

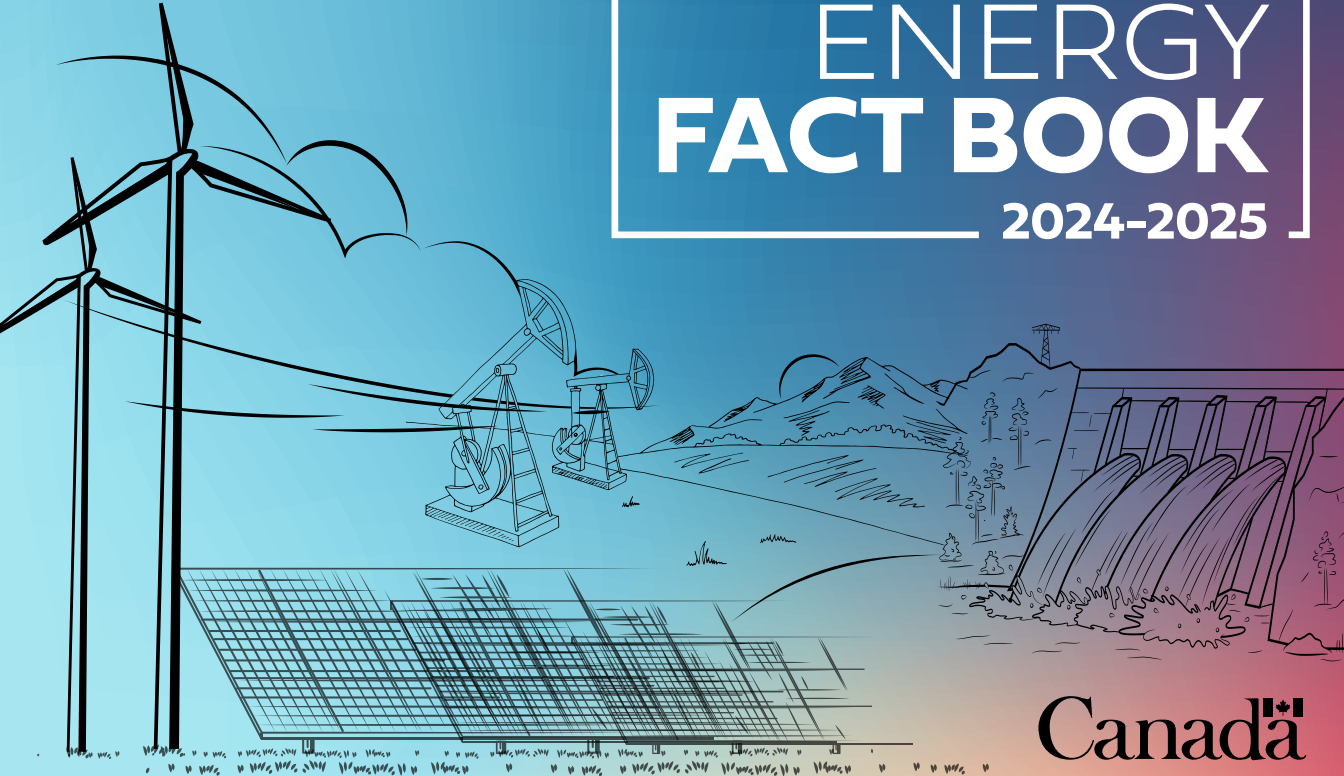


Natural Resources
Canada

Ressources naturelles
Canada

ENERGY FACT BOOK

2024-2025



Canada



Natural Resources
Canada

Ressources naturelles
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ENERGY **FACT BOOK** 2024–2025

Canada

Aussi disponible en français sous le titre : Cahier d'information sur l'énergie, 2024-2025

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PREFACE

The purpose of the *Energy Fact Book* is to provide key information on energy markets in Canada in a format that is easy to consult. Resources including a summary of units and conversion factors, abbreviations, and data sources used throughout this publication are available in the annexes.

All data is subject to revisions by statistical sources. In some instances, more than one source may be available and discrepancies in numbers may occur because of conceptual or methodological differences. In addition, some numbers may not add up precisely due to rounding.

This publication was assembled by the Energy and Economic Analysis Division of the Energy Policy Branch with the help of subject experts from across Natural Resources Canada (NRCan).

For questions or comments, contact NRCan at **energyfacts-faitsenergetiques@nrcan-rncan.gc.ca**.

In this publication, energy industries are generally considered to include oil and gas extraction; coal mining; uranium mining; electric power generation, transmission and distribution; pipeline transportation; natural gas distribution; biofuels production; petroleum refineries; and support activities for oil and gas extraction. The petroleum sector is a subset of these industries, and in this publication consists of oil and gas extraction and support activities, pipeline transportation and distribution of oil and gas, and petroleum refineries.

Clean energy industries such as renewable and nuclear electricity generation, biofuels production and carbon capture and storage facilities are contained within the definition of energy industries. Some energy-related industries (e.g. petroleum product wholesaler-distributors and coal product manufacturing) are excluded because of a lack of data.

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INTRODUCTION

From an energy perspective, Canada is very fortunate. We have a large land mass, small population and one of the largest and most diverse supplies of energy in the world. Our rivers discharge close to 7% of the world's renewable water – a tremendous source of hydroelectric power. We have the fourth-largest proven oil reserves and third-largest reserves of uranium; our energy resources are a source of strength that continues to shape our economy and society.

Canada is at the forefront of innovative technologies for how we produce and use energy. For example, low- or non-emitting forms of energy are growing in significance as part of our evolving electricity mix. In fact, wind and solar photovoltaic (PV) energy are the fastest-growing sources of electricity generation in Canada. In addition, technological advancements, such as co-generation, have resulted in an increase in energy-efficient practices and a reduction in greenhouse gas (GHG) emissions in areas such as the oil sands. Ongoing developments in areas such as grid-scale electricity storage, carbon capture and storage, hydrogen, and electric and alternative fuel vehicles have the potential to further transform the energy system.

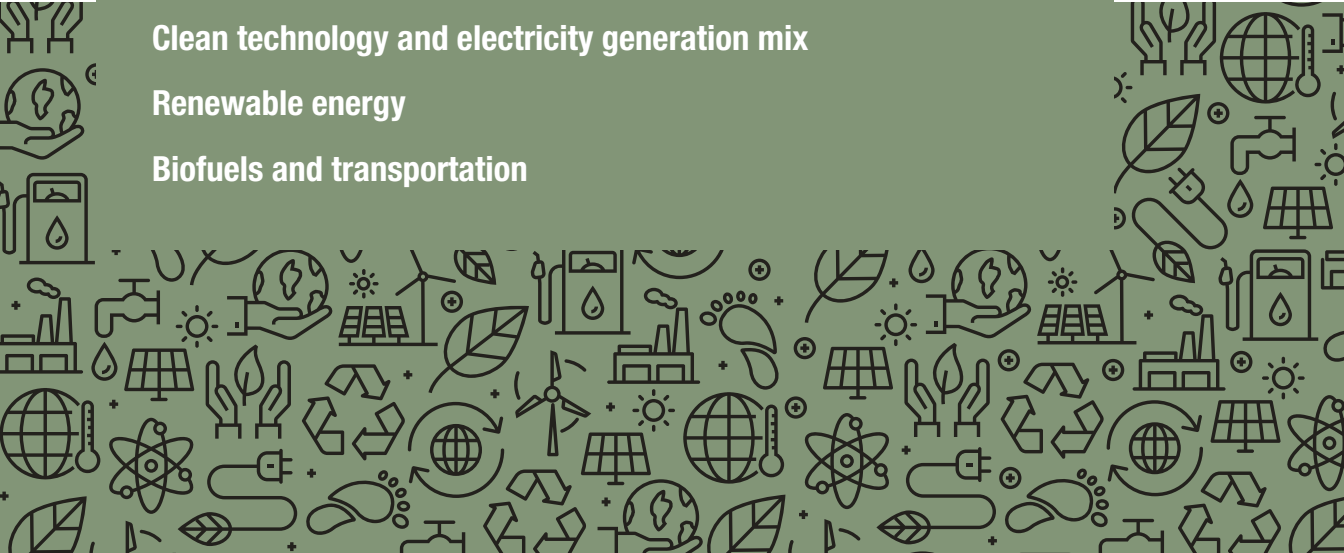
For over ten years, the *Energy Fact Book* has provided a solid foundation for Canadians to understand and discuss important developments across the energy sector. A significant milestone in Canadian energy information was achieved in 2019 with the launch of the Canadian Center for Energy Information (CCEI). Housed at Statistics Canada, the CCEI brings together Canada's existing energy information in one place, facilitating access to products like the Energy Fact Book.

Section 5: Clean Power and Low Carbon Fuels

Clean technology and electricity generation mix

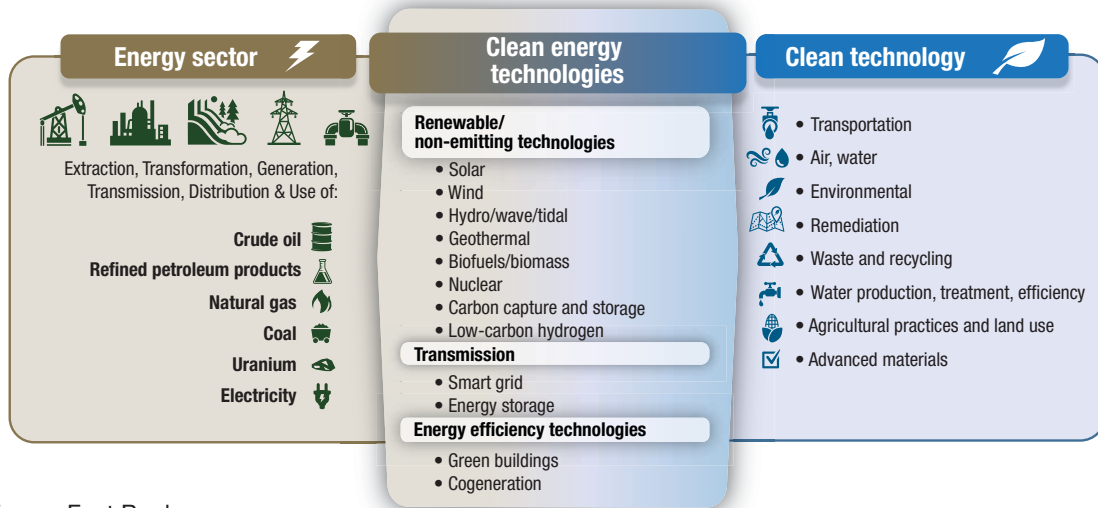
Renewable energy

Biofuels and transportation



CLEAN TECHNOLOGY AND THE ECONOMY

- In 2017, the Government of Canada invested in a Clean Technology Data Strategy to provide the foundation for measuring the economic, environmental and social impacts of clean technology in Canada.
- As part of this strategy, Statistics Canada has developed the Environmental and Clean Technology Products Economic Account (ECTPEA), which provides a comprehensive picture of the state of Canada's clean technology economy for the years from 2007 to 2022.
- The ECTPEA includes processes, products and services that reduce environmental impacts through environmental protection and resource management activities and the use of goods that have been adapted to be significantly less energy- or resource-intensive than the industry standard.



Environmental and clean technology (2022):

\$80.2 billion of GDP
(3.0% of total GDP)

327,500 jobs representing
1.7% of jobs in the Canadian economy

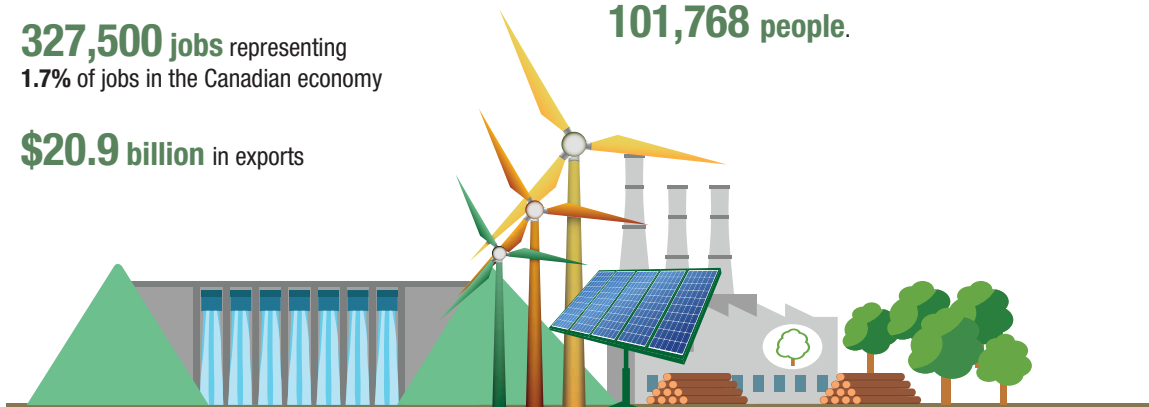
\$20.9 billion in exports

Of this, clean energy alone accounted for

1.5% of Canada's GDP

and employed

101,768 people.

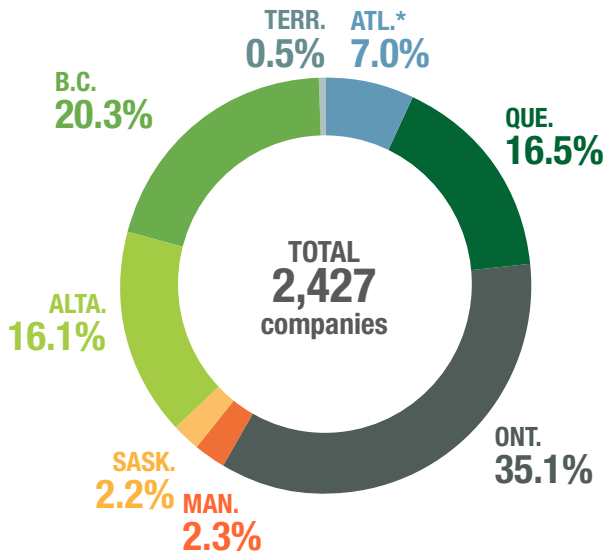


The TSX and TSX-Venture exchanges list **94 companies in the cleantech sector**, with a total market capitalization of **\$48.9 billion**. Of these companies, 83 are headquartered in Canada, with a total market capitalization of **\$40.5 billion** (as of May 31, 2024).

CLEANTECH COMPANIES

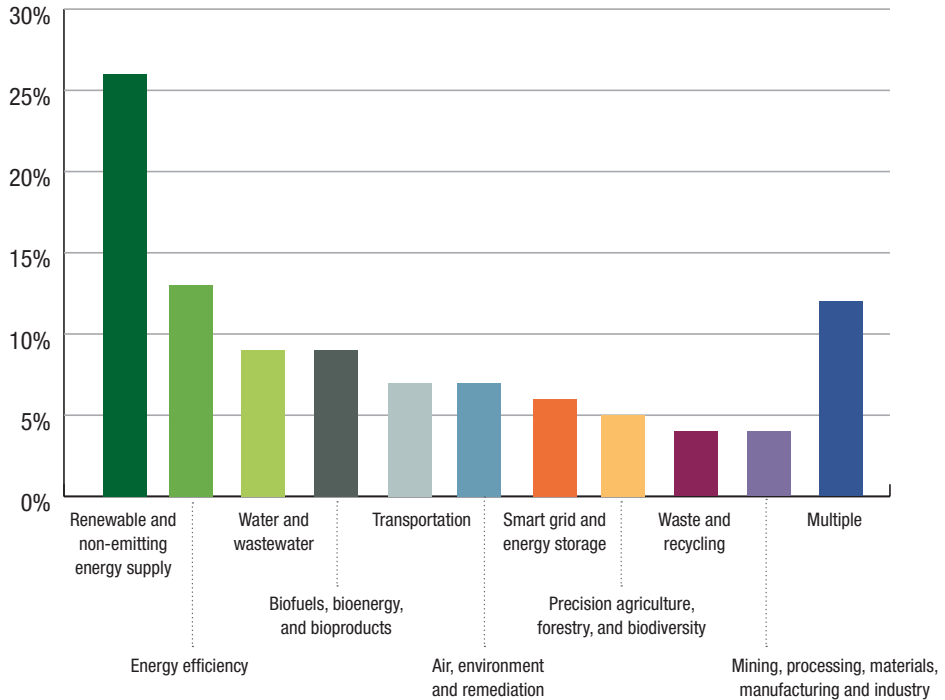
More than half of Canada's 2,427 cleantech companies relate to the energy industry, operating in renewables, energy efficiency, and smart grid technology. They are concentrated in Ontario, British Columbia, Quebec, and Alberta.

CANADIAN CLEANTECH COMPANIES BY PROVINCE, 2022



* Atlantic provinces

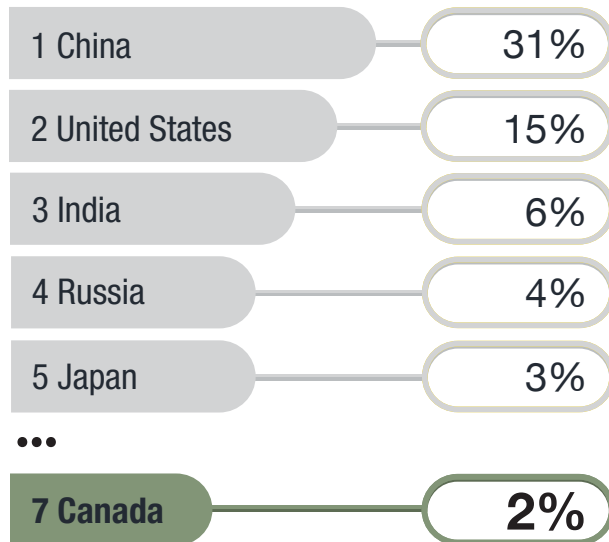
CANADIAN CLEANTECH COMPANIES BY INDUSTRY, 2022



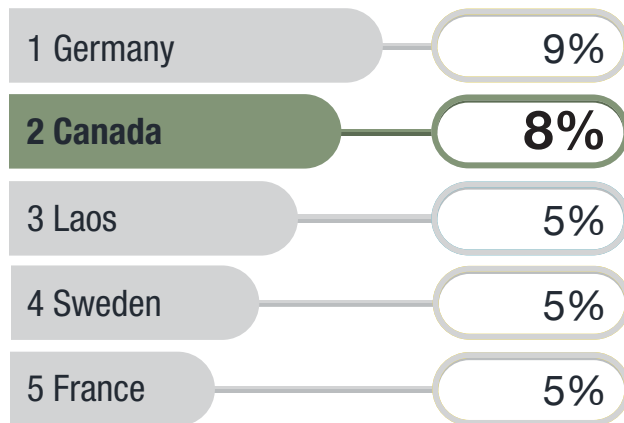
ELECTRICITY

INTERNATIONAL CONTEXT

World production – 29,270 TWh (2022)



World exports – 833 TWh (2022)



TRADE (2023)

All Canadian electricity trade is with the U.S.

EXPORTS



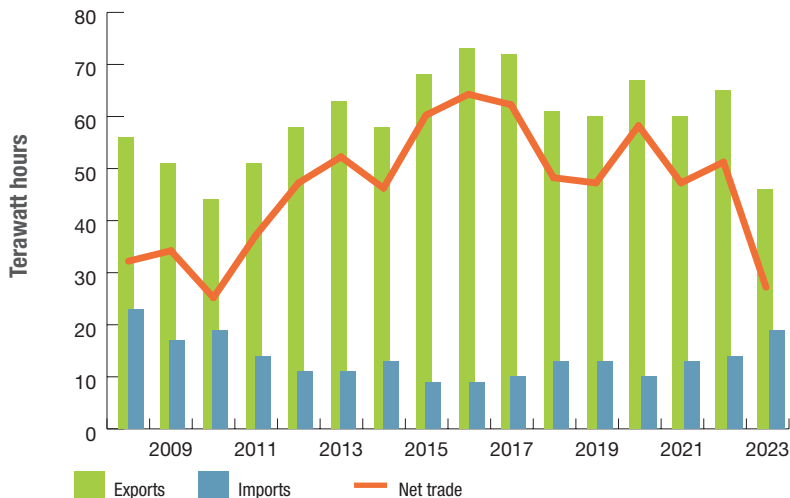
45.9 TWh

IMPORTS



19.2 TWh

CANADA'S ELECTRICITY TRADE WITH THE U.S.*

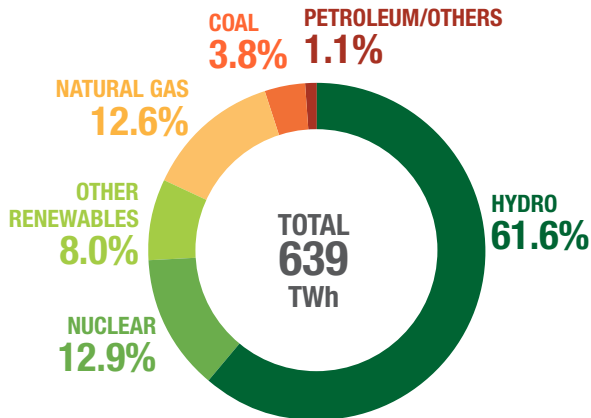


* includes only electricity traded under purchased contracts; excludes electricity transferred under non-financial agreements (e.g. under treaty obligations)

CANADIAN SUPPLY

GENERATION IN CANADA – 639 TWh

GENERATION BY SOURCE, 2022



HYDRO

Canada **61.6%**

Man.	96.9%
N.L.	96.7%
Que.	94.3%
B.C.	90.0%
Y.T.	86.9%
N.W.T.	34.1%
N.B.	27.3%
Ont.	26.7%
Sask.	13.3%
N.S.	9.9%
Alta.	2.6%

NUCLEAR

Canada **12.9%**

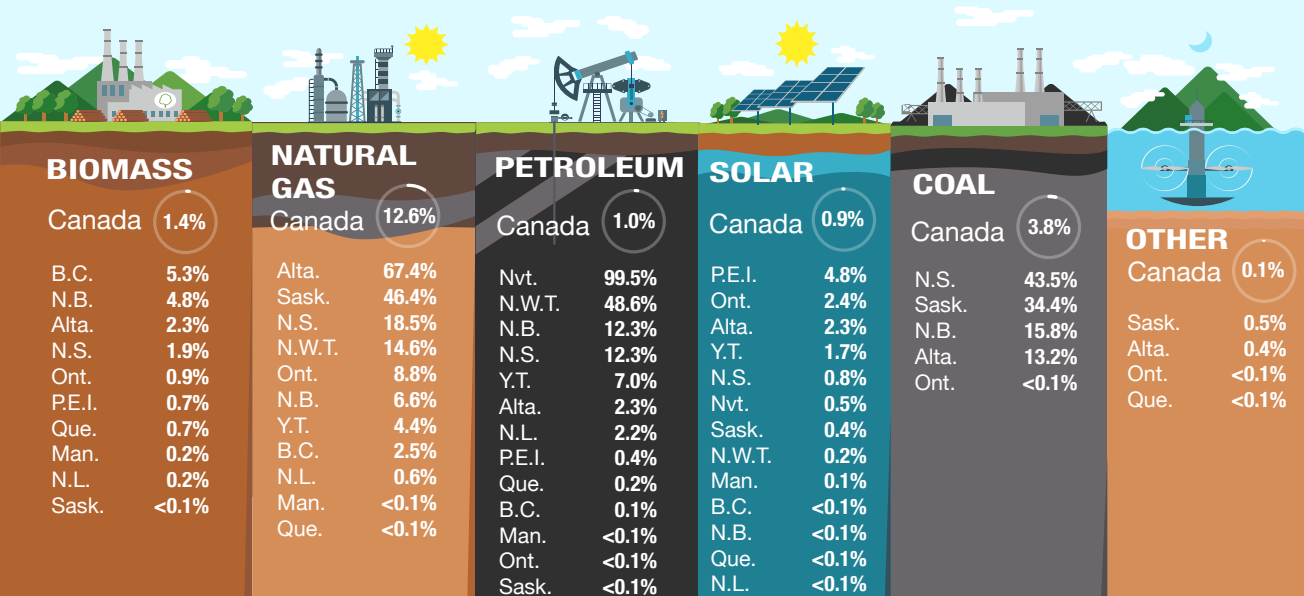
Ont.	52.5%
N.B.	28.1%

WIND

Canada **5.7%**

P.E.I.	94.1%
N.S.	13.1%
Alta.	9.5%
Ont.	8.7%
Sask.	5.0%
N.B.	4.9%
Que.	4.7%
Man.	2.6%
N.W.T.	2.4%
B.C.	2.0%
N.L.	0.4%

PROVINCIAL ELECTRICITY GENERATION BY SOURCE, 2022



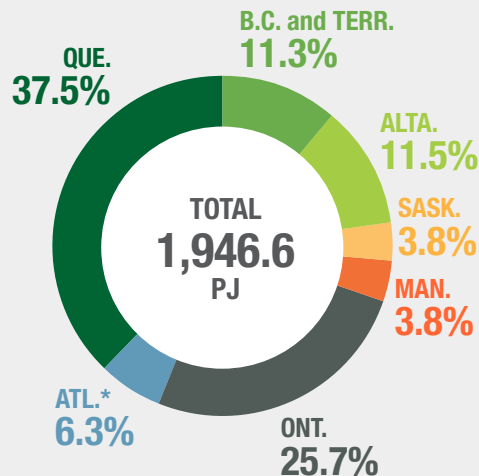
ELECTRICAL ENERGY USE

TOTAL ELECTRICAL ENERGY USE* ROSE TO 1,946.6 PJ IN 2021

Sector	Energy use (PJ)	% of the total
Residential	633.3	32.5%
Commercial	522.8	26.9%
Industrial	747.6	38.4%
Transportation	4.6	0.2%
Agriculture	38.1	2.0%
Total	1,946.6	100%

*secondary energy use

ELECTRICAL ENERGY USE BY PROVINCE, 2021

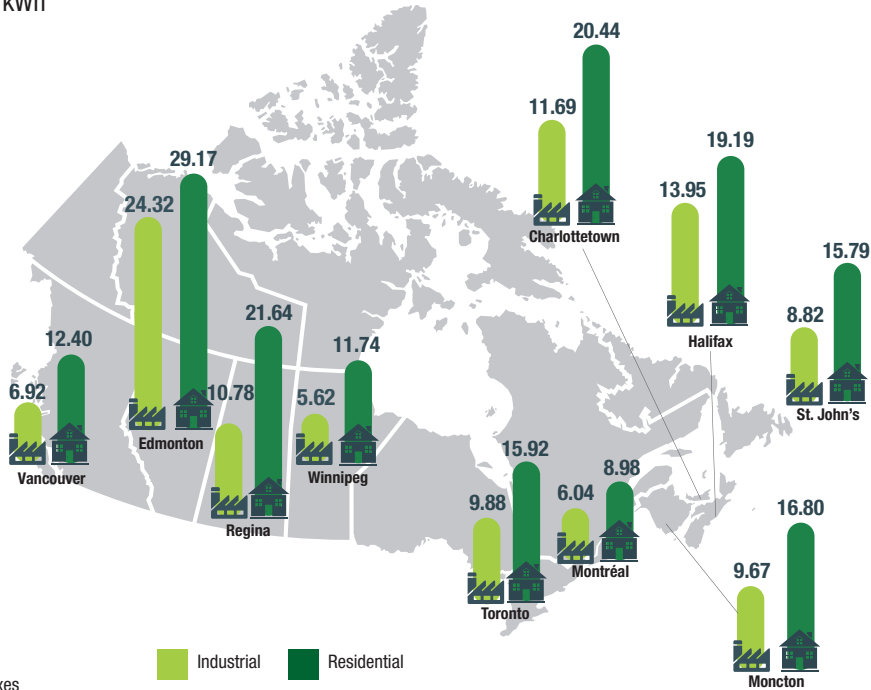


* Atlantic provinces

ELECTRICITY PRICES

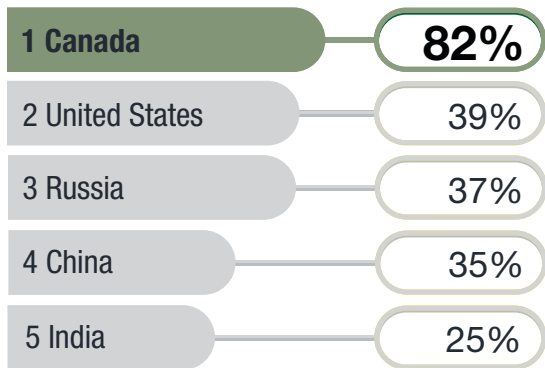
AVERAGE LARGE INDUSTRIAL AND RESIDENTIAL ELECTRICITY PRICES* (AS OF APRIL 2023)

in cents/kWh



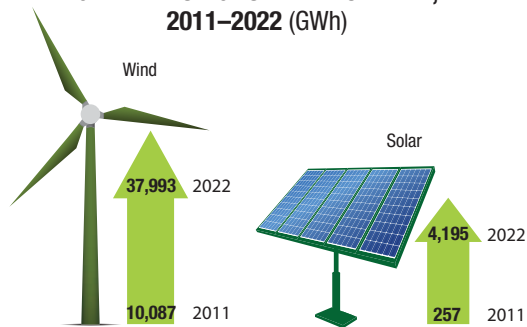
*including taxes

PERCENTAGE OF TOTAL ELECTRICITY FROM NON-EMITTING SOURCES FOR THE TOP FOUR ELECTRICITY-GENERATING COUNTRIES AND CANADA, 2022



- **Renewable electricity generation has increased 14%** between 2011 and 2022, with solar and wind having the largest growth.
- In 2022, **82% of electricity in Canada** came from non-GHG emitting sources. **Hydro** made up **62%**, **nuclear was 13%**, and other renewables were the remaining **8%***.

WIND AND SOLAR NET ELECTRICITY GENERATION GROWTH IN CANADA, 2011–2022 (GWh)



*Parts may not sum to total due to rounding.

GHG SPOTLIGHT: ELECTRICITY

Total electricity emissions **decreased by 63%** from 2000 to 2022 because of increased generation from non-emitting sources.

Coal-fired electricity generation accounted for **4% of generation** and **52% of electricity-related GHG emissions** in 2022.

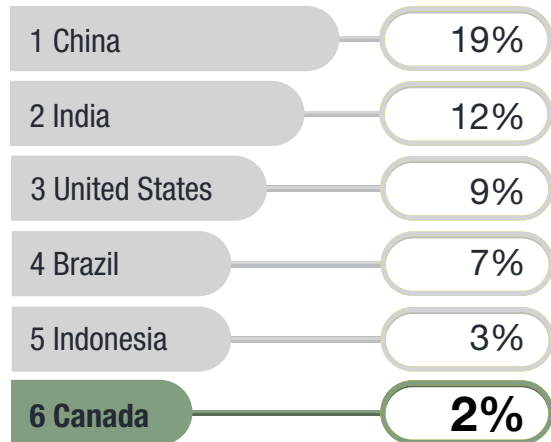
ELECTRICITY SECTOR GHG EMISSIONS FOR CANADA, 2000–2022



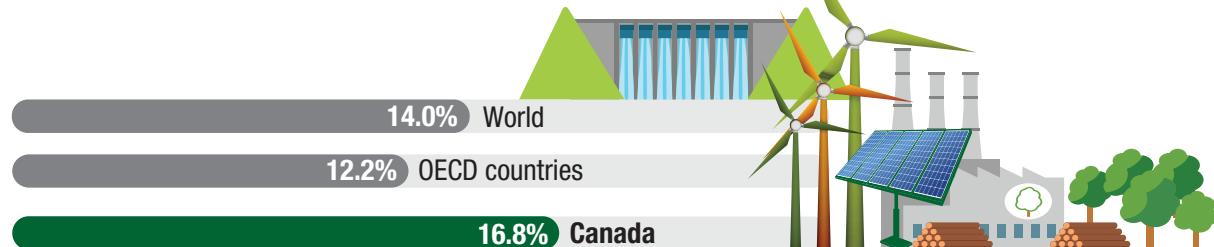
RENEWABLE ENERGY

INTERNATIONAL CONTEXT

World production – 86,666 PJ or 2,070 MTOE (2022)

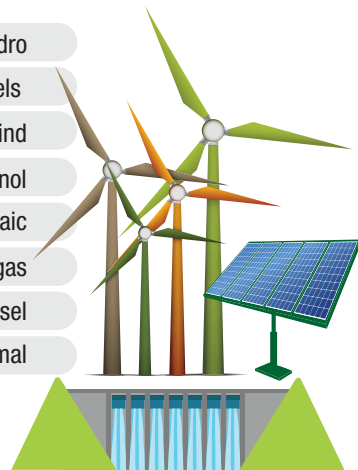
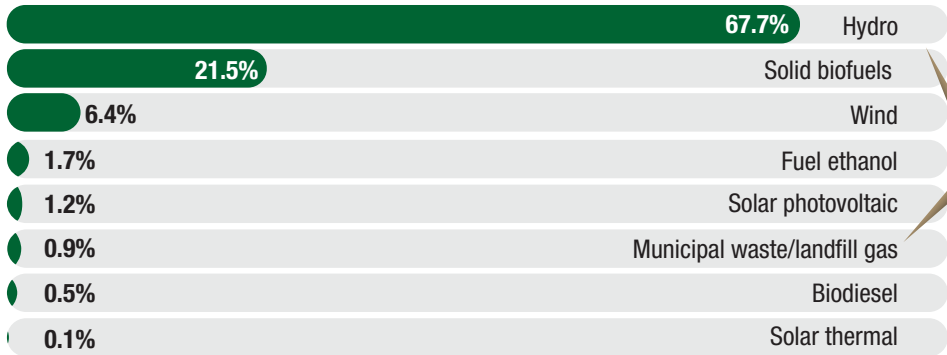


Share of energy supply from renewable sources (2022)



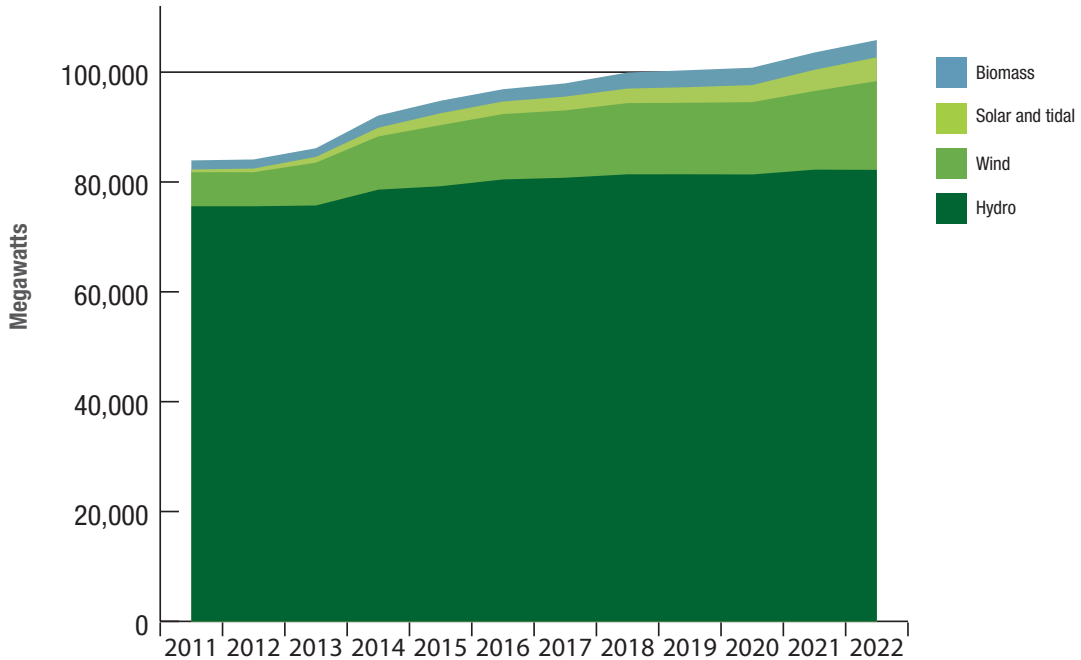
CANADIAN PRODUCTION (2022)

Total renewable energy* – 2,121 PJ or 50.7 MTOE

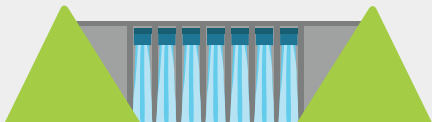


*includes energy consumed for electricity and heat production and for biofuels in the transportation sector

CANADIAN RENEWABLE ELECTRICITY GENERATING CAPACITY



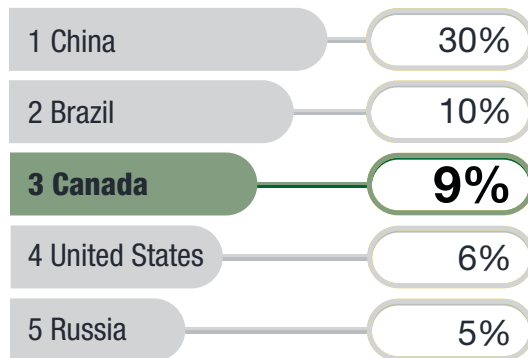
HYDROELECTRICITY



Moving water is the most important renewable energy source in Canada, providing **62%** of Canada's electricity generation. In fact, in 2022, Canada was the third-largest producer of hydroelectricity in the world.

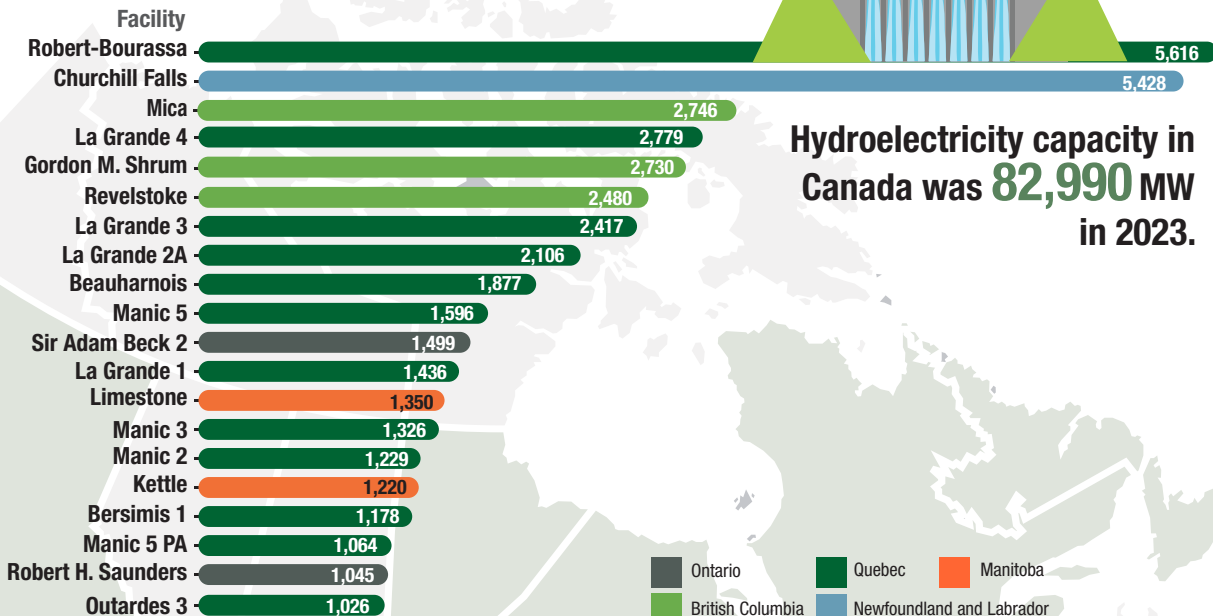
INTERNATIONAL CONTEXT

World generation of hydroelectricity – 4,350 TWh
(2022)



HYDROELECTRICITY CAPACITY IN CANADA

MAJOR HYDRO FACILITIES IN CANADA (≥1,000 MW)



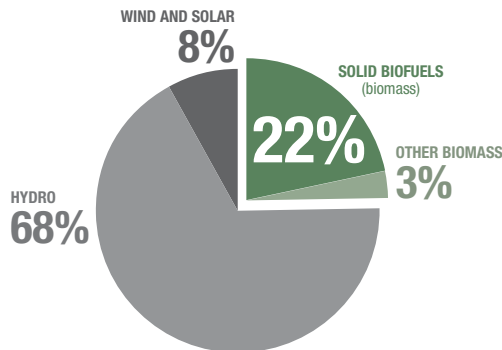
BIOMASS

- Biomass is a renewable energy resource derived from living organisms and/or their by-products.
- In 2023 there were **41 operational** co-generation units at pulp and paper mills and **35 Independent Power Providers (IPP)** using biomass.
- Electrical capacity of pulp and paper co-generation was **1,551 MW**, while heat capacity was **10,154 MW**. IPP capacity for electricity and heat was **831 MW** and **701 MW**, respectively.
- In 2023, there were about **640 operational** bioheat systems with installed capacity of **480 MWth**. **83%** of the biomass heating systems are less than **1 MW** in size.

Biomass* accounts for the **largest share of renewable energy production** in the OECD**, at



In Canada, that share is **25%**.

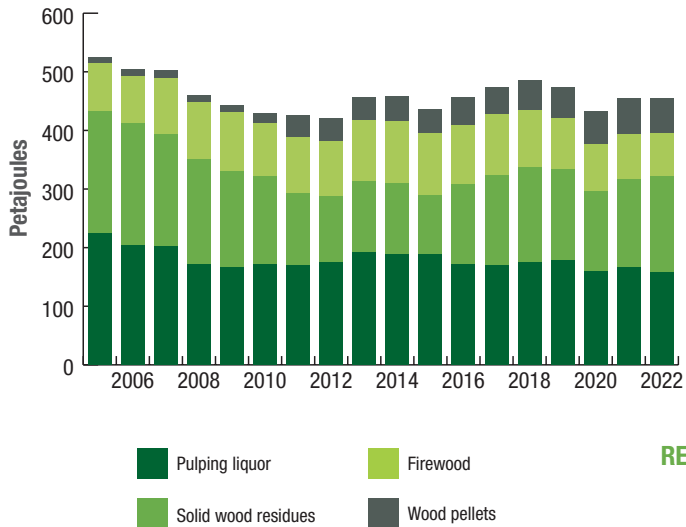


*Includes solid biofuels, liquid biofuels, biogases and renewable municipal waste

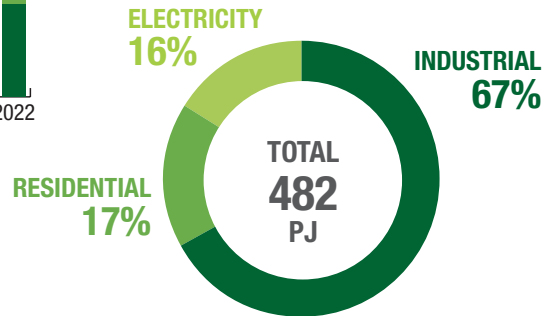
**Organization for Economic Cooperation and Development

CANADIAN PRODUCTION OF SOLID BIOFUELS

CANADIAN PRODUCTION OF SOLID BIOFUELS, 2022



WOOD FUEL USE BY SECTOR, 2022

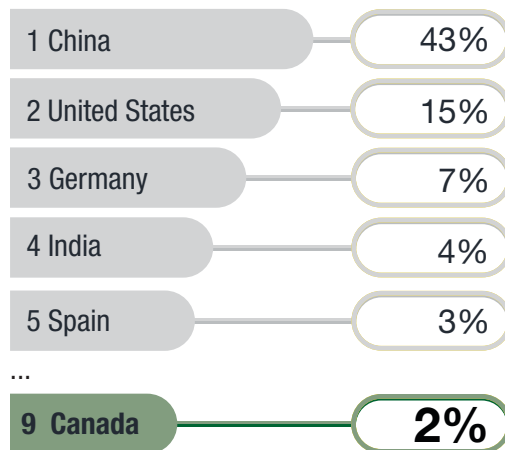


WIND POWER

- Electricity from wind energy is one of the **fastest growing sources** of electricity in the world and in Canada.
- Wind accounted for **5.7%** of electricity generation in Canada in 2022.

INTERNATIONAL CONTEXT

World capacity of wind power – 1,021 GW (2023)



WIND POWER IN CANADA

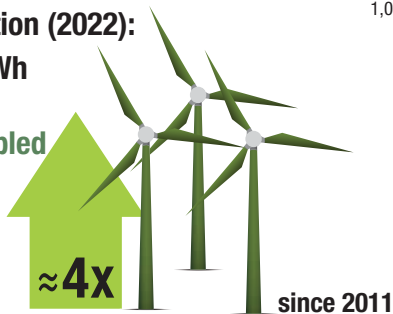
Capacity (2022):

16.2 GW
more than
tripled

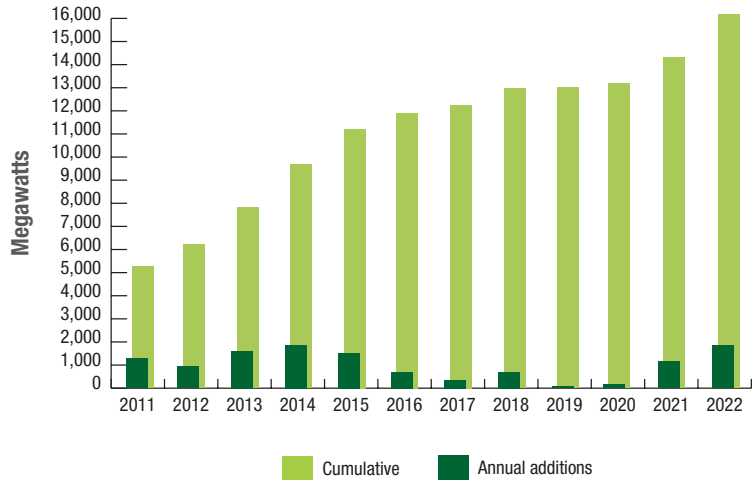


Generation (2022):

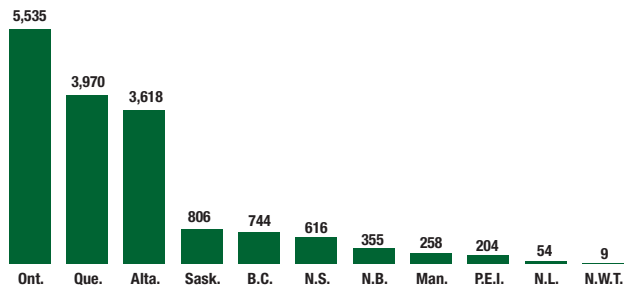
38.0 TWh
nearly
quadrupled



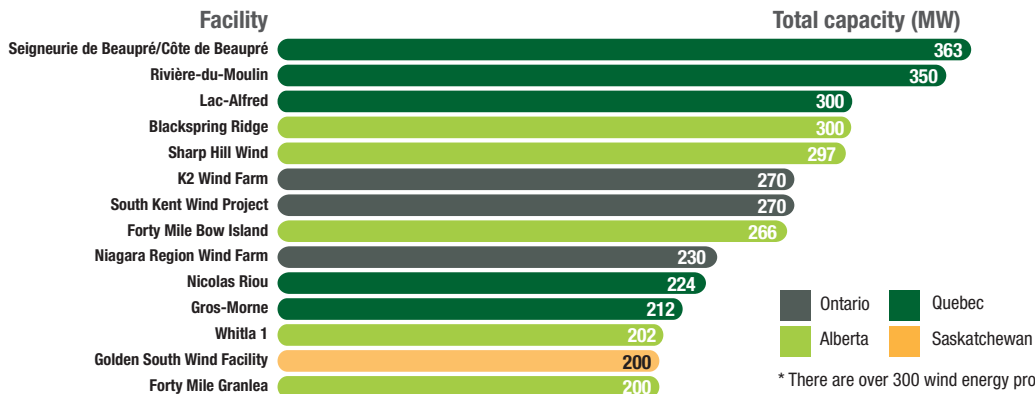
INSTALLED CAPACITY



CAPACITY BY PROVINCE (MW)



LARGEST WIND PROJECTS* (≥200 MW)



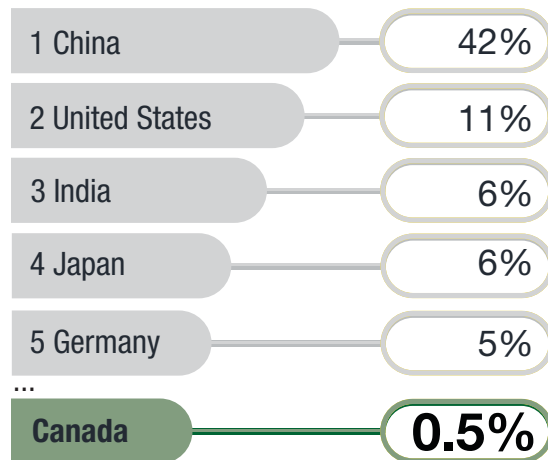
* There are over 300 wind energy projects across Canada. Some projects are part of a larger wind farm.

SOLAR PHOTOVOLTAIC

- Solar power is the conversion of energy from sunlight into electricity. Solar PV is rapidly becoming an economical, renewable technology to harness renewable energy from the sun.

INTERNATIONAL CONTEXT

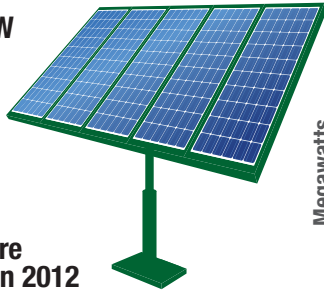
World capacity of solar PV – 1,581 GW (2023)



SOLAR PV IN CANADA

Capacity (2022):

4,323 MW



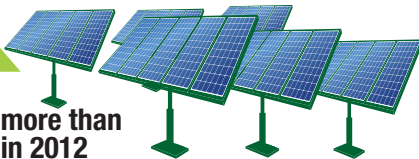
6.6x more than 2012

Generation (2022):

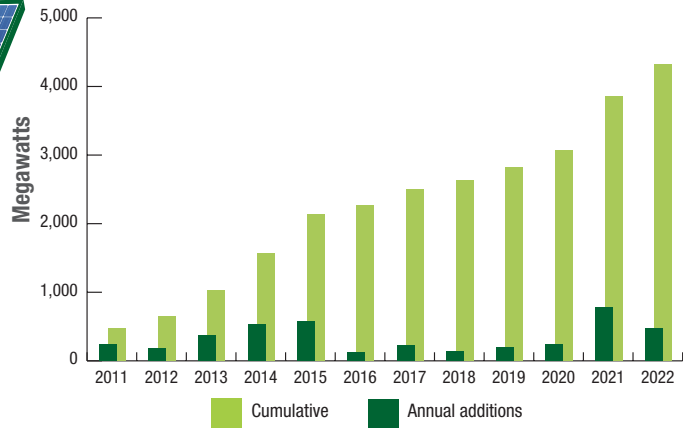
4.2 TWh



16x more than in 2012



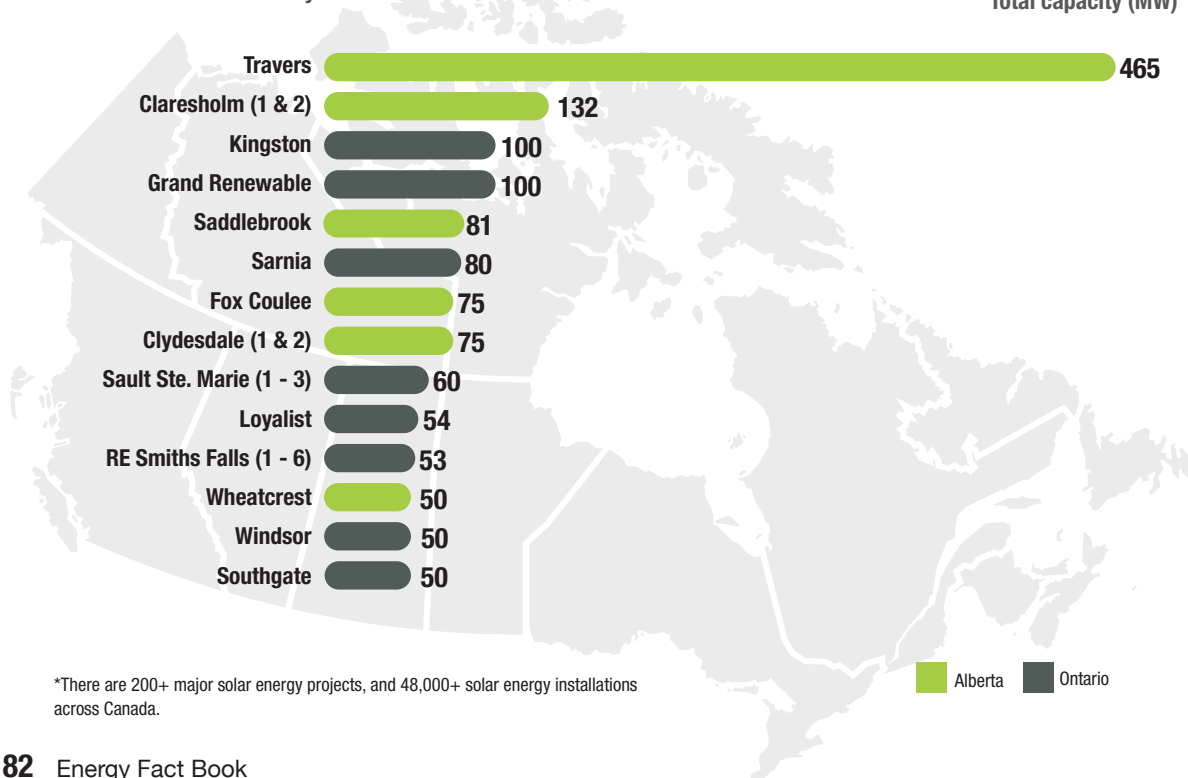
INSTALLED CAPACITY



LARGEST SOLAR PROJECTS* (≥ 50 MW)

Facility

Total capacity (MW)

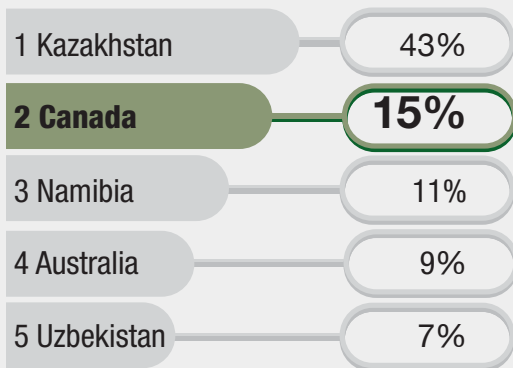


URANIUM

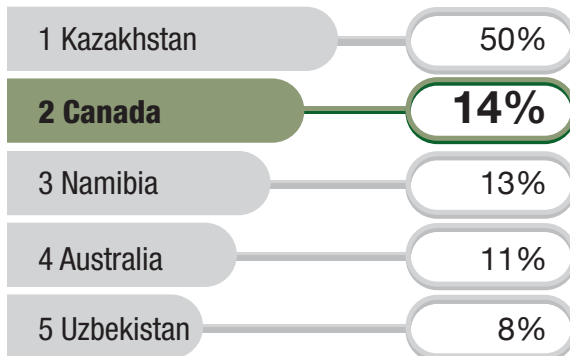
- Uranium is a silvery-white metal and a primary energy source. After raw uranium is mined and milled, it is **processed to make fuel for nuclear reactors** to generate electricity.

INTERNATIONAL CONTEXT

World production – 49.4 kt (2022)



World exports – 42.6 kt (2022)



World known recoverable resources – 6.1 Mt (2021)



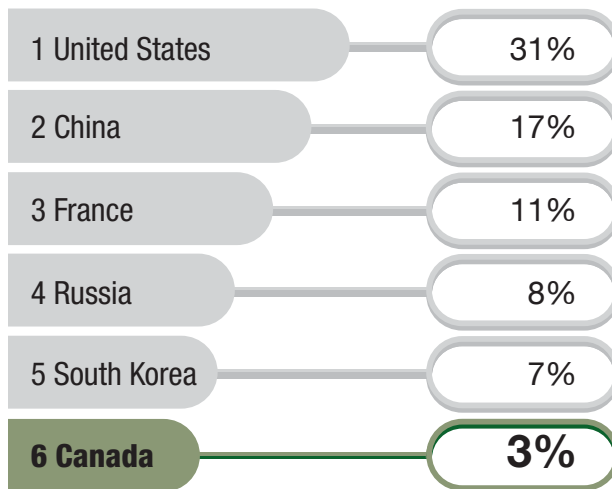
NUCLEAR POWER

- Nuclear energy is the second largest contributor of non-emitting electricity in Canada. In 2022, nuclear energy

provided approximately **13%** of **Canada's total electricity needs** (52% in Ontario).

INTERNATIONAL CONTEXT

World generation – 2,487 TWh (2022)



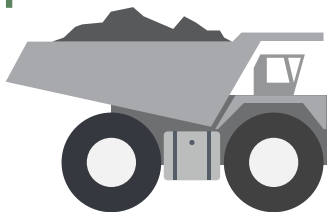
CANADIAN SUPPLY AND DEMAND (2022) URANIUM

Canadian production **7.4 kt**

All uranium comes from mines in Saskatchewan.

VALUED AT
about

\$1.1 billion



80% of production was available for export.

Based on long-term contracts*, uranium sold by Canada is destined for:

- 1) North America/Latin America **58%**
- 2) Europe **26%**
- 3) Asia **16%**

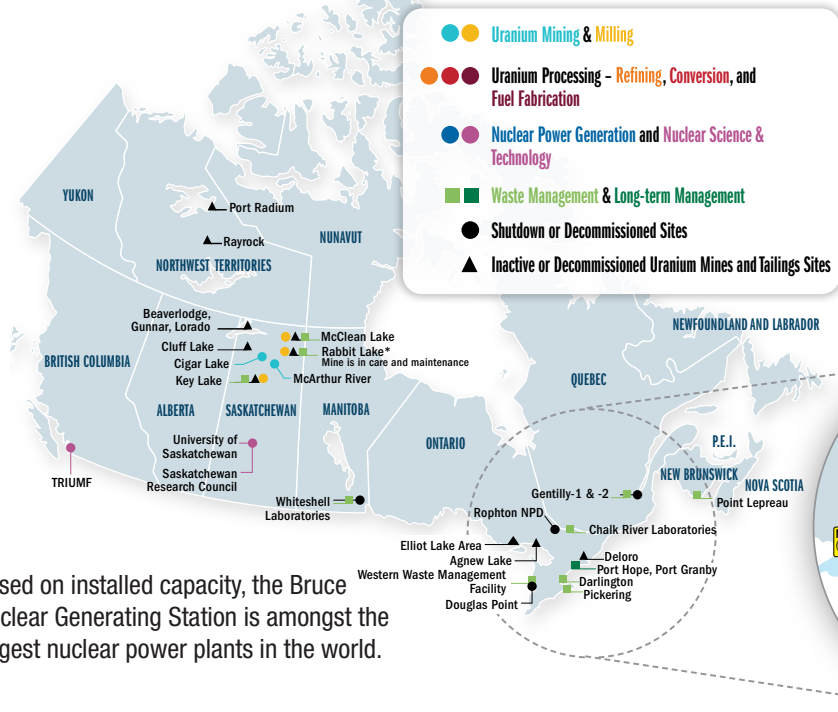
* These values can vary based on changes in regional demand.

25% of uranium purchased by U.S. nuclear reactors in 2023 came from Canada, making Canada the largest foreign supplier of uranium to the U.S.

DOMESTIC USE: 20% of production

Used in Canada's CANDU reactors (Ontario and New Brunswick), including the Bruce Generating Station, amongst the world's largest operating nuclear facilities.

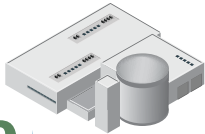
Across the country, nuclear power is generated from uranium that has been mined, milled and processed.



Based on installed capacity, the Bruce Nuclear Generating Station is amongst the largest nuclear power plants in the world.

CANDU NUCLEAR REACTORS

- **Canada has developed a unique nuclear reactor technology called CANDU**, for CANada Deuterium Uranium. Canada is one of roughly half a dozen countries that offer domestically designed reactors to the open commercial market.
- The CANDU reactor is a pressurized heavy water reactor (PHWR) that uses heavy water (deuterium oxide) as a moderator and coolant and natural uranium for fuel. The majority of power reactors in use in the world are light water reactors (LWR), which use normal water as the moderator and coolant and enriched uranium for fuel.
- There are 19 CANDU reactors operating in Canada, and nine operating in five other countries. These 28 reactors represent nearly 7% of global reactors and 5% of global nuclear electricity capacity (18.7 GWe).
- CANDU reactor refurbishment in Ontario is one of the largest infrastructure projects in Canada and will extend the life of Ontario's nuclear fleet past mid-century.



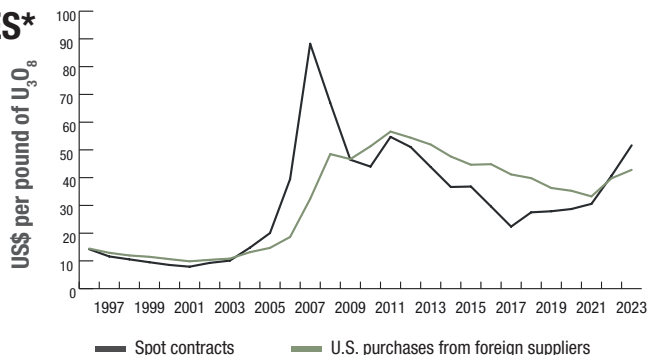
9 CANDU reactors
are in operation outside of Canada.



GROSS ELECTRICAL OUTPUT OF NUCLEAR POWER PLANTS IN CANADA

Facility	Province	Gross Electrical Output (MW)	Units
Darlington	Ontario	3,736	4
Bruce B	Ontario	3,507	4
Bruce A	Ontario	3,437	4
Pickering B	Ontario	2,160	4
Pickering A	Ontario	1,084	2
Point Lepreau	New Brunswick	705	1

URANIUM - PRICES*



* The majority of Canadian uranium production is sold by long-term contract, as opposed to the spot market.

BIOFUELS AND TRANSPORTATION

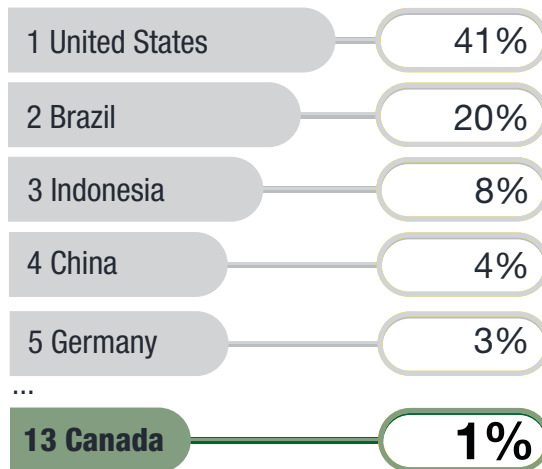
LIQUID BIOFUELS

- Liquid biofuels are enhanced biomass-derived fuels that can take the form of a liquid such as ethanol or renewable diesel fuels. The liquid biofuels are mixed with traditional gasoline and diesel to reduce the overall GHG emissions associated with the blended fuel.
- The federal *Renewable Fuels Regulations* require fuel producers and importers to have an average renewable content of **at least 5%** based on the **volume of gasoline** that they produce or import and **at least 2%** of the **volume of diesel fuel** that they produce and import.*

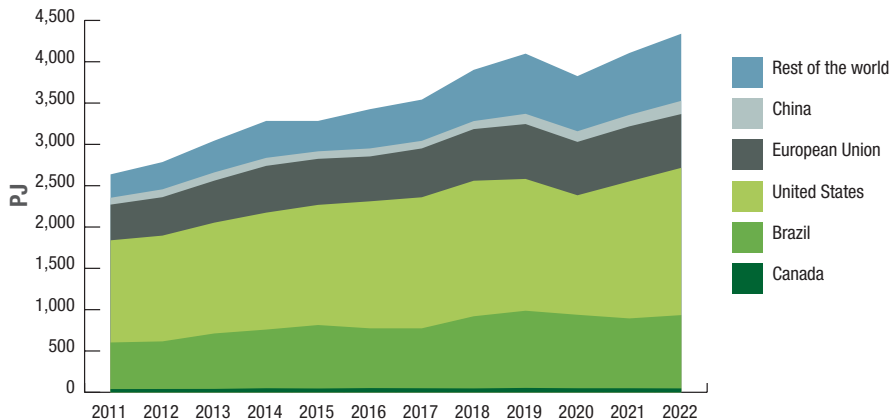
* Heating distillate oil volumes for space-heating purposes are excluded from the diesel regulations.

INTERNATIONAL CONTEXT

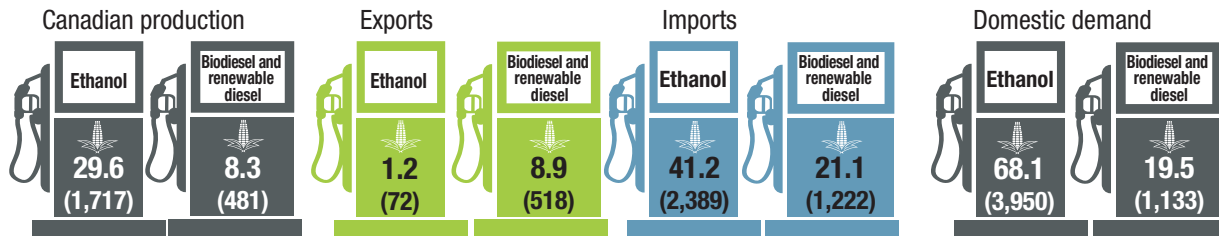
World production of biofuels – 4,340 PJ (2022)



WORLD BIOFUELS PRODUCTION

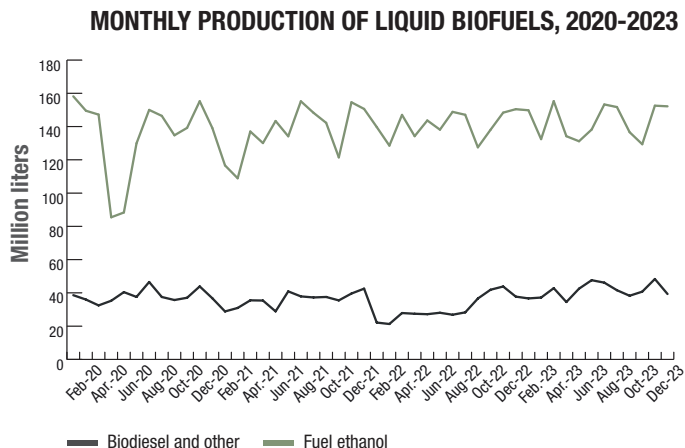


CANADIAN SUPPLY AND DEMAND (2023) - MB/D (MILLION LITRES)



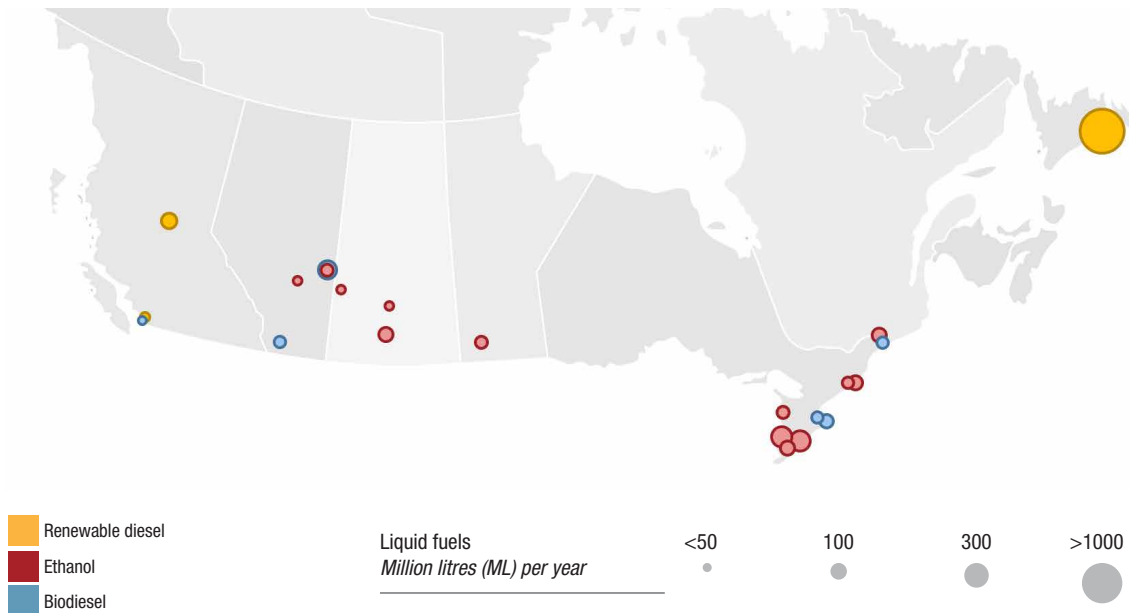
CANADIAN BIOFUEL PRODUCTION

- Liquid biofuels are made of **feedstocks such as cereal grains and vegetable oils**.
- In 2023, **4.1 million tonnes** of cereal grain, and **420 thousand tonnes** of vegetable oil were used in domestic production of biofuels.
- Canada produced **1.7 billion liters of fuel ethanol** and **500 million liters of biodiesel and other products** in 2023.
- Co-products are secondary goods that are generated during the biofuel manufacturing process and can be sold or reused. Biofuel production generated **1.5 million tonnes of co-products in 2023**, primary distillers grains which can be used as animal feed.

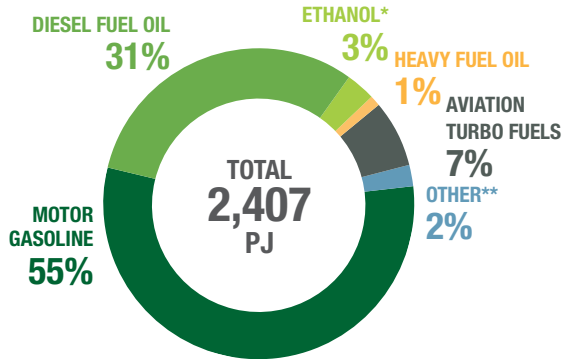


Currently the **majority of liquid biofuel facilities** in Canada are **located in southern Ontario and Saskatchewan**. The largest facility is located in Newfoundland and Labrador.

BIOFUEL PRODUCTION CAPACITY (2024)



FUEL MIX OF THE TRANSPORTATION SECTOR, 2021

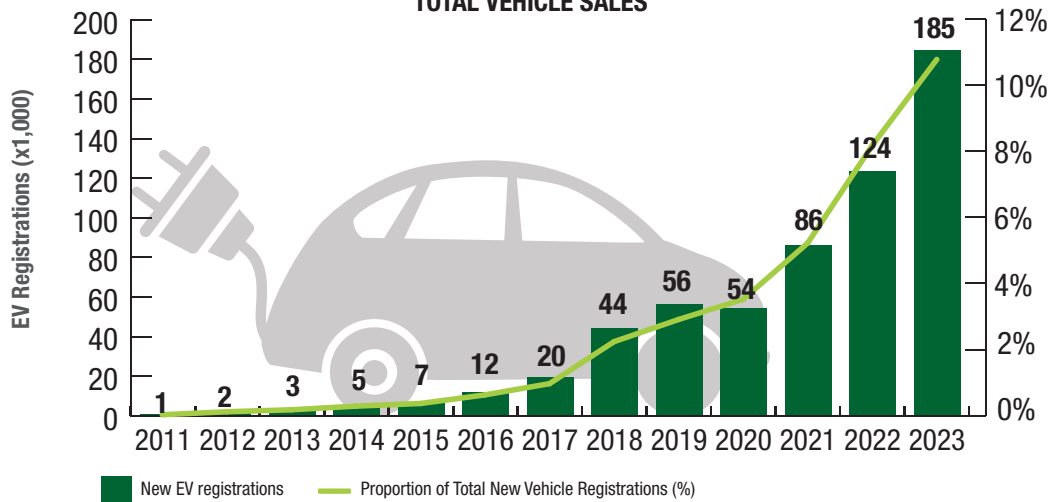


- Total transportation energy use **increased 6%** from 2000 to 2021.
- Energy efficiency improvements in the transportation sector saved Canadians **456 PJ** of energy and over **\$16 billion** in energy costs in 2021.
- Passenger transportation contributes **47%** to the total emissions, freight emissions are **47%**, and off-road emissions are **6%**.

* The ethanol proportion is estimated based on production data.

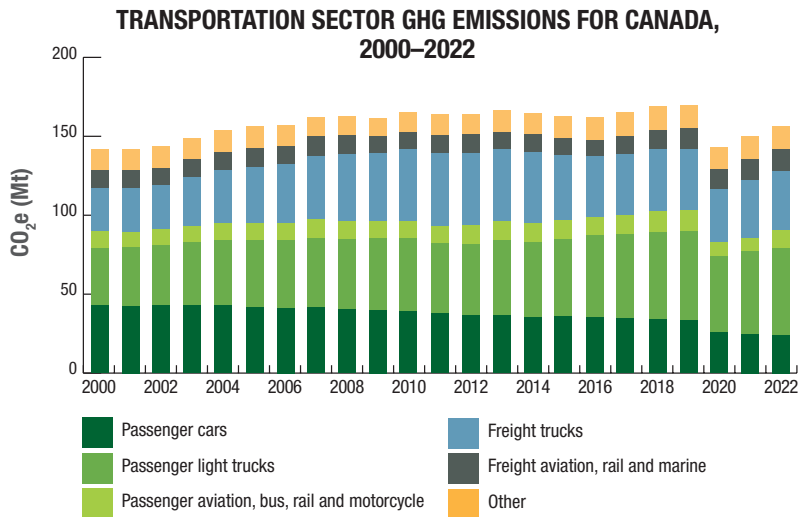
** The category "Other" includes electricity, natural gas, biodiesel fuel oil, light fuel oil, aviation gasoline and propane. Parts may not sum to total due to rounding.

PLUG-IN ELECTRIC VEHICLE REGISTRATIONS PORTION OF TOTAL VEHICLE SALES



- In 2023, electric vehicle (EV) registrations made up **10.8% of total vehicle registrations**.
- Over **184,000 plug-in EVs** were **registered** in 2023, over nine times the number of registrations as in 2017. Sales are highest in the provinces of Quebec, British Columbia and Ontario.

GHG SPOTLIGHT: TRANSPORTATION



- **Transportation GHG emissions** (from passenger, freight, and other forms of transport) **increased 4%** from 2020 to 2022, reflecting a gradual rebound from the pandemic. Despite the increase, transportation emissions were 8% below their pre-pandemic level in 2019.

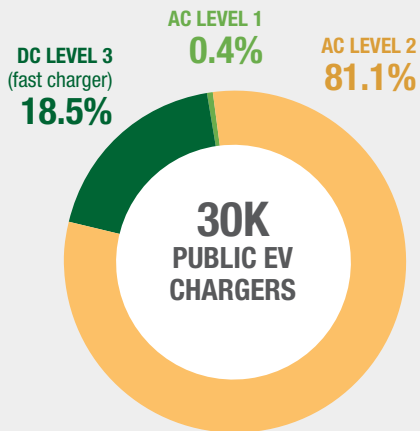
ELECTRIC VEHICLE CHARGING

EV chargers deliver electricity to the on-board batteries of both **battery electric vehicles (BEV)** and **plug-in hybrid electric vehicles (PHEVs)**. There are two main types of EV chargers: **alternating current (AC) chargers** provide electricity to the vehicle via Level 1 and Level 2 chargers. **Direct current (DC) chargers**, also known as **Level 3 fast chargers**, provide electricity much more rapidly.

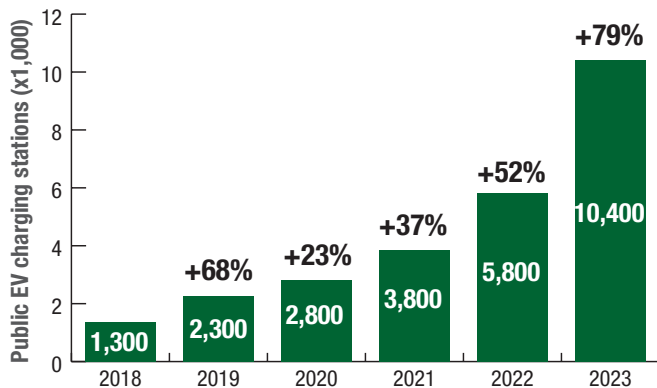
Charger	Input	Outlet type	Estimated charging time*	Estimated range per hour of charging*	Typical uses
AC Level 1	120 V	Standard electrical outlet (for example, phone charger)	8–50+ hours	3-8 km	Home charging and back-up situations
AC Level 2	208/240 V	Special electrical outlet (for example, stove or dryer plug)	4–10 hours	16-50 km	Home charging, charging at businesses and public spaces
DC Level 3 (fast charger)	480 V	DC outlet (not found in homes)	25–30 minutes	Up to maximum driving range of vehicle	Charging at dedicated stations, public spaces, and highway corridors

*Estimates assume 80% charging level limit. Time to full charge and range per hour of charging will vary depending on the vehicle, battery, and charger, as well as fluctuating temperatures, battery state, and tire pressure.

TYPES OF EV CHARGERS AT PUBLIC CHARGING STATIONS IN CANADA (2024)*



PUBLIC EV CHARGING STATIONS IN CANADA*



Canada's network of public charging facilities for EVs has expanded rapidly in recent years. In 2024, roughly **17%** of publicly accessible EV charging facilities nationwide supported at least one DC fast charger.

*Total includes publicly accessible stations reserved for patrons of businesses

HYDROGEN

Hydrogen is a versatile energy carrier that can be produced from a variety of feedstocks.

Hydrogen can be converted to electricity through a fuel-cell in electric vehicles and power generation equipment, combusted to produce heat, or used as a feedstock in a range of chemical and industrial processes.

Hydrogen produced via low-carbon production pathways such as electrolysis or natural gas using carbon abatement can be ideal for decarbonizing hard-to-abate sectors such as heavy industry, truck freight or bus transit.



**Versatile
energy carrier**



**Carbon free at
point of use**



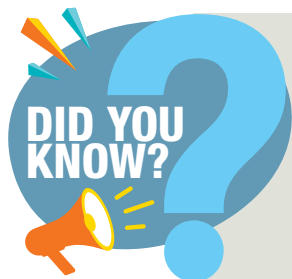
**Can be produced
from variety of
feedstocks**



**Can be
transported
long distances**



**Highest energy
per mass of
any fuel**



The energy in

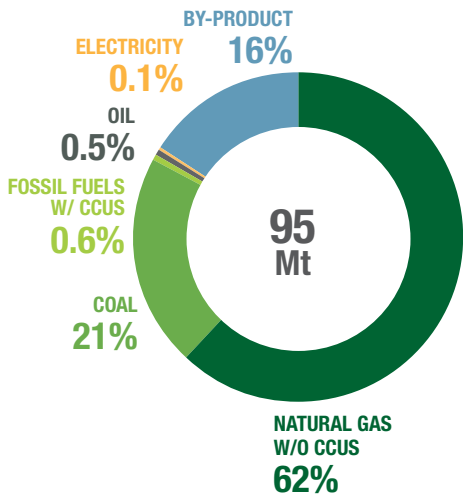
1 kg of hydrogen

is the same as approximately

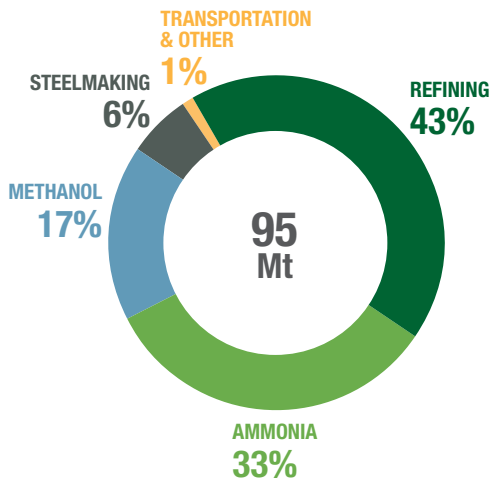
2.8 kg of gasoline.

- The total global production of hydrogen in 2022 was **95 million tonnes (Mt)**, in which **84%** of production was deliberate, and **16%** was produced as a by-product to industrial processes.
- Global demand for hydrogen in 2022 was **95 Mt**. Hydrogen for oil refining and ammonia production were the most common end-uses, accounting for approximately **43%** and **33%** of total demand, respectively.

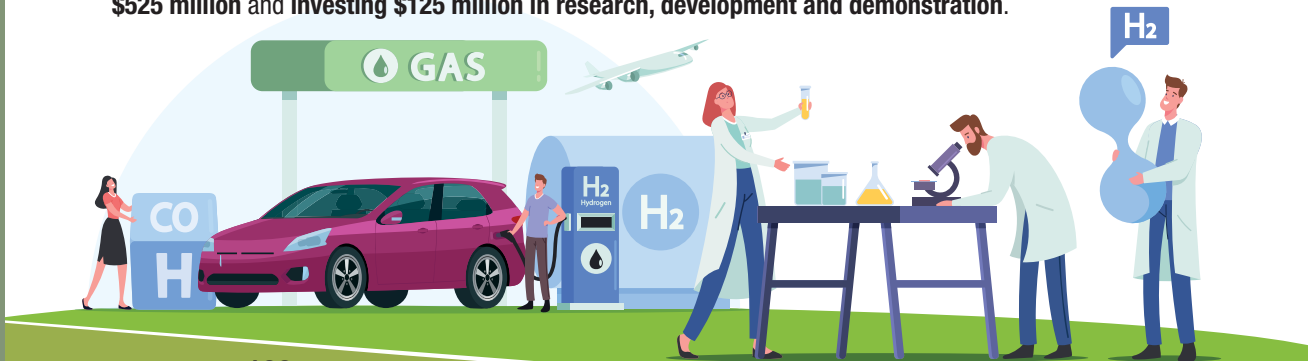
GLOBAL HYDROGEN PRODUCTION BY ENERGY SOURCE, 2022



GLOBAL HYDROGEN DEMAND BY END-USE, 2022



- Canada is **one of the top 10 hydrogen producers in the world today**, with an estimated **4 Mt** of hydrogen produced per year (low-carbon and carbon-intensive).
- Most hydrogen in Canada is produced from natural gas and used by the chemical industry and the oil and gas sector. Some of this hydrogen is now being produced using carbon abatement technologies and interest is growing rapidly in low-carbon production facilities.
- Air Liquide deployed a **20 MW** electrolyser in Canada in 2021, which is **Canada's largest** facility, producing low-carbon hydrogen using electricity to split water. Canada's total deployed low-carbon hydrogen production capacity is currently **over 3,450 tonnes** per year.
- Currently in Canada, there are over **80 electrolysis or natural gas with CCUS production projects** in various forms of initial planning or development, with a **combined potential value over \$100 billion** and **combined potential production capacity over 5 Mt**.
- There are more than **100 established hydrogen and fuel cell companies** spanning the full value chain, **employing almost 4,300 people** in direct jobs within Canada, and generating **revenues in excess of \$525 million** and **investing \$125 million in research, development and demonstration**.



ANNEXES

ANNEX 1: UNITS AND CONVERSION FACTORS

PREFIXES AND EQUIVALENTS

Prefix				
SI/Metric		Imperial	Equivalent	
k	kilo	M	thousand	10^3
M	mega	MM	million	10^6
G	giga	B	billion	10^9
T	tera	T	trillion	10^{12}
P	peta	-	quadrillion	10^{15}

Notes

- Tonne may be abbreviated to “t” and is not to be confused with “T” for tera or trillion.
- Roman numerals are sometimes used with imperial units (this can create confusion with the metric “M”).

CRUDE OIL

Upstream

- reserves usually in barrels or multiples (million barrels)
- production/capacity often in barrels per day or multiples (thousand barrels/day or Mb/d, million barrels/day or MMB/d)
- metric: 1 cubic metre = 6.2898 barrels
- International Energy Agency: uses weight (tonnes) rather than volume

Downstream (petroleum products)

- volumes of refined products usually in litres
- 1,000 litres = 1 cubic metre
- U.S.: 1 U.S. gallon = 3.785 litres

NATURAL GAS

Volume

- reserves/production usually in cubic feet or multiples (billion cubic feet or Bcf, trillion cubic feet or Tcf)
- production/capacity often in cubic feet per day or multiples (Bcf/d, Tcf/d)
- metric: 1 cubic metre = 35.3147 cubic feet

Density

- 1 million t LNG = 48.0279 billion cubic feet

Pricing

Volume-based:

- cents per cubic metre (¢/m³) (customer level in Canada)
- \$ per hundred cubic feet (\$/CCF) (customer level in the U.S.)

Energy content-based:

- \$ per gigajoule (\$/GJ) (company level in Canada)
- \$ per million British thermal units (\$/MMbtu) (company level in the U.S., LNG)

URANIUM

- 1 metric tonne = 1,000 kilograms of uranium metal (U)
- U.S.: in pounds of uranium oxide (U₃O₈)
- 1 lb. U₃O₈ = 0.84802 lb. U = 0.38465 kg U

COAL

- 1 metric tonne = 1,000 kilograms
- U.S.: 1 short ton = 2,000 pounds
- 1 metric tonne = 1.10231 short tons

ELECTRICITY

Capacity

- maximum rated output that can be supplied at an instant, commonly expressed in megawatts (MW)

Total capacity

- installed generator nameplate capacity

Generation/sales

- flow of electricity over time, expressed in watt-hours or multiples:
 - kilowatt-hours or kWh (e.g. customer level)
 - megawatt-hours or MWh (e.g. plant level)
 - gigawatt-hours or GWh (e.g. utility level)
 - terawatt-hours or TWh (e.g. country level)

From capacity to generation

- A 1-MW unit operating at full capacity over one hour generates 1 MWh of electricity
- Over one year, this unit could generate up to 8,760 MWh (1 MW × 24 hr × 365 days)

- Units are rarely used at full capacity over time because of factors such as maintenance requirements, resource limitations and low demand
- “Capacity factor” is the ratio of actual generation to full capacity potential

ENERGY CONTENT

Rather than using “natural” units (e.g. volume, weight), energy sources can be measured according to their energy content – this allows comparison between energy sources

- metric: joules or multiples (gigajoules or GJ, terajoules or TJ, petajoules or PJ)
- U.S.: 1 British thermal unit (BTU) = 1,055.06 joules
- IEA: energy balances expressed in oil equivalent: :
 - thousand tonnes of oil equivalent (ktoe)
 - million tonnes of oil equivalent (Mtoe)

Typical values

- 1 m³ of crude oil = 39.0 GJ
- 1,000 m³ of natural gas = 38.3 GJ
- 1 MWh of electricity = 3.6 GJ
- 1 metric tonne of coal = 29.3 GJ
- 1 metric tonne of wood waste = 18.0 GJ
- 1 metric tonne of uranium = 420,000 GJ to 672,000 GJ

ANNEX 2: ABBREVIATIONS

AC	alternating current	EIA	Energy Information Administration (U.S.)
AECO	Alberta Energy Company	EU	European Union
AESO	Alberta Electric System Operator	EV	electric vehicle
AER	Alberta Energy Regulator	FDI	foreign direct investment
B	billion	G7	seven wealthiest major developed nations: Canada, France, Germany, Italy, Japan, U.K. and U.S.
b/d	barrels per day		
Bcf/d	billion cubic feet per day	GDP	gross domestic product
Bcm/d	billion cubic metres per day	GHG	greenhouse gas
BEV	battery electric vehicle	GJ	gigajoule
CANDU	Canada deuterium uranium	GST	Goods and Services tax
CAPP	Canadian Association of Petroleum Producers	GWh	gigawatt hours
CanREA	Canadian Renewable Energy Association	HGL	hydrocarbon gas liquids
CCS	carbon capture and storage	HST	Harmonized sales tax
CCUS	carbon capture, utilization and storage	IEA	International Energy Agency
CDIA	Canadian direct investment abroad	IHA	International Hydropower Association
CEA	Canadian energy assets	kg	kilogram
CER	Canada Energy Regulator	km	kilometre
CFS	Canadian Forest Service	km ²	square kilometre
CO ₂ equivalent	carbon dioxide equivalent	kt	kilotonne
CPI	consumer price index	kWh	kilowatt hour
CPL	cents per litre	lb.	pound
DC	direct current	L	litre
ECCC	Environment and Climate Change Canada	LCOE	levelized cost of electricity
ECTPEA	Environmental and Clean Technology Products Economic Account	LNG	liquefied natural gas
		LPG	liquefied petroleum gases
EGS	enhanced geothermal system	LWR	light water reactor

m	metre
m ²	square metre
m ³	cubic metre
Mb/d	thousand barrels per day
MJ	megajoule
MMb/d	million barrels per day
MMcf/d	million cubic feet per day
MMbtu	million British thermal units
Mt	million tonnes; megatonne
Mtoe	million tons of oil equivalent
MW	megawatt
NGCC	natural gas combined cycle
NGL	natural gas liquids
NRCan	Natural Resources Canada
OEE	NRCan Office of Energy Efficiency
NRSA	Natural Resources Satellite Account
NSERC	National Science and Engineering Research Council of Canada
NYMEX	New York Mercantile Exchange
OECD	Organisation for Economic Co-operation and Development
PHEV	plug-in hybrid electric vehicle
PHWR	pressurized heavy water reactor
PJ	petajoule
Pkm	passenger-kilometre

Provinces

Alta.	– Alberta
B.C.	– British Columbia
Man.	– Manitoba
N.B.	– New Brunswick
N.L.	– Newfoundland and Labrador
N.S.	– Nova Scotia
N.W.T.	– Northwest Territories
Ont.	– Ontario
P.E.I.	– Prince Edward Island
Que.	– Quebec
Sask.	– Saskatchewan
Y.T.	– Yukon
Atl.	– Atlantic provinces
Terr.	– Territories
P/T	provincial/territorial
PV	photovoltaic
RD&D	research, development and demonstration
R&D	research and development
RPP	refined petroleum products
SDTC	Sustainable Development Technology Canada
StatCan	Statistics Canada
States	
Ala.	– Alabama
Ariz.	– Arizona
Ark.	– Arkansas
Calif.	– California

Colo. – Colorado		Okla.– Oklahoma
Conn. – Connecticut		Ore. – Oregon
Del. – Delaware		Penn. – Pennsylvania
D.C. – District of Columbia		R.I. – Rhode Island
Fla. – Florida		S.C. – South Carolina
Ga. – Georgia		S.D. – South Dakota
Ill. – Illinois		Tenn. – Tennessee
Ind. – Indiana		Tex. – Texas
Kans. – Kansas		Vt.– Vermont
Ky. – Kentucky		Va. – Virginia
La. – Louisiana		Wash. – Washington
Me. – Maine		W.Va. – West Virginia
Md. – Maryland		Wis. – Wisconsin
Mass. – Massachusetts		Wyo. – Wyoming
Mich. – Michigan	Tcf	trillion cubic feet
Minn. – Minnesota	Tcm	trillion cubic metres
Miss. – Mississippi	Tkm	tonne-kilometre
Mo. – Missouri	t	tonnes
Mont. – Montana	TPES	total primary energy supply
Nebr.– Nebraska	TWh	terawatt-hour
Nev. – Nevada	TSX	Toronto Stock Exchange
N.H. – New Hampshire	U.K.	United Kingdom
N.J. – New Jersey	U.S.	United States
N.Mex. – New Mexico	US\$	United States dollars
N.Y.– New York	V	volt
N.C.– North Carolina	WCS	Western Canadian Select
N.D. – North Dakota	WTI	West Texas Intermediate

ANNEX 3: SOURCES

SECTION 1: KEY ENERGY, ECONOMIC AND ENVIRONMENTAL INDICATORS

- **ENERGY PRODUCTION AND SUPPLY**
 - **Global Primary Energy Production:** IEA. *Annual Database*
 - **Global Energy Rankings:** IEA. *Annual Database*; IHA. *World Hydropower Outlook*
 - **Primary Energy Production by Region & Source:** StatCan. Tables 25-10-0020-01, 25-10-0029-01, 25-10-0030-01, 25-10-0031-01, and 25-10-0082-01; NRCan OEE. *National Energy Use Database*; ECCC. *Special tabulations*
 - **Canada's energy supply:** IEA. *Annual Database*
 - **Primary and secondary energy use:** NRCan OEE. *National Energy Use Database*
- **ECONOMIC CONTRIBUTION**
 - **GDP:** StatCan. Tables 38-10-0285-01, 36-10-0221-01, 36-10-0103-01 and 36-10-0400-01; StatCan. *Custom tabulations*; NRCan estimates
 - **Employment:** StatCan. Tables 38-10-0285-01, 36-10-0480-01 and 14-10-0023-01; StatCan. *Custom tabulations*; NRCan estimates
 - **Energy Trade:** StatCan. *International Merchandise Trade Database*; IEA. *Annual Database*; U.S. EIA. *U.S. Imports by Country of Origin Trade Database*; U.S. EIA. *U.S. Imports by Country of Origin*; U.S. Bureau of Economic Analysis. *Gross Domestic Product by State*
 - **Government Revenues:** StatCan. Tables 33-10-0500-01 and 25-10-0065-01; CAPP. *Statistical Handbook, Table 01-01*; geoLOGIC Systems Ltd. *Daily Oil Bulletin. Land sales data*;

Canada-Newfoundland and Labrador Offshore Petroleum Board; *Annual Report*; Canada-Nova Scotia Offshore Petroleum Board. *Annual Report*

- **ENERGY AND GHG EMISSIONS**
 - **Emissions by Sector:** ECCC. *National Inventory Report*; Climate Watch. *Data Explorer*
 - **Indexed Trend in GHG Emissions:** ECCC. *National Inventory Report*; StatCan. Tables 17-10-0005-01 and 36-10-0434-03

SECTION 2: INVESTMENT

- **Capital expenditures:** StatCan. Tables 34-10-0035-01, 34-10-0036-01 and 34-10-0040-01
- **Canada's Energy Infrastructure:** StatCan. Table 36-10-0608-01
- **Canada's Major Energy Projects:** NRCan. *Major Projects Inventory*
- **Foreign Direct Investment and Canadian Direct Investment Abroad:** StatCan. Table 36-10-0009-01
- **Foreign Control of Canadian Assets:** StatCan. Tables 33-10-0033-01, 33-10-0005-01 and 33-10-0006-01
- **Canadian Energy Assets:** Compiled by NRCan from S&P Global Market Intelligence and annual financial statements from publicly traded Canadian energy companies
- **Research, Development and Demonstration:** Compiled by NRCan from internal sources
- **Environmental Protection Expenditures:** StatCan. Tables 38-10-0130-01 and 38-10-0132-01

SECTION 3: SKILLS, DIVERSITY AND COMMUNITY

- **Energy Sector Demographics:** StatCan. *NRSA Human Resources*

Module custom tables

- **Energy Affordability:** StatCan. Estimation of Energy Poverty Rates Using the 2021 Census of Population ; StatCan. Table 11-10-0222-01
- **Household Expenditures on Energy:** StatCan. Table 11-10-0222-01
- **Energy Retail Prices:** StatCan. Table 18-10-0004-01 and 18-10-0001-01; IEA. *Annual Database*
- **Energy Reliant Communities:** NRCan analysis based on StatCan 2021 Census Data

SECTION 4: ENERGY EFFICIENCY

- **Energy use, efficiency and trends:** NRCan OEE. *National Energy Use Database*; NRCan estimates

SECTION 5. CLEAN POWER AND LOW CARBON FUELS

• CLEAN TECHNOLOGY AND THE ECONOMY

- **Environmental and clean technology:** NRCan. *2022 Cleantech Industry Survey*; StatCan. Tables 14-10-0023-01, 36-10-0103-01, 36-10-0629-01 and 36-10-0632-01; Toronto Stock Exchange. *TSX & TSXV Listed Companies*

• ELECTRICITY

- **World production and exports:** IEA. *Electricity Information* [note: IEA production/generation data is expressed on a “gross” basis, i.e. before generating station use])
- **Trade:** CER. *Commodity Tracking System*
- **Canadian and provincial supply:** Compiled by NRCan’s Energy Systems Sector from various sources

- **Prices:** Hydro-Québec. *Comparison of Electricity Prices in Major North American Cities*
- **Electricity energy use:** NRCan OEE. *National Energy Use Database*
- **RENEWABLES**
 - **Electricity GHG emissions:** ECCC. *National Inventory Report*
 - **International context – Production:** IEA. *Renewables Information*
 - **International context – share of energy supply:** IEA. *World renewables and waste energy supply*
 - **Domestic production:** IEA. *Renewables Information*
 - **Hydro – international generation:** IEA. *Electricity Information*; IEA. *Energy Balances of OECD Countries*; IEA. *Energy Balances of Non-OECD Countries*
 - **Hydro – capacity in Canada:** WaterPower Canada. *Hydropower Refurbishments and Redevelopments in Canada*
 - **Hydro – facilities and projects:** WaterPower Canada. *Hydropower Refurbishments and Redevelopments in Canada*
 - **Biomass – Renewable balance:** IEA. *Renewables balances*
 - **Biomass – production and facilities:** StatCan. Table 25-10-0031-01; NRCan CFS data compiled from various sources
 - **Biomass – wood fuel use by sector:** StatCan. Tables 25-10-0025-01 and 25-10-0084-01; NRCan estimates
 - **Wind – international context:** Global Wind Energy Council. *Global Wind Report*
 - **Wind – generation and capacity in Canada:** CanREA. *By the Numbers*; NRCan analysis based on various sources
 - **Wind – wind farms:** AESO. *Current Supply Demand Report*; CanREA. *By the Numbers*; Government of Ontario. *Renewable*

Energy Projects Listing; Hydro Québec. *Electricity supply contracts in force in Québec*; SaskPower. *System Map*

- **Solar PV – international context:** IEA Photovoltaic Power Systems Programme. *2024 Snapshot of Global PV Markets*
- **Solar PV – capacity in Canada:** NRCan and CanREA. *National Survey Report of PV Power Applications in Canada - 2022*
- **Solar PV – generation in Canada:** Compiled by NRCan from various sources
- **Solar PV – solar PV farms:** CanREA. *By the Numbers*; AESO. *Current Supply Demand Report*; Government of Ontario. *Renewable Energy Projects Listing*; NRCan analysis based on various sources
- **URANIUM AND NUCLEAR**
 - **World uranium production and exports:** World Nuclear Association. *World Uranium Mining*; NRCan estimates
 - **World known recoverable resources of uranium:** OECD Nuclear Energy Agency and International Atomic Energy Agency. *Uranium: Resource, Production and Demand*; World Nuclear Association. *Supply of Uranium*
 - **World generation of nuclear power:** International Atomic Energy Agency. *Nuclear Power Reactors in the World*
 - **Canadian supply and demand:** World Nuclear Association. *Uranium in Canada*; Cameco. *Annual report*; NRCan estimates
 - **Nuclear in Canada infographic:** NRCan. *Nuclear Energy and Uranium*
 - **Purchases by U.S. nuclear reactors:** U.S. EIA. *Uranium Marketing Annual Report*
 - **CANDU nuclear reactors and nuclear power plants in Canada:** International Atomic Energy Agency. *Power Reactor Information System*; NRCan analysis based on various sources
 - **Spot prices:** U.S. EIA. *Annual Uranium Market Report*

• **BIOFUELS AND TRANSPORTATION**

- **Biofuels – international context:** IEA. *Renewables Information*
- **Biofuels – production, supply and demand:** StatCan. Tables *25-10-0081-01* and *25-10-0082-01*
- **Transportation – Electric vehicle sales:** StatCan. Tables *20-10-0021-01* and *20-10-0024-02*
- **Transportation – Electric vehicle chargers:** NRCan. *Electric vehicle charging – EV charging basics*; NRCan. *Electric Charging and Alternative Fuelling Stations Locator*
- **Transportation – GHG emissions:** ECCC. *National Inventory Report*
- **Hydrogen:** IEA. *Global Hydrogen Review*; NRCan. *Hydrogen Strategy for Canada*

SECTION 6: PETROLEUM, GAS AND COAL

• **PETROLEUM AND THE ECONOMY**

- **GDP and employment:** StatCan. Tables *38-10-0285-01* and *36-10-0480-01*; StatCan. *Special tabulations of the NRSA Human Resources Module*
- **Capital expenditures:** StatCan. Table *34-10-0036-01* and *special tabulations*
- **Exports:** StatCan. *International Merchandise Trade Database*

• **CRUDE OIL**

- **World production and exports:** IEA. *Annual Database*
- **World proved reserves:** Oil and Gas Journal. *Worldwide Look at Reserves and Production*
- **Canadian resources – remaining established reserves:** AER. *Alberta Energy Outlook (ST98)*; CAPP. *Conventional reserves special tabulation*
- **Oil wells in Western Canada:** AER. *ST59: Alberta Drilling*

Activity Monthly Statistics; BCER. *Drilling Data for All Wells in BC [BCOGC-41984]*; Petrinex. *Saskatchewan Public Data*; Province of Manitoba. *Oil & Gas Statistics*

- **Canadian and provincial production:** StatCan. Tables 25-10-0063-01 and 25-10-0014-01; NRCan analysis
- **Canadian Supply and Demand:** StatCan. Tables 25-10-0063-01 and 25-10-0014-01; StatCan. *International Merchandise Trade Database*
- **Trade:** StatCan. Table 25-10-0063-01; StatCan. *International Merchandise Trade Database*; U.S. EIA. *Imports by Country of Origin and Refining and Processing*
- **Oil Sands:** CAPP. *Statistical Handbook, Table 04-14*; StatCan. Tables 34-10-0036-01 and 25-10-0063-01; AER. *Alberta Energy Outlook (ST98)*
- **Prices:** U.S. EIA. Table *Cushing, OK WTI Spot Price FOB*; Sproule. *Price Forecast*
- **Pipelines:** CER. *Crude Oil Pipeline Transportation System*
- **Transportation by Rail:** CER. *Canadian Crude Oil Exports by Rail – Monthly Data*; StatCan. Table 23-10-0062-01
- **Oil Sands Environmental Considerations:** ECCC. *National Inventory Report*; World Resources Institute. *Country Greenhouse Gas Emissions Data*; Alberta Government. *Oil Sands Information Portal*; Alberta Government. *Oil Sands 101*; Alberta Government. *Lower Athabasca Regional Plan*; AER. *Oil Sands Mining Water Use*; AER. *Oil Sands In Situ Recovery Water Use*; AER. *Alberta Mineable Oil Sands Plant Statistics Monthly Supplement (ST39)*; AER. *Alberta In Situ Oil Sands Production Summary (ST53)*; StatCan. Table 25-10-0063-01; NRCan. *Boreal forest data*

• NATURAL GAS

- **World production and exports:** IEA. *World natural gas statistics*
- **World proved reserves:** Oil and Gas Journal. *Worldwide look at reserves and production*
- **Canada and U.S. – Proved reserves:** U.S. EIA. *International Data Browser*; Oil and Gas Journal. *Worldwide look at reserves and production*
- **Canada and U.S. – Marketable and technically recoverable resources:** CER. *Canada’s Energy Future 2023, Macro Indicators*; U.S. EIA. *Annual Energy Outlook 2023*; U.S. EIA. *Shale Gas, Proved Reserves as of Dec. 31*; NRCan analysis
- **Canadian average marketable production:** CER. *Canada’s Energy Future 2023, Figure Data (Excel)*; StatCan. Table 25-10-0055-01
- **U.S. average marketable production:** U.S. EIA. *Annual Energy Outlook 2023*; U.S. EIA. *Dry Natural Gas Production, Annual*
- **LNG imports, Canada:** StatCan. *Canadian International Merchandise Trade Database*
- **LNG imports, U.S.:** U.S. EIA. *U.S. Liquefied Natural Gas Imports (MMcf)*
- **LNG exports, Canada:** CER. *Commodity Tracking System*
- **LNG exports, U.S.:** U.S. EIA. *Liquefied U.S. Natural Gas Exports (MMcf)*
- **Natural gas wells in Western Canada:** AER. *ST59: Alberta Drilling Activity Monthly Statistics*; BCER. *Drilling Data for All Wells in BC [BCOGC-41984]*; Petrinex. *Saskatchewan Public Data*; Province of Manitoba. *Oil & Gas Statistics*
- **Canadian and U.S. marketable production of natural gas:** StatCan. Table 25-10-0055-01; U.S. EIA. *Dry Natural Gas Production, Annual*

- **Canadian trade of natural gas:** CER. *Commodity Tracking System*; StatCan. *Canadian International Merchandise Trade Database*
- **Marketable production by province:** StatCan. Table 25-10-0055-01
- **Upstream prices:** Sproule. *Sproule Price Forecast*; StatCan. Table 33-10-0163-01
- **Pipelines:** CER. *Facilities we regulate*
- **Natural gas energy use:** NRCan OEE. *National Energy Use Database*
- **HGLs**
 - **Processing plant production:** StatCan. Table 25-10-0036-01
 - **Refinery production:** StatCan. *Monthly Refined Petroleum Product Survey*
 - **Shares of NGL Production by province:** CAPP. *Custom report for NRCan*
 - **NGLs end use:** NRCan OEE. *National Energy Use Database*
 - **Exports:** CER. *Commodity Tracking System*
 - **Imports:** StatCan. *International Merchandise Trade Database*
- **RPPs**
 - **Canadian refineries:** Compiled by NRCan from various sources
 - **Supply and Demand:** StatCan. Table 25-10-0081-01
 - **Crude oil shipped to domestic refineries:** StatCan. Table 25-10-0063-01
 - **Domestic consumption by product:** StatCan. Table 25-10-0081-01; NRCan analysis
 - **Trade:** StatCan. Table 25-10-0081-01; StatCan. *International Merchandise Trade Database*. U.S. EIA. *U.S. Imports by Country of Origin for Petroleum and Other Liquids*
- **Gasoline prices:** Kalibrate Technologies Ltd. *Petroleum price data, Pricing analytics: Margin*
- **Refinery capacity:** Oil Sands Magazine. *List of Canadian Refineries; NRCan analysis*
- **COAL**
 - **World proved reserves:** U.S. EIA. *Coal Reserves*
 - **World production and exports:** IEA. *Coal Information*
 - **Canadian supply and demand:** IEA. *Coal Information*; StatCan. *International Merchandise Trade Database; NRCan analysis*
 - **Canadian Production:** StatCan. Table 25-10-0046-01; NRCan analysis
 - **Electricity Generation:** StatCan. Tables 25-10-0017-01 and 25-10-0084-01; Data compiled by NRCan from StatCan and other public sources
- **GHG EMISSIONS FROM PETROLEUM**
 - **GHG Emissions by Sector:** ECCC. *National Inventory Report*

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