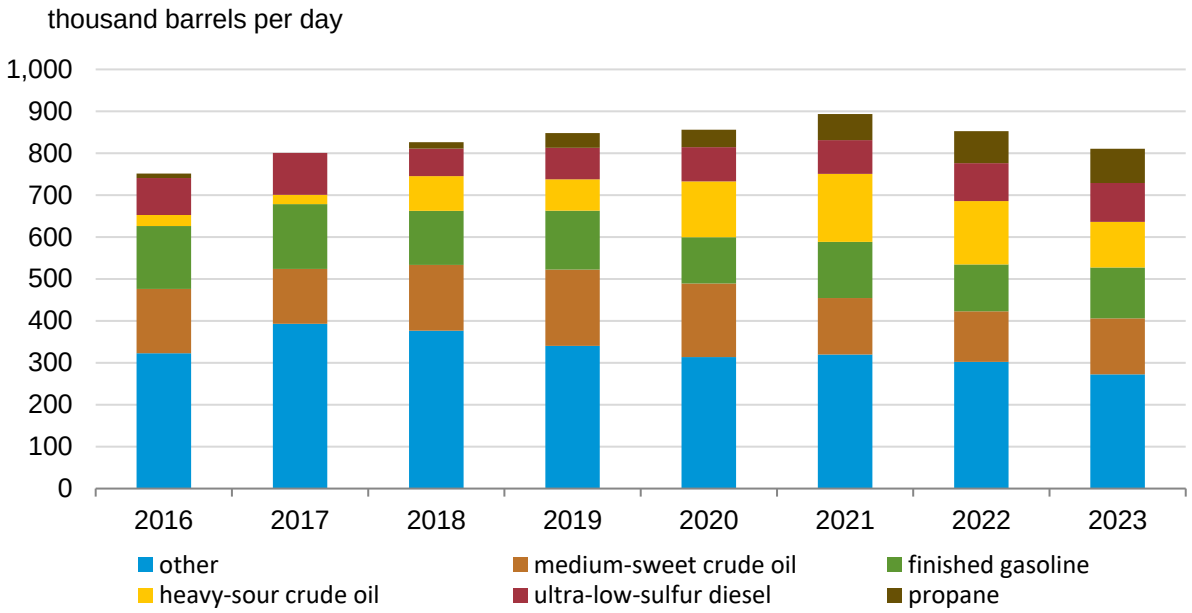
- Canada’s crude oil producers face complex market and logistical challenges. The transportation capacity of pipelines serving foreign markets is less than Western Canada's crude oil supply. Canadian oil producers rely on rail for transportation as export pipelines are operating at full capacity. Since 2022, the Marathon Capline pipeline has allowed producers to increase oil sands volume from Alberta through the Gulf Coast to Asia. The Trans Mountain Expansion Project (TMX) has been in operation since May 2024 and has significantly increased the pipeline capacity to Canada's Pacific Coast, enabling export to foreign markets. The pipeline runs parallel to the existing 715-mile pipeline route between Strathcona County (near Edmonton) and Burnaby, British Columbia, which is Canada's only crude oil pipeline to its West Coast. The expansion project aims to enhance the capacity of the Trans Mountain pipeline system, facilitating the delivery of more crude oil to global markets.
- Canada’s natural gas exports were 3.1 Tcf Bcf in 2023, and 100% of those exports went to the United States. Canada is the top natural gas supplier to the United States, providing 99.9% of U.S. imports in 2023. Most of Canada's natural gas exports to the United States come from Western Canada and are transported to U.S. markets in the West and Midwest regions.
- Canada is the world's top electricity exporter; it exported 52 terawatthours (TWh) to the United States in 2023.[54] Hydropower is the main source of Canada’s electricity, and the United States was the primary import recipient. Provinces with abundant hydroelectric resources, such as Quebec and British Columbia, export electricity to neighboring regions and the United States, particularly the U.S. Northeast and Midwest. Canada imported 17 TWh of electricity from the United States; almost all of it came from the Pacific Northwest.[55]
- Canada is the eighth-largest coal exporter in the world, as of 2022, and Asia was its primary market. In 2023, Canada exported 44.7 million short tons (MMst) of coal, which includes lignite and peat. Japan (31%), China (22%), and Korea (20%) were the top destinations. On the other hand, Canada imported 6,526 MMst of coal in 2023, which mainly came from the United States (77%) and Colombia (22%). For over a decade, coal imports have been decreasing, but exports have remained mostly stable. Canada is planning to phase out traditional coal-fired electricity by 2030 domestically. However, because coal is utilized for metallurgical processes, Canada continues to export coal, which constitutes almost two-thirds of its production as of 2022.[56]

Figure 16. Canada's crude oil exports by region and country, 2023



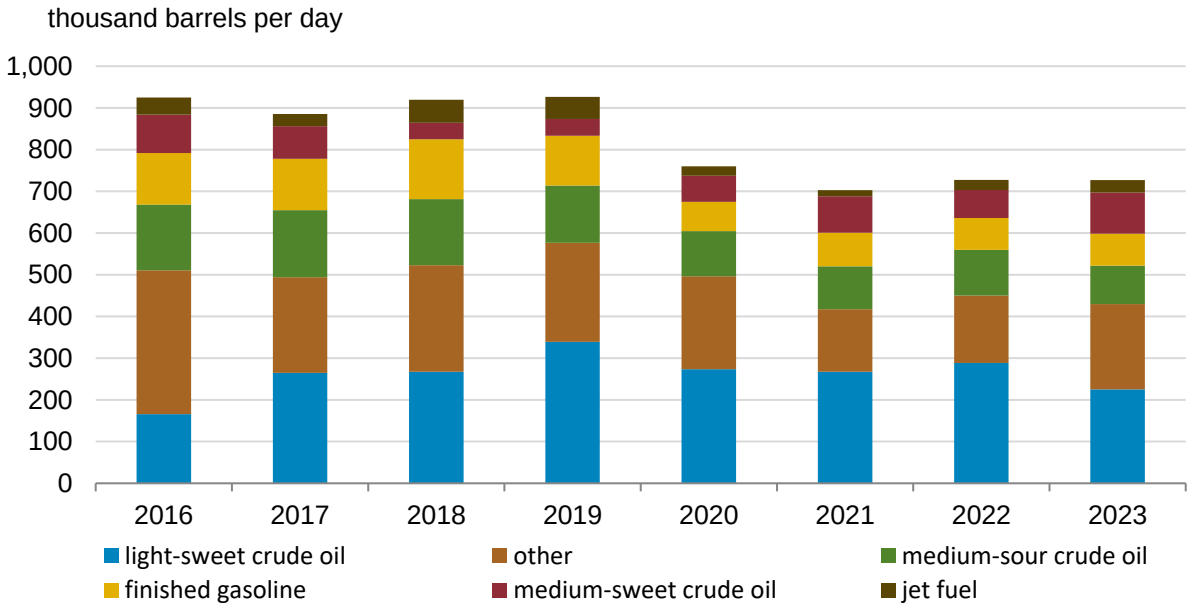
Data source: Global Trade Tracker, provided by Zen Innovations AG © 2024

Figure 17. Canada's petroleum exports via vessel, 2016–2023



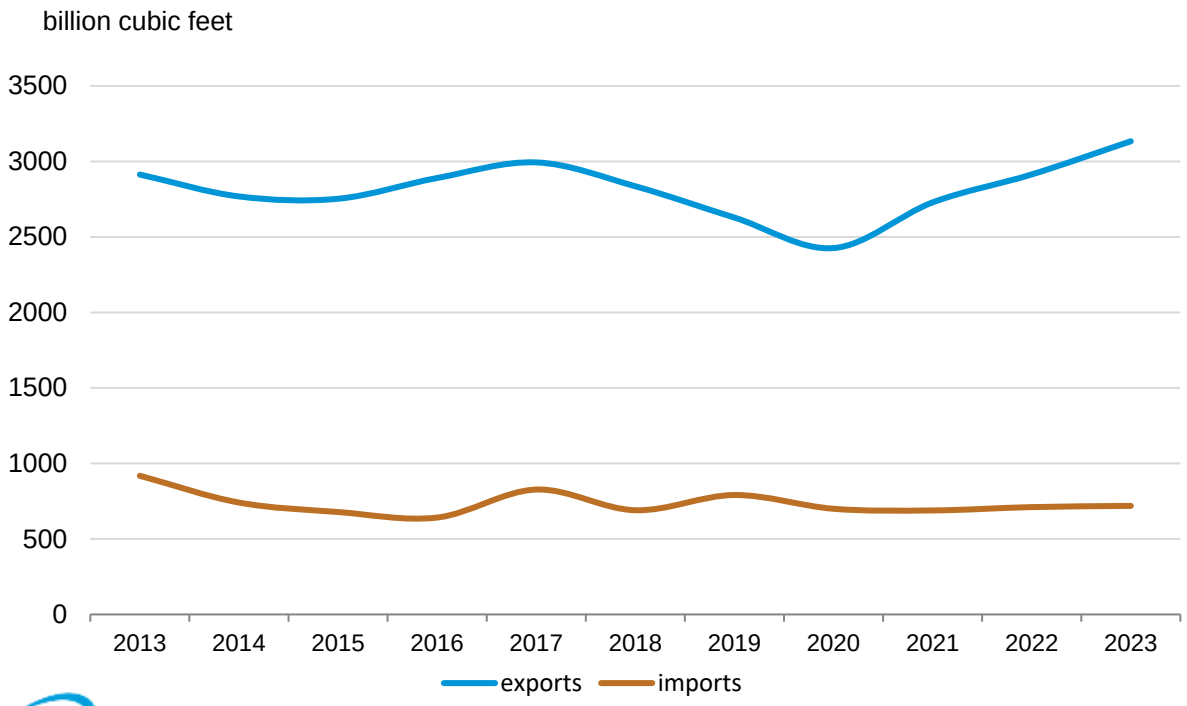
Data source: Vortexa Ltd.
Note: *Other* includes asphalt, biodiesel feedstock, bitumen, blending components, chemicals, cycle oils, diesel, finished biodiesel, full range naphtha, gasoil, heavy-sweet crude oil, kerosene, light-sour crude oil, light-sweet, low sulfur fuel oil, lube oils, medium-sour crude oil, olefins or other chemicals, other biodiesel or edible oils, propane, ultra-low sulfur diesel, undetermined, and vacuum gas oil.

Figure 18. Canada's petroleum imports via vessel, 2016–2023



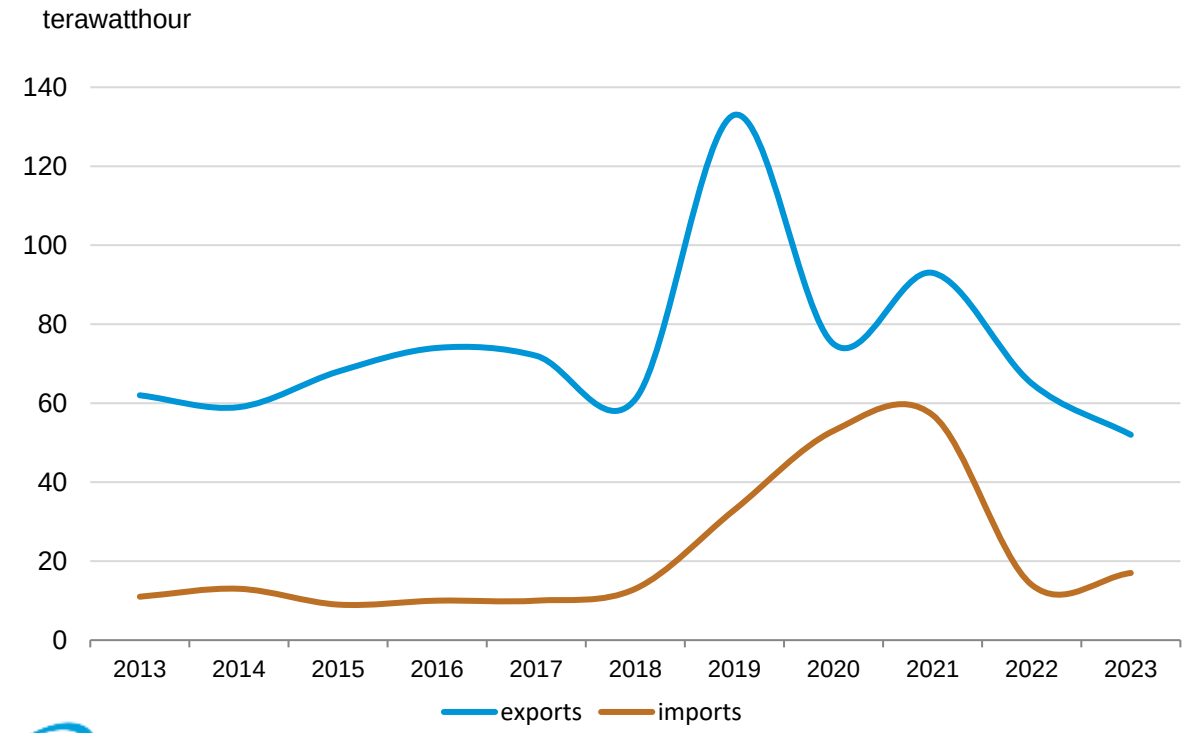
Data source: Vortexa Ltd.
Note: *Other* contains biodiesel feedstock, bitumen, blending components, butane, chemicals, diesel, dirty condensates, finished biodiesel, full range naphtha, gasoil, heavy-sour crude oil, heavy-sweet crude oil, high sulfur fuel oil, jet fuel, light naphtha, light-sour crude oil, light-sweet crude oil, low sulfur fuel oil, lube oils, medium-sweet crude oil, olefins or other chemicals, other biodiesel or edible oils, propane, undetermined, and vacuum gas oil.

Figure 19. Canada's natural gas trade, 2013–2023



Data source: Global Trade Tracker, provided by Zen Innovations AG © 2024

Figure 20. Canada's electricity trade, 2013–2023



Data source: Global Trade Tracker, provided by Zen Innovations AG © 2024

[1] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed February 28, 2024. https://www.eia.gov/international/data/country/CAN/total-energy/total-energy-production?pd=44&p=0040000000000000000000000000000000000000000000000000000000000000000f00o&u=2&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249-0000001000000000000000000000000000000000000000000001&s=315532800000&e=1609459200000.

[2] Government of Canada, Statistics Canada. "Oil and Gas Extraction, 2022." The Daily - , September 27, 2023. https://www150.statcan.gc.ca/n1/daily-quotidien/230927/dq230927c-eng.htm.

[3] Energy Fact Book 2023–2024. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.

[4] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.

[5] "Canada's Trans Mountain Pipeline Expansion Reportedly 95% Complete - U.S. Energy Information Administration (EIA)." Canada's Trans Mountain Pipeline expansion reportedly 95% complete - U.S. Energy Information Administration (EIA). Accessed March 1, 2024. https://www.eia.gov/todayinenergy/detail.php?id=61184.

[6] Canada's Trans Mountain Oil Pipeline faces new delay due to technical ..., January 29, 2024. https://www.reuters.com/world/americas/canadas-trans-mountain-oil-pipeline-faces-new-delay-due-technical-issues-2024-01-29/.

[7] Canada's long-delayed Trans Mountain Oil Pipeline starts operations | Reuters. Accessed May 8, 2024. https://www.reuters.com/business/energy/canadas-long-delayed-trans-mountain-oil-pipeline-set-start-operations-2024-05-01/.

[8] "Government of Canada." Canadian Centre for Energy Information, February 6, 2024. https://energy-information.canada.ca/en/energy-facts/key-energy-economic-environmental-indicators.

[9] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed March 1, 2024. https://www.eia.gov/international/data/country/CAN/other-statistics/emissions-by-fuel?pd=40&p=0000000000000000000000000000000000000000000000000000000000000b0001&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249--34&s=-662688000000&e=1609459200000.

[10] Canada, Service. "Government of Canada." Canada.ca, December 7, 2023. https://www.canada.ca/en/services/environment/weather/climatechange/climate-plan/oil-gas-emissions-cap/regulatory-framework.html.

[11] "Worldwide Reserves and Production." Oil & Gas Journal, December 12, 2023. https://www.ogj.com/ogj-survey-downloads/worldwide-production/document/14302483/worldwide-reserves-and-production.

[12] Canada, Natural Resources. "What Are the Oil Sands?" Natural Resources Canada, July 28, 2020. https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/fossil-fuels/crude-oil/what-are-oil-sands/18089.

[13] Government of Canada, Canada Energy Regulator. "Canada Energy Regulator / Régie de l'énergie Du Canada." CER, November 24, 2023. https://www.cer-rec.gc.ca/en/data-analysis/energy-commodities/crude-oil-petroleum-products/report/canadian-crude-oil-exports-30-year-review/.

[14] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.

[15] Government of Canada, Canada Energy Regulator. "Canada Energy Regulator / Régie de l'énergie Du Canada." CER, August 22, 2023. https://www.cer-rec.gc.ca/en/data-analysis/facilities-we-regulate/canadas-pipeline-system/2021/crude-oil-pipeline-transportation-system.html.

[16] "Pipeline Safety: Capp: A Unified Voice for Canada's Upstream Oil and Gas Industry." CAPP, March 15, 2024. https://www.capp.ca/en/our-priorities/safety/pipeline-safety/.

[17] "Global Oil Infrastructure Tracker." Global Energy Monitor. Accessed February 6, 2024. https://globalenergymonitor.org/projects/global-oil-infrastructure-tracker/download-data/.

[18] "Worldwide, US Refinery Survey-Capacities as of Jan. 1, 2024." Oil & Gas Journal, March 9, 2024. https://www.ogj.com/ogj-survey-downloads/worldwide-refining.

[19] IEA. "Canada - Countries & Regions." IEA. Accessed March 29, 2024. https://www.iea.org/countries/canada/oil#how-is-oil-used-in-canada.
[20] Vortexa. Accessed April 1, 2024. https://analytics.vortexa.com/.
[21] Government of Canada, Canada Energy Regulator. "Canada Energy Regulator / Régie de l'énergie Du Canada." CER, November 28, 2023. https://www.cer-rec.gc.ca/en/data-analysis/energy-markets/market-snapshots/2022/market-snapshot-a-tour-of-canadas-oil-sands-upgraders.html#:~:text=Synthetic%20crude%20oil%20is%20made,oil%20into%20a%20lighter%20blend.&text=Dilbit%20is%20a%20crude%20oil,diluent%20such%20as%20light%20naphtha.
[22] "Products from the Oil Sands: Dilbit vs Synthetic Crude - What's the Difference?" Oil Sands Magazine, May 6, 2022. https://www.oilsandsmagazine.com/news/2022/5/6/crude-products-diluted-bitumen-dilbit-synthetic-crude-sco.
[23] "Products from the Oil Sands: Dilbit vs Synthetic Crude - What's the Difference?" Oil Sands Magazine, May 6, 2022. https://www.oilsandsmagazine.com/news/2022/5/6/crude-products-diluted-bitumen-dilbit-synthetic-crude-sco.
[24] "Worldwide Reserves and Production." Oil & Gas Journal, December 12, 2023. https://www.ogj.com/ogj-survey-downloads/worldwide-production/document/14302483/worldwide-reserves-and-production.
[25] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed April 1, 2024. https://www.eia.gov/international/data/country/CAN/natural-gas/dry-natural-gas-production?pd=3002&p=00g&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=00000000000000000000000000000000000000000000000001&l=249-ruvvvvvfvtvnvv1vrvvvvfvvvvvvfvvvou20evvvvvvvvvvvnvvvs0008&s=315532800000&e=1640995200000.
[26] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.
[27] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.
[28] Canada, Natural Resources. "Canadian Liquified Natural Gas Projects." Natural Resources Canada, December 14, 2023. https://natural-resources.canada.ca/energy/energy-sources-distribution/natural-gas/canadian-liquified-natural-gas-projects/5683.
[29] Government of Canada, Canada Energy Regulator. "Canada Energy Regulator / Régie de l'énergie Du Canada." CER, July 13, 2022. https://www.cer-rec.gc.ca/en/data-analysis/facilities-we-regulate/canadas-pipeline-system/2021/natural-gas-pipeline-transportation-system.html.
[30] GasLink, Coastal. "Coastal Gaslink Achieves Mechanical Completion, Ahead of 2023 Year-End Target." Coastal GasLink. Accessed April 1, 2024. https://www.coastalgaslink.com/whats-new/news-stories/2023/2023-11-08-coastal-gaslink-achieves-mechanical-completion-ahead-of-2023-year-end-target/.
[31] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed April 2, 2024. https://www.eia.gov/international/data/country/CAN/coal-and-coke/coal-reserves?pd=1&p=0000000000000000000000000000000000000000000000000001&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249--34&s=1199145600000&e=1640995200000.
[32] About the coal industry. Accessed April 2, 2024. https://www.coal.ca/coal-resources/about-the-coal-industry/.
[33] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed April 2, 2024. https://www.eia.gov/international/data/country/CAN/coal-and-coke/coal-and-coke-production?pd=1&p=3i0000000000000000000000000000000000000180000000000000g&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249--34&s=315532800000&e=1640995200000.
[34] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.
[35] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed April 2, 2024.

https://www.eia.gov/international/data/country/CAN/coal-and-coke/coal-and-coke-consumption?pd=1&p=0000000000000000000000000000000000000000jg0880000000008&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249--34&s=315532800000&e=1640995200000.

[36] Government of Canada, Statistics Canada. "Coal for Christmas? A Coal Industry Snapshot." Statistics Canada, December 12, 2023. https://www.statcan.gc.ca/o1/en/plus/5211-coal-christmas-coal-industry-snapshot.

[37] Government of Canada, Statistics Canada. "Coal for Christmas? A Coal Industry Snapshot." Statistics Canada, December 12, 2023. https://www.statcan.gc.ca/o1/en/plus/5211-coal-christmas-coal-industry-snapshot.

[38] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed April 2, 2024. https://www.eia.gov/international/data/country/CAN/biofuels/biofuels-production?pd=79&p=000003g&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249--34&s=315532800000&e=1640995200000.

[39] "U.S. Energy Information Administration - EIA - Independent Statistics and Analysis." International - U.S. Energy Information Administration (EIA). Accessed April 2, 2024. https://www.eia.gov/international/data/country/CAN/biofuels/biofuels-consumption?pd=79&p=00000000000e&u=0&f=A&v=mapbubble&a=-&i=none&vo=value&&t=C&g=none&l=249--34&s=315532800000&e=1640995200000.

[40] IEA. "Canada - Countries & Regions." IEA. Accessed April 2, 2024. https://www.iea.org/countries/canada/renewables.

[41] "Demand for Biofuels Sparks Canadian Boom. but Will U.S. Subsidies Pull Investment South? | CBC News." CBCnews, July 12, 2023. https://www.cbc.ca/news/canada/calgary/canada-biofuel-production-us-ira-1.6903008.

[42] "Canada: Biofuels Annual." USDA Foreign Agricultural Service, April 1, 2024. https://fas.usda.gov/data/canada-biofuels-annual-9.

[43] "Canada: Biofuels Annual." USDA Foreign Agricultural Service, April 1, 2024. https://fas.usda.gov/data/canada-biofuels-annual-9.

[44] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.

[45] IEA. "Canada - Countries & Regions." IEA. Accessed April 3, 2024. https://www.iea.org/countries/canada/electricity#how-is-electricity-used-in-canada.

[46] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.

[47] "Global Nuclear Power Tracker." Global Energy Monitor, February 6, 2024. https://globalenergymonitor.org/projects/global-nuclear-power-tracker/.

[48] "Nuclear Power in Canada." Nuclear Power in Canada - World Nuclear Association. Accessed April 3, 2024. https://www.world-nuclear.org/information-library/country-profiles/countries-a-f/canada-nuclear-power.aspx.

[49] Canada, Natural Resources. 2009. "About-Renewable-Energy." Natural-Resources.canada.ca. January 27, 2009. https://natural-resources.canada.ca/our-natural-resources/energy-sources-distribution/renewable-energy/about-renewable-energy/7295.

[50] IEA. "Canada - Countries & Regions." IEA. Accessed April 3, 2024. https://www.iea.org/countries/canada/electricity.

[51] "Canada - Energy." International Trade Administration | Trade.gov. Accessed April 3, 2024. https://www.trade.gov/country-commercial-guides/canada-energy.

[52] Canada, Environment and Climate Change. "Government of Canada." Canada.ca, August 21, 2023. https://www.canada.ca/en/services/environment/weather/climatechange/canada-international-action/coal-phase-out.html.

[53] *Energy Fact Book 2023–2024*. Accessed February 29, 2024. https://energy-information.canada.ca/sites/default/files/2023-10/energy-factbook-2023-2024.pdf.

[54] "Solutions - Global Trade Tracker Global Trade Tracker." Global Trade Tracker - Get the best tool to explore global trade data. Accessed April 29, 2024. https://www.globaltradetracker.com/.

[55] "Solutions - Global Trade Tracker Global Trade Tracker." Global Trade Tracker - Get the best tool to explore global trade data. Accessed April 29, 2024. https://www.globaltradetracker.com/.
[56] Canada, Natural Resources. "Coal Facts." Natural Resources Canada, April 3, 2024. https://natural-resources.canada.ca/our-natural-resources/minerals-mining/mining-data-statistics-and-analysis/minerals-metals-facts/coal-facts/20071.