

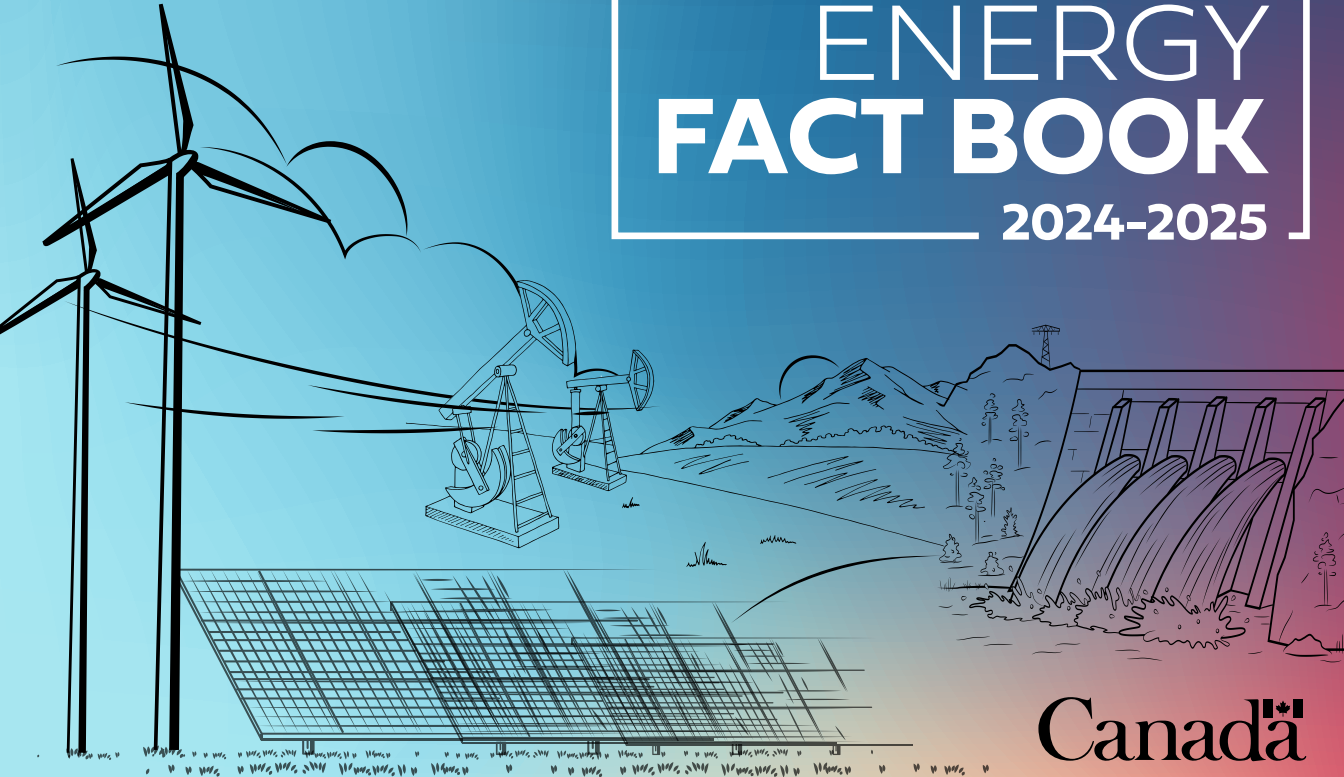


Natural Resources
Canada

Ressources naturelles
Canada

ENERGY FACT BOOK

2024-2025



Canada



Natural Resources
Canada

Ressources naturelles
Canada

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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Cat. No. M136-1E (Print) M136-1E-PDF (online)

ISSN 2370-3105 ISSN 2370-5027

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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 6:

Oil, natural gas and coal

Crude oil

Natural gas

Hydrocarbon gas liquids (HGLs)

Refined petroleum products (RPPs)

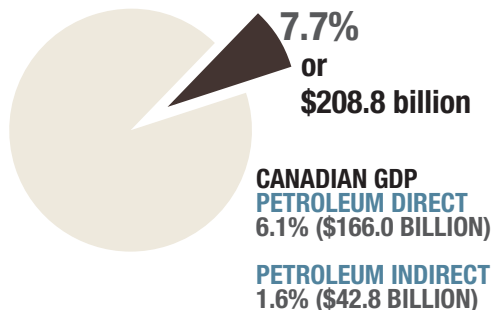
Coal

GHG Emissions from petroleum

PETROLEUM AND THE ECONOMY

NOMINAL GDP CONTRIBUTION FOR CANADA, 2023

NOMINAL GDP (% OF CURRENT DOLLARS)



- Capital Expenditures (2023): **\$64 billion**
- Canada's oil and gas sector represents about **31%** of the country's GHG emissions.
- Exports (2023): **\$177 billion** (25% of total exports)

EMPLOYMENT, 2023

DIRECT: 181,100 JOBS

OIL AND GAS EXTRACTION:	73,400
SUPPORT ACTIVITIES:	55,700
EXPLORATION:	2,900
NATURAL GAS TRANSMISSION AND DISTRIBUTION:	17,300
CRUDE OIL AND OTHER PIPELINE TRANSPORTATION:	4,700
OTHER:	27,000

INDIRECT: 265,500 JOBS

TOTAL: 446,600 JOBS

Approximately
10,800 Indigenous people are employed in the oil and gas sector.



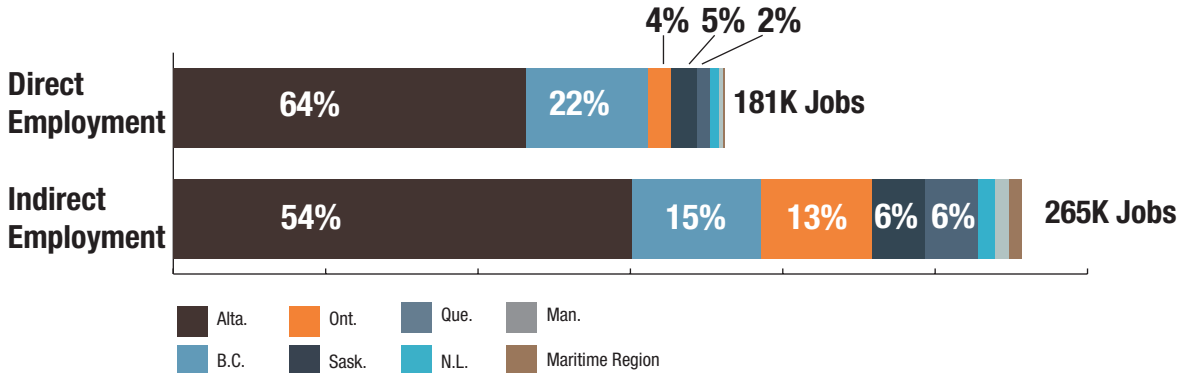
4TH Largest oil producer globally

5TH Largest gas producer globally

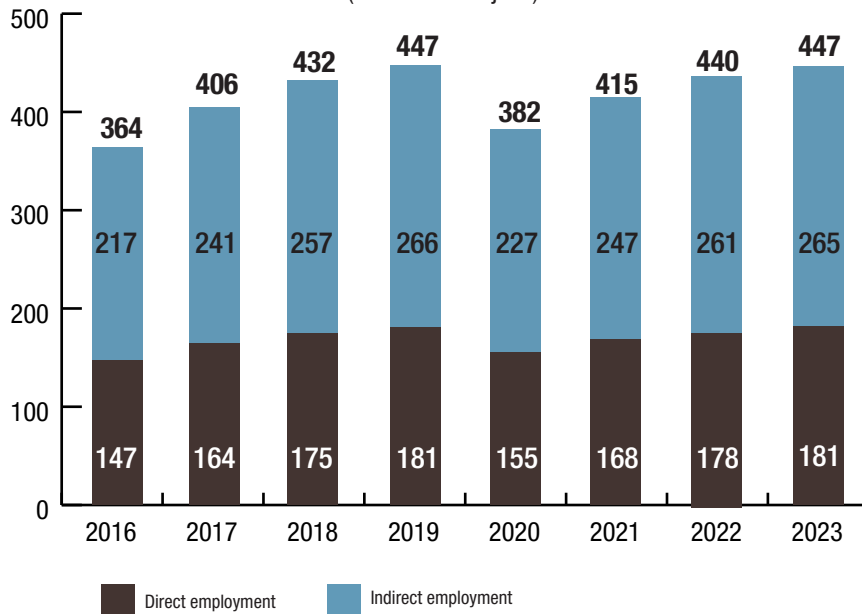
Parts may not sum to total due to rounding. The indirect contribution is not comparable to previously published estimates due to revisions and a change in estimation methodology by Statistics Canada. For more information on Statistics Canada's estimation methodology, please contact statcan.iadinfoddc-dciinfoiad.statcan@statcan.gc.ca.

- While Canada's petroleum sector **directly employed 181K people** in 2023, the sector's use of inputs from other industries created an additional **265K indirect jobs in the supply chain.**

Alberta employed the majority (54%) of the supply chain workers followed by BC (15%). Ontario (13%) and Quebec (6%) also accounted for sizeable shares of supply chain jobs.

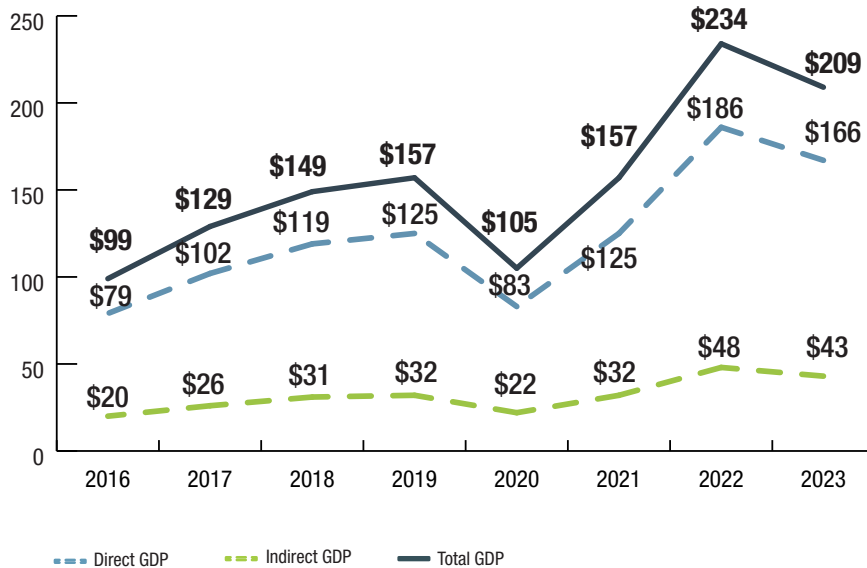


PETROLEUM EMPLOYMENT (Thousands of jobs)



Parts may not sum to total due to rounding. The indirect contribution is not comparable to previously published estimates due to revisions and a change in estimation methodology by Statistics Canada. For more information on Statistics Canada's estimation methodology, please contact statcan.iadinfoddc-dciinfoiad.statcan@statcan.gc.ca.

PETROLEUM GDP (Billions of Canadian Dollars)

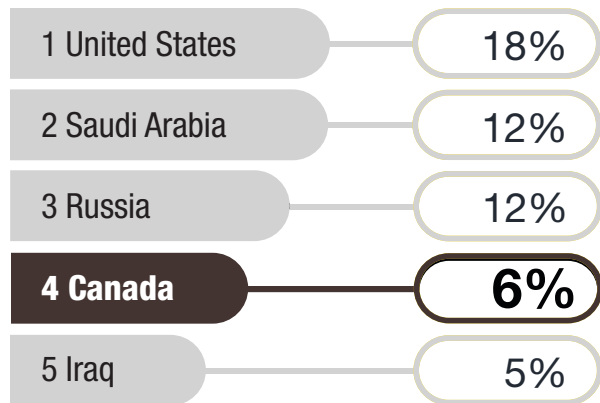


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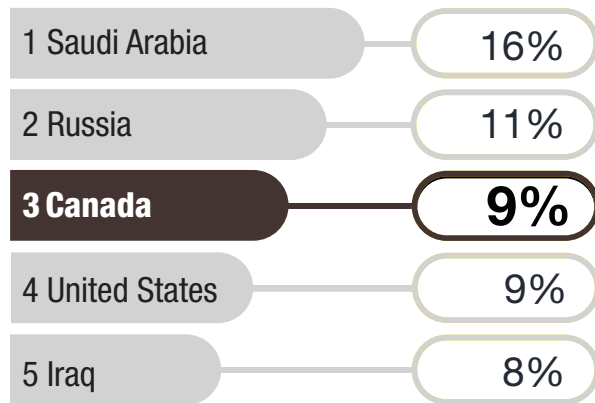
CRUDE OIL

INTERNATIONAL CONTEXT

World production* – 89.6 MMb/d (2023)



World exports* – 45.2 MMb/d (2022)

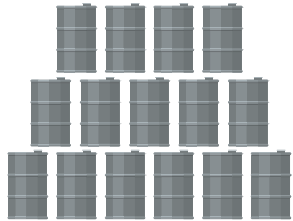


* includes crude oil, NGLs, additives and other hydrocarbons (including the receipts of additives).

World proved reserves

1,747 billion barrels

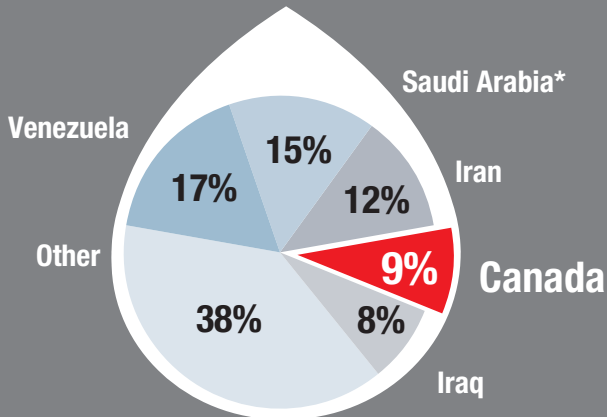
(at the end of 2022)



Proved reserves are those reserves expected to be recoverable with a high degree of certainty.



of Canada's proven oil reserves are located in the oil sands.

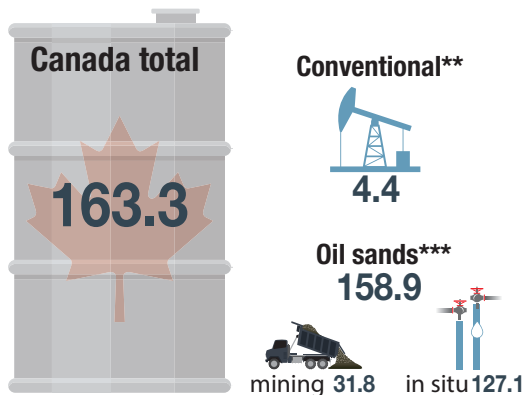


*Saudi Arabia and Kuwait reserves include the Saudi-Kuwaiti "neutral zone," with total proved reserves of 5 billion barrels.

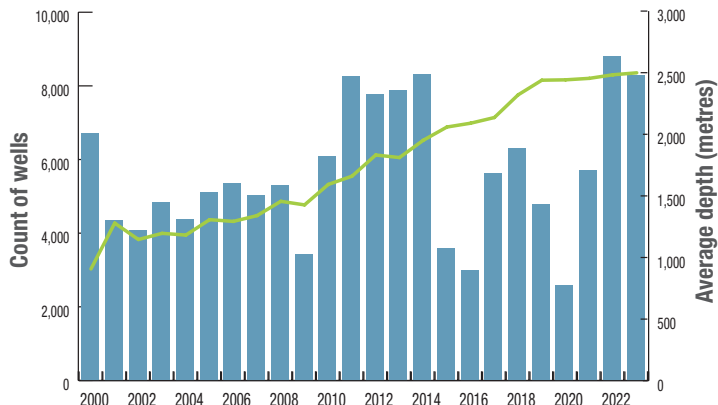
CANADIAN RESOURCES

REMAINING ESTABLISHED RESERVES*

(billion barrels, as of December 2022)



COUNT AND AVERAGE DEPTH OF OIL WELLS COMPLETED IN WESTERN CANADA



* Reserves known to exist and recoverable under current technological and economic conditions. Totals may not sum due to rounding.

** Reserves also include proved reserves of pentanes plus (a crude-oil equivalent that is associated with oil production).

***With improved technology, it is estimated that 315 billion barrels are ultimately recoverable from the oil sands. Totals may not sum due to rounding.

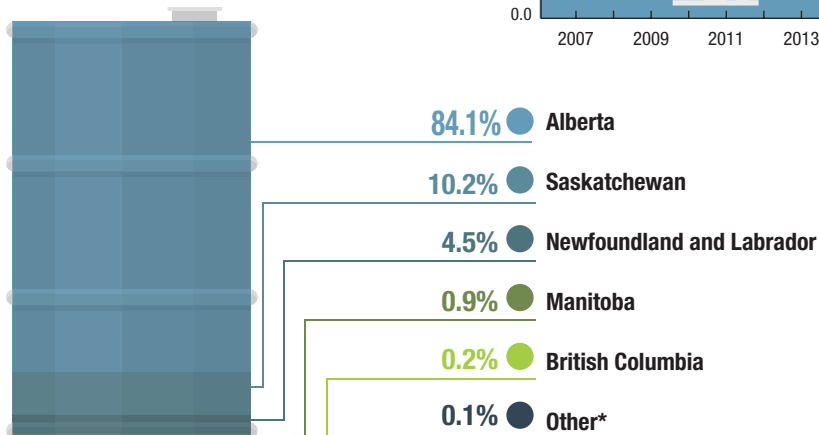
■ Wells completed — Average depth

CANADIAN PRODUCTION

Oil sands production has exceeded conventional production since 2010.

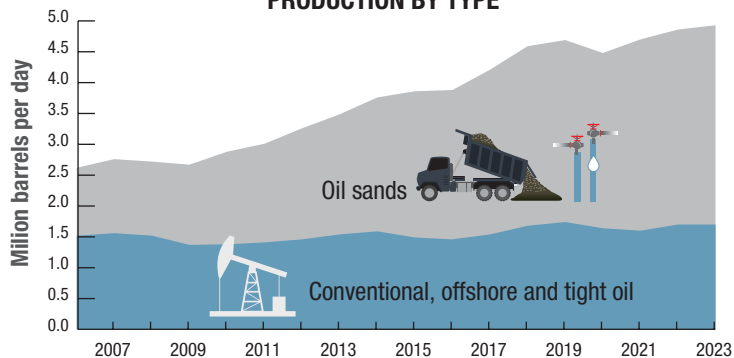
In 2023, oil sands production was **3.2 MMb/d** compared with **1.7 MMb/d** of other oil production.

PRODUCTION BY PROVINCE, 2023



*Other: Nova Scotia, Ontario and the Northwest Territories.

PRODUCTION BY TYPE



CANADIAN SUPPLY AND DEMAND* (2023)

Canadian production



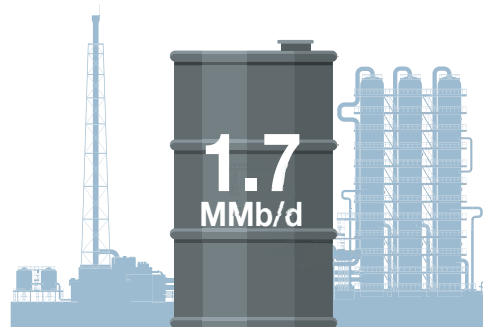
Exports



Imports



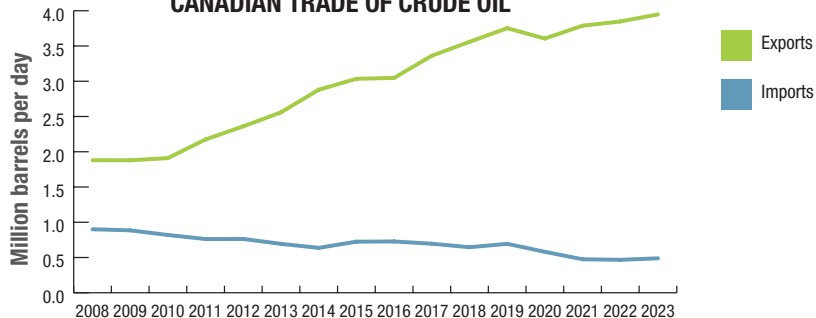
* includes condensates and pentanes plus.



CRUDE OIL INPUT TO DOMESTIC REFINERIES

TRADE

CANADIAN TRADE OF CRUDE OIL



OIL SANDS

An estimated **\$366 billion** of capital investment to date, including

\$12.4 billion in 2023



OF CANADA'S PROVED RESERVES



**OF CANADA'S OIL PRODUCTION IN
2023 OR 3.2 MMb/d**

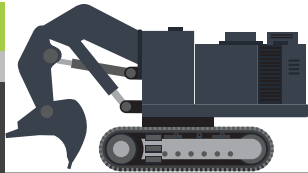
BITUMEN UPGRADING

- Crude bitumen from oil sands may be transported to upgraders for processing to make it lighter – “synthetic crude oil.”
- In 2023, **41%** of the raw bitumen produced was sent for upgrading in Alberta.
- Major companies with upgrading capacity include Syncrude, Suncor, Shell, Canadian Natural Resources, Husky and Nexen-CNOOC.
- The total upgrading capacity in Canada is **1.5 MMb/d**
- Bitumen may also be blended with diluent (e.g. condensates) and sold directly to refineries capable of processing heavier oils.

MINING METHOD

Process: Companies use trucks and shovels to scoop oil sands from the ground. The oil sands are then transported to extraction plants where bitumen is separated from the sand by using steam. Tailings are then pumped into settling basins.

In 2023, **seven projects in Alberta** produced **1,647 Mb/d**: Syncrude Mining Project (**366 Mb/d**), Suncor Base Mine (**249 Mb/d**), CNRL Horizon Mine (**266 Mb/d**), Athabasca Oil Sands Project – Muskeg River (**195 Mb/d**), Jackpine Mine (**129 Mb/d**), Imperial's Kearl Mine (**288 Mb/d**) and Fort Hills (**154 Mb/d**).



↑
formation of
75 m or less
↓

48%

OF CURRENT
PRODUCTION

ROUGHLY
20%

OF OIL SANDS
RESOURCES

IN SITU METHOD

Process: Companies drill vertical and/or horizontal wells to inject steam to facilitate the flow of oil.

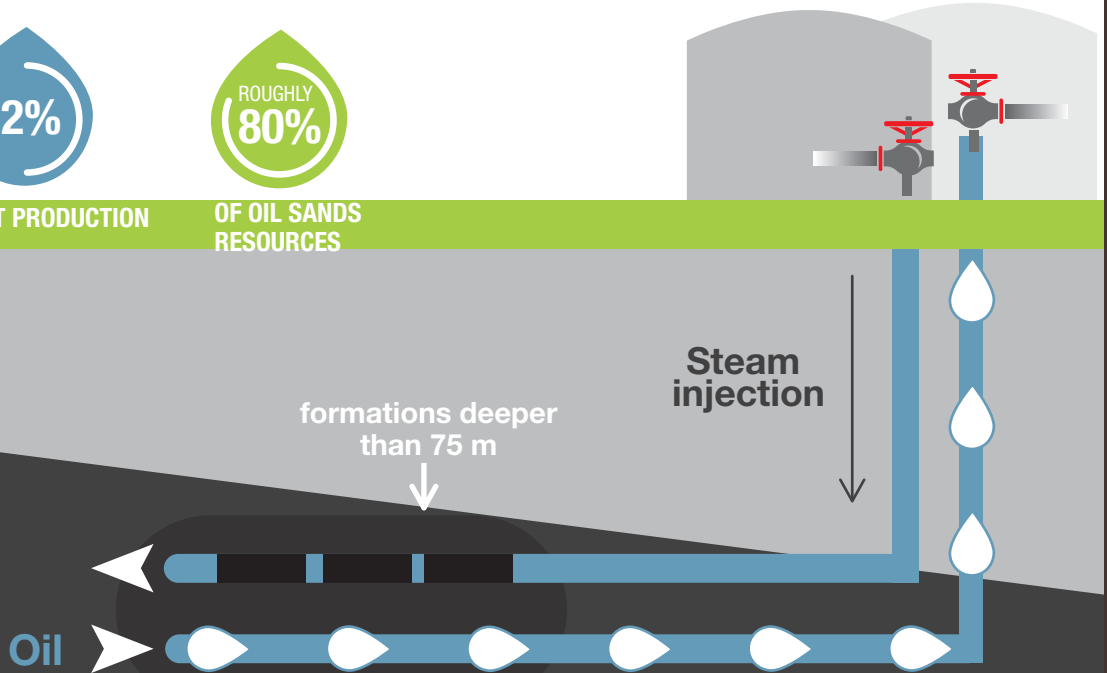
More than 20 projects in Alberta – The largest projects in 2023 were Firebag and MacKay River (Suncor) at **251 Mb/d**, Christina Lake (Cenovus) at **237 Mb/d**, Foster Creek (Cenovus) at **183 Mb/d** and Cold Lake (Imperial Oil) at **137 Mb/d**.



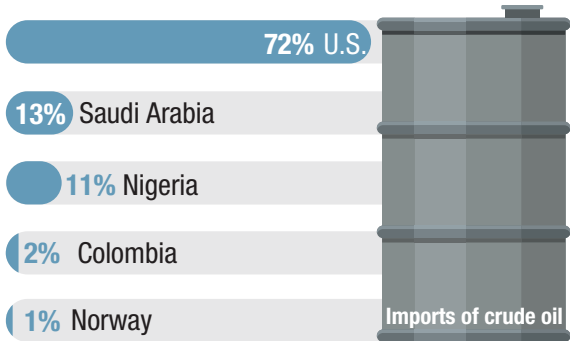
OF CURRENT PRODUCTION



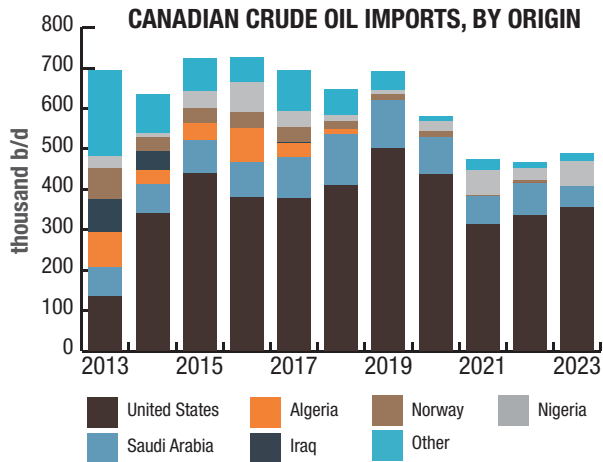
OF OIL SANDS
RESOURCES



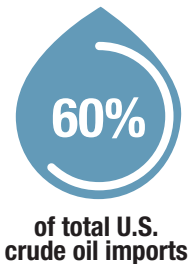
In 2023, imports of crude oil into Canada came from a range of countries including:



Over recent years, the U.S. has become Canada's primary supplier of imported crude oil.



In 2023, Canada was the **largest foreign supplier of crude oil** to the U.S., accounting for



exported
3.7MMb/d to



representing
97%
of all Canadian crude oil exports

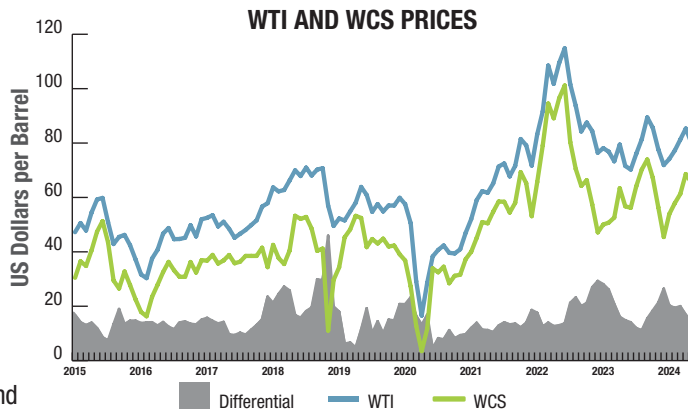
PRICES

WEST TEXAS INTERMEDIATE (WTI) AND WESTERN CANADIAN SELECT (WCS)

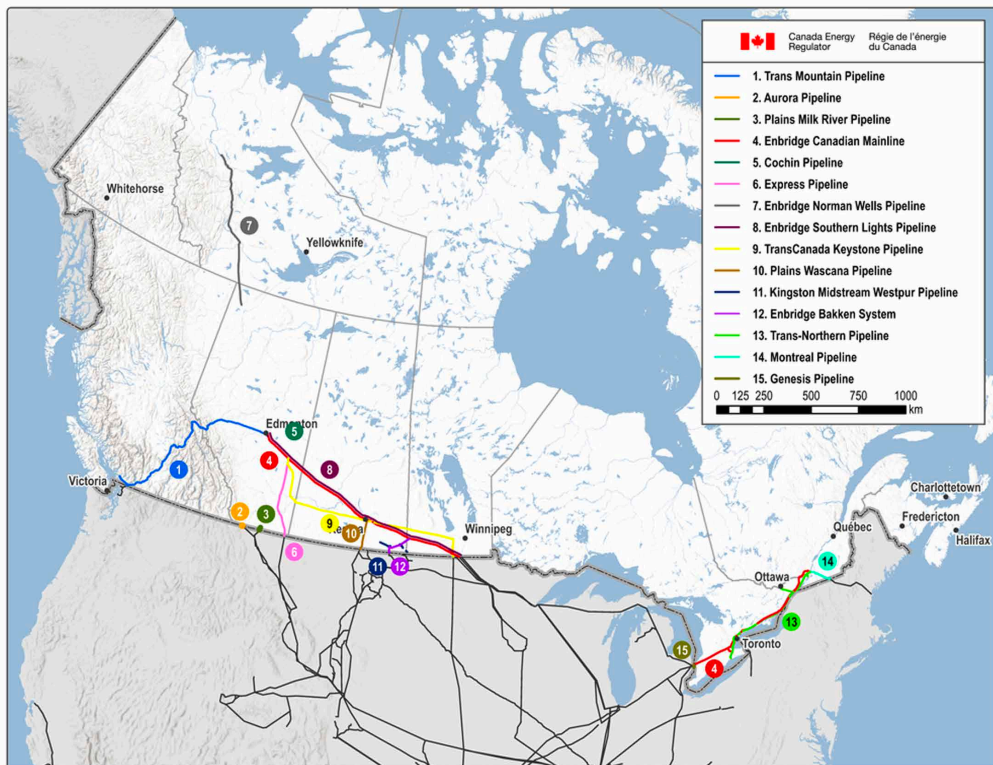
- WTI is a reference price for light crude oil delivered at Cushing, Oklahoma (a major pipeline hub) and is used as the benchmark price for North American crudes. WTI underlies oil futures contracts on the NYMEX.
- WCS is the main benchmark price for Canadian heavy crude, specifies delivery at Hardisty, Alberta and is representative of the price of oil from the oil sands.

WTI-WCS DIFFERENTIAL

- WCS is typically sold at a discount to WTI due to differences in quality and transportation costs. Heavy crude is more difficult to process and requires specialized equipment at refineries.
- The WCS-WTI differential has historically averaged between US\$10-\$15 per barrel. However, during the fall of 2018, the differential reached a record high of over US\$50 per barrel due to insufficient pipeline capacity.
- In Q2 2020, oil prices collapsed due to the drop in demand resulting from the global pandemic. US refineries drastically reduced their refinery runs and purchases of Canadian heavy crude.
- Starting in Q3 2020, easing lockdown measures led to a demand recovery and a price rebound that lasted through 2021, accelerating in the first half of 2022 following the Russian invasion of Ukraine. After peaking in June 2022, prices trended downward due to increasing global inventories and concerns over slowing demand amid rising interest rates.



MAJOR CER REGULATED OIL PIPELINES



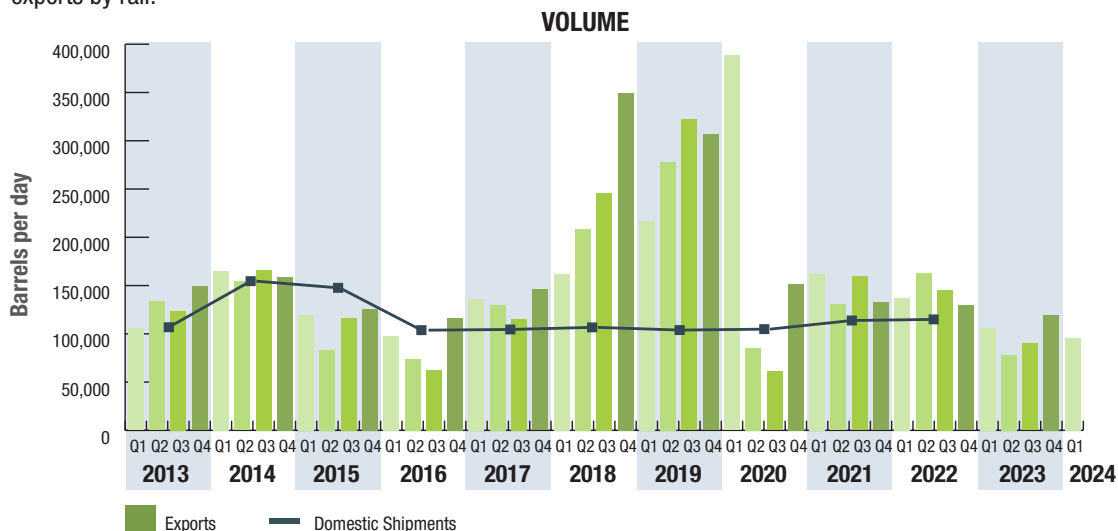
The map is a graphical representation intended for general informational purposes only. Map produced by the CER, June 2021. Last updated on Jun 03

CRUDE BY RAIL

In 2018, as production increases in Western Canada began to outpace pipeline capacity, shipments of crude oil by rail increased to fill the gap, more than doubling from their 2017 levels.

Amidst the economic disruption beginning in Q1 2020, crude shipments surged beyond their 2019 peak, reaching a high of **412 Mb/d** in February 2020. This upswing was promptly reversed in Q2, when shipments fell sharply. After bottoming-out at a four year low in July 2020, volumes started to recover.

Domestic rail shipments of fuel oils and crude petroleum are relatively stable compared to volumes of crude oil exports by rail.

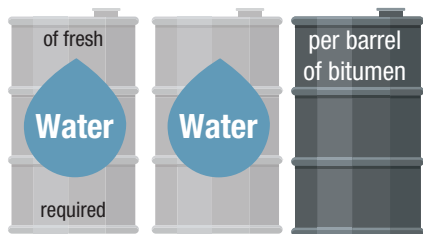


OIL SANDS: ENVIRONMENTAL CONSIDERATIONS

WATER

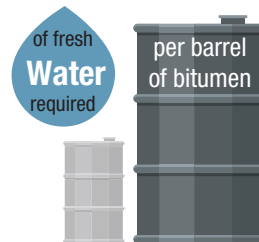
Mining method:

2.0 barrels

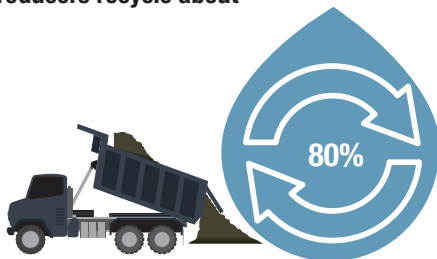


In situ method: an average of

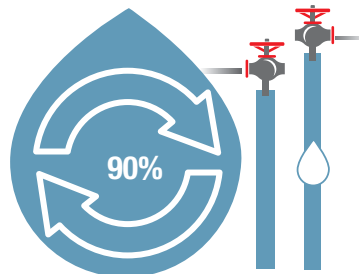
0.16 barrels



Oil sands producers recycle about



OF THE WATER USED FOR ESTABLISHED MINES



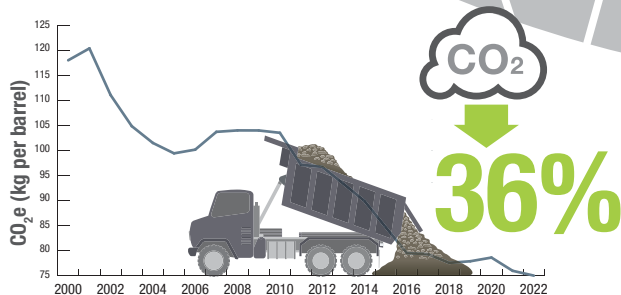
OF THE WATER USED FOR IN SITU PRODUCTION

GREENHOUSE GASES

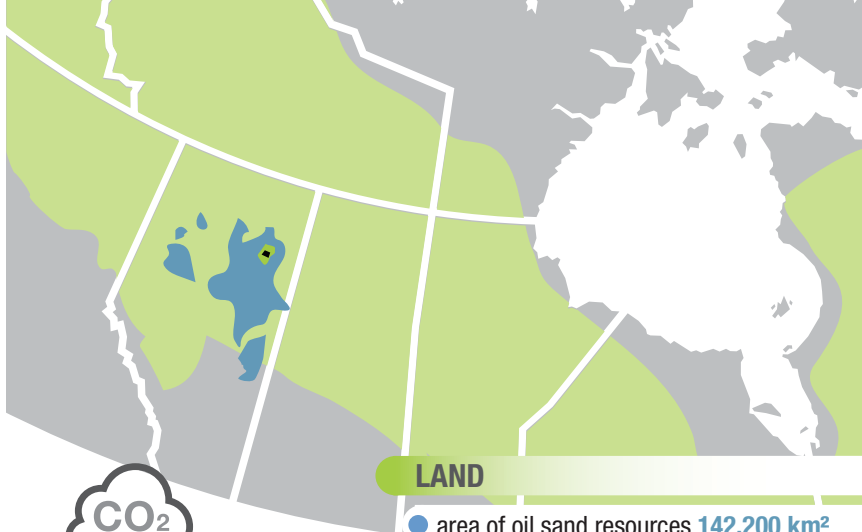
12% of Canada's total
GHG emissions in 2022

and **0.18%** of global
emissions in 2021

From 2000 to 2022,
emissions intensity per
barrel decreased by



as a result of **technological and efficiency improvements**, fewer venting emissions and reductions in the percentage of crude bitumen being upgraded to synthetic crude oil.



LAND

- area of oil sand resources **142,200 km²**
- total mineable area **4,800 km²**
- total area being mined **953 km²**
tailings ponds **257 km²**

For comparison:

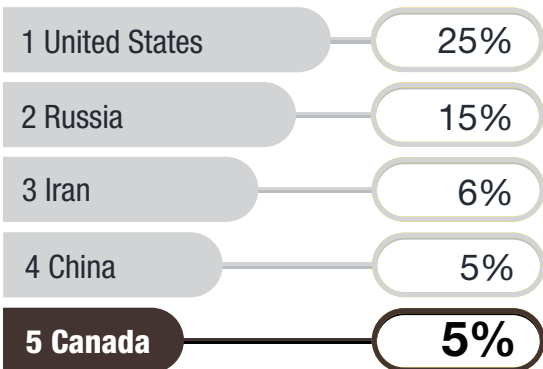
- Canada's area **10,000,000 km²**
- Canada's boreal forest **2,700,000 km²**

NATURAL GAS

INTERNATIONAL CONTEXT

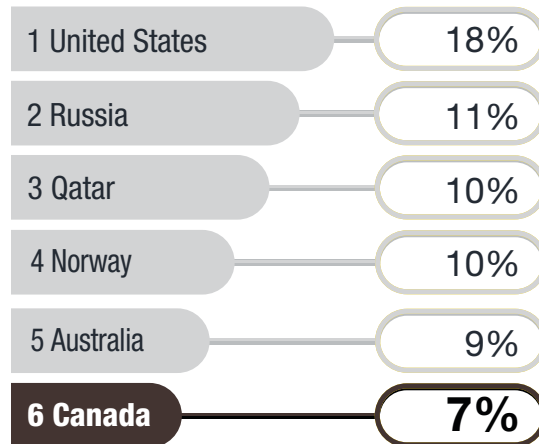
World production – 409 Bcf/d (11.6 Bcm/d)

(2023, PRELIMINARY)



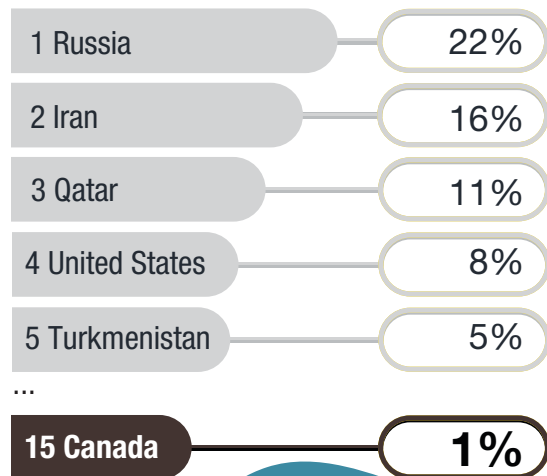
World exports – 118 Bcf/d (3.4 Bcm/d)

(2023, PRELIMINARY)



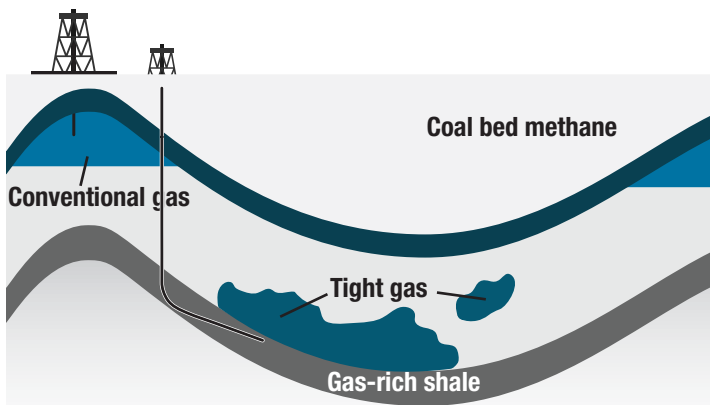
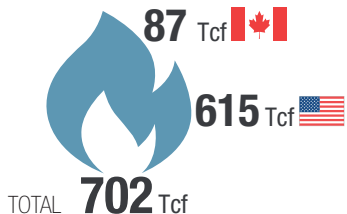
World proved reserves – 7,507 Tcf (213 Tcm)

(BEGINNING OF 2024)



CANADA-U.S. RESOURCES

PROVED RESERVES* BEGINNING OF 2024



MARKETABLE/TECHNICALLY RECOVERABLE RESOURCES**

Canada total,
year-end 2022 1,368 Tcf

conventional

380 Tcf

unconventional

988 Tcf

(coal-bed methane, shale and tight gas)

U.S. total,
year-end 2020 2,973 Tcf

portion that is
shale and tight gas 2,172 Tcf

portion that is
other 801 Tcf

World total (year-end 2022) 28,358 Tcf



conventional 14,867 Tcf

unconventional 13,490 Tcf

* Proved reserves are known to exist and are recoverable under current technological and economic conditions.

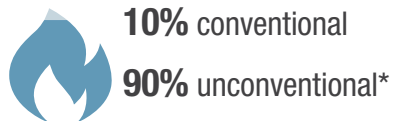
** Canadian marketable resources: natural gas that is in a marketable condition, after the removal of impurities and after accounting for any volumes used to fuel surface facilities. Marketable resources are recoverable using existing technologies, based on geological information, but much of the drilling necessary to produce the natural gas has not yet been performed. U.S. technically recoverable resources: gas estimated to be recoverable as drilling and infrastructure expands (similar to Canadian marketable resources)

CANADA-U.S. MARKET (2023)

Canada's natural gas market is heavily integrated with that of the U.S. largely because of the location of supply basins, demand centres, and the availability of transportation infrastructure, as well as existing Canada-U.S. trade agreements. These factors allow for consumers and distributors on either side of the border to freely access natural gas from the lowest cost supplier.

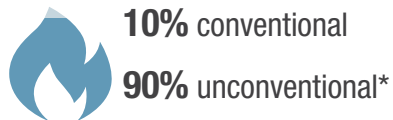
Canadian average marketable production

18.5 Bcf/d (0.52 Bcm/d)

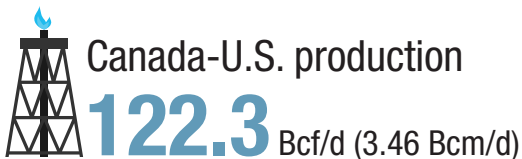


U.S. average marketable production

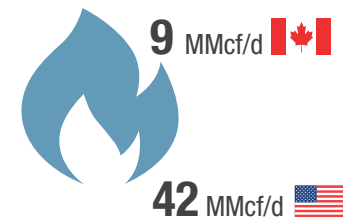
103.8 Bcf/d (2.94 Bcm/d)



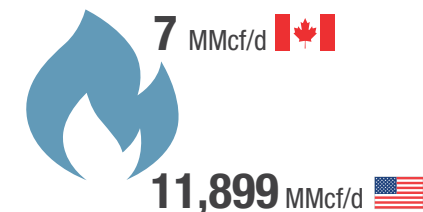
* Unconventional gas includes tight gas, coal bed methane and shale gas.



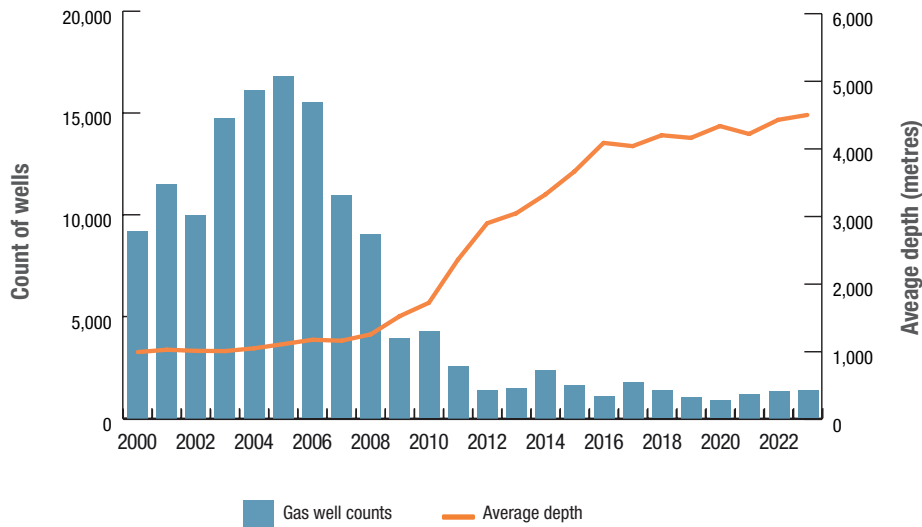
LNG imports



LNG exports

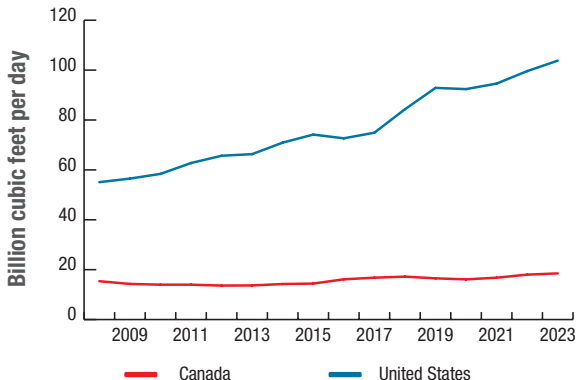


COUNT AND AVERAGE DEPTH OF NATURAL GAS WELLS COMPLETED IN WESTERN CANADA

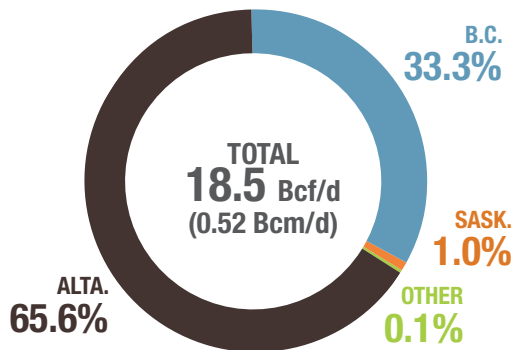


While Canadian natural gas production remained relatively flat and the number of wells drilled declined, the well productivity has increased over time. This reflects the increased use of horizontal drilling and increased well length.

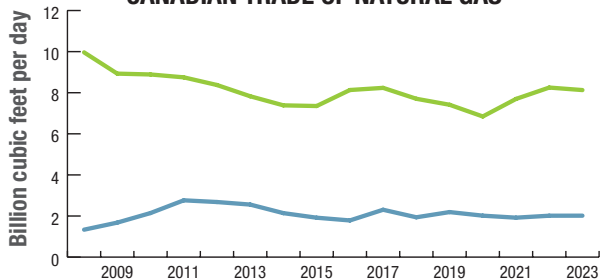
CANADIAN AND U.S. MARKETABLE PRODUCTION OF NATURAL GAS



MARKETABLE PRODUCTION BY PROVINCE, 2023



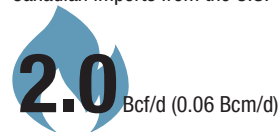
CANADIAN TRADE OF NATURAL GAS



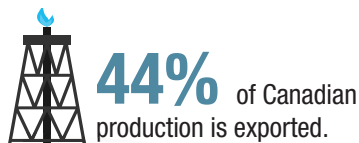
Canadian exports to the U.S.



Canadian imports from the U.S.



- Natural gas imports from the U.S. into Eastern Canada are on the rise because of higher supplies in the U.S. Northeast and shorter transportation distances from these U.S. natural gas basins.
- Canadian natural gas exports to the western U.S. and U.S. Midwest remain significant.
- Since 2009, Canada has imported liquefied natural gas (LNG) from other countries via the Canaport LNG terminal in Saint John, N.B.
- Since 2017, Canada has also exported small quantities of LNG to other countries via the Port of Vancouver, B.C.



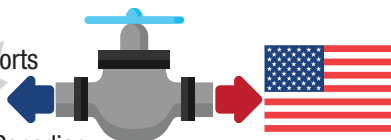
Canadian exports are largely destined for the U.S.



99% of U.S. imports and **9%** of U.S. consumption comes from Canada.

The value of Canadian net exports (exports minus imports) was **\$10.1 billion** in 2023.

99% of Canada's imports and **17%** of Canadian consumption comes from the U.S.



UPSTREAM PRICES

The AECO hub is Canada's largest natural gas trading hub, and the AECO price serves as a benchmark for Alberta wholesale natural gas transactions.

AECO PRICE

Average: 2009–2016 **\$3.38/MMbtu**

Average: 2017 **\$2.20/MMbtu**

Average: 2018 **\$1.53/MMbtu**

Average: 2019 **\$1.80/MMbtu**

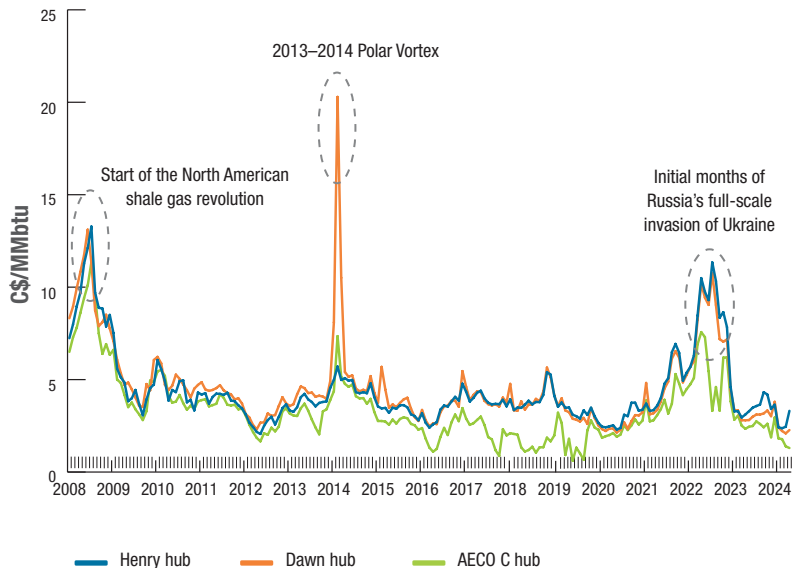
Average: 2020 **\$2.24/MMbtu**

Average: 2021 **\$3.64/MMbtu**

Average: 2022 **\$5.43/MMbtu**

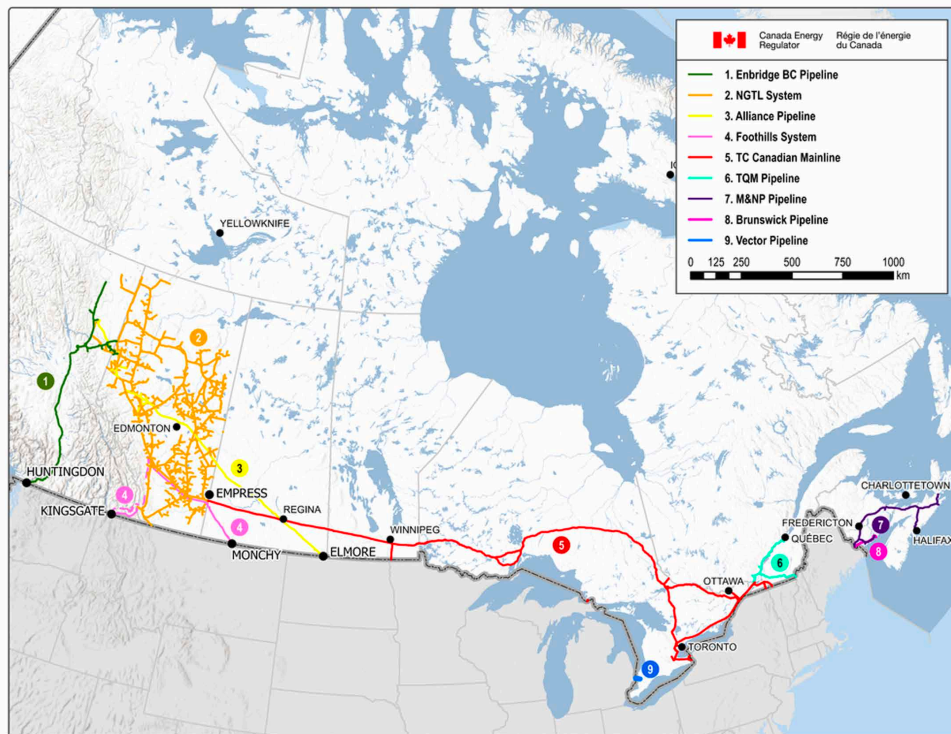
Average: 2023 **\$2.64/MMbtu**

MONTHLY AVERAGE NATURAL GAS SPOT PRICES



TRANSPORTATION

CER REGULATED GAS PIPELINES



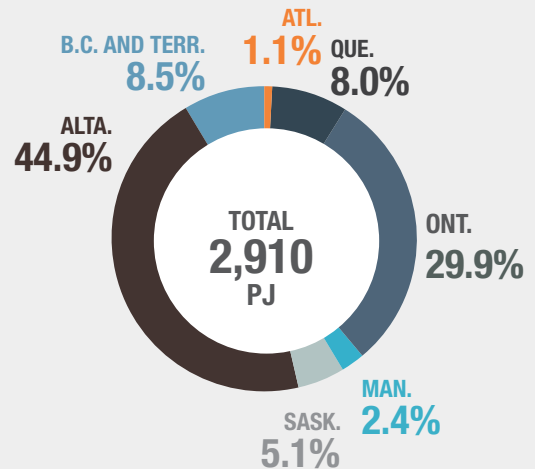
The map is a graphical representation intended for general informational purposes only. Map produced by the CER, December 2020. Last updated on Oct 30.

NATURAL GAS ENERGY USE

NATURAL GAS END USE BY SECTOR, 2021

Sector	Energy use (PJ)	Energy use (Bcf/d)	% of the total
Residential	628.4	1.63	21.6%
Commercial	623.4	1.62	21.4%
Industrial	1,608.8	4.18	55.3%
Transportation	4.6	0.01	0.2%
Agriculture	45.0	0.12	1.5%
Total	2,910.1	7.56	100%

NATURAL GAS ENERGY USE BY PROVINCE, 2021

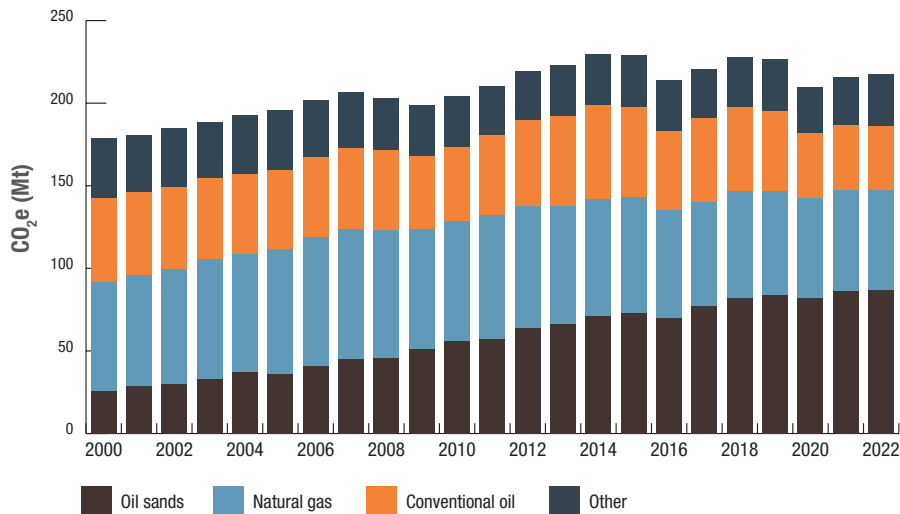


GHG SPOTLIGHT: OIL AND GAS

GHG emissions from oil and gas production **have gone up 21% between 2000 and 2022**, largely from increased oil sands production, particularly in situ extraction.

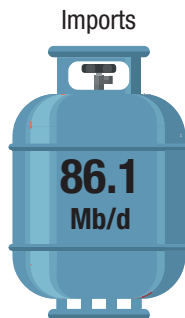
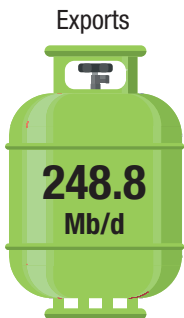
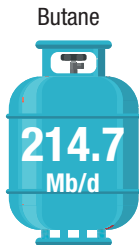
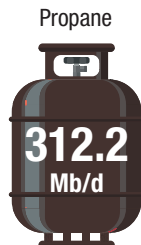
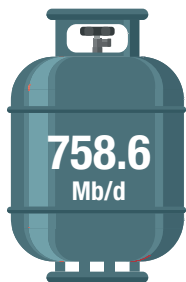
During this period, oil sands production emissions **more than tripled** while conventional oil and natural gas emissions **decreased by 15%**.

OIL AND GAS SECTOR GHG EMISSIONS FOR CANADA, 2000–2022

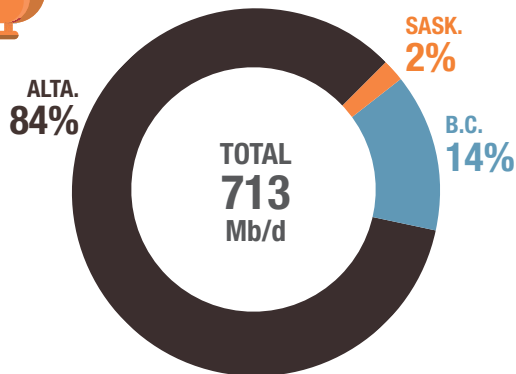


HYDROCARBON GAS LIQUIDS (HGLs) SUPPLY AND DEMAND* (2023)

Canadian production



GAS PROCESSING PLANT PRODUCTION
OF NGLS BY PROVINCE (2023)



* excludes condensates and pentanes plus, which are included as part of crude oil, and includes refinery-produced LPGs.

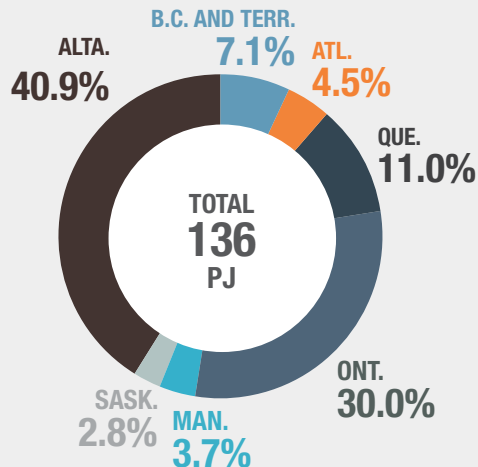
NATURAL GAS LIQUIDS ENERGY USE

TOTAL NATURAL GAS LIQUIDS ENERGY USE WAS 135.5 PJ IN 2020.

Sector	Energy use* (PJ)	% of the total
Residential	15.8	11.7%
Commercial	34.1	25.1%
Industrial	64.9	47.9%
Transportation	11.4	8.4%
Agriculture	9.4	6.9%
Total	135.7	100%

*secondary energy use

NATURAL GAS LIQUIDS ENERGY USE BY PROVINCE, 2021



REFINED PETROLEUM PRODUCTS (RPPs)

PETROLEUM REFINERIES

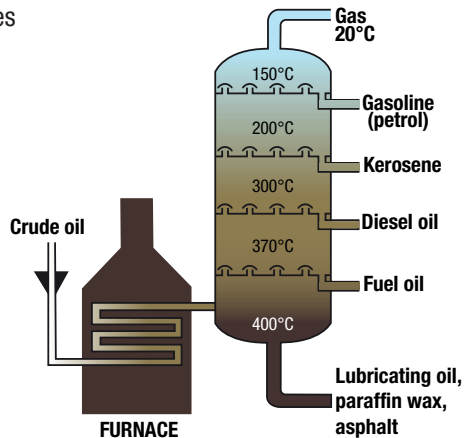
Petroleum refineries transform crude oil into a wide range of refined petroleum products (RPPs, e.g. gasoline, diesel). Other facilities such as asphalt plants, lubricant plants, upgraders and some petrochemical plants also process crude oil to produce a limited range of products.

REFINERY ACTIVITIES

- **crude oil distillation:** separating products from crude oil by heating
- **additional processing:** e.g. catalytic cracking, reforming, coking
- **product blending:** end-use RPPs are usually blended with additives or renewable fuels

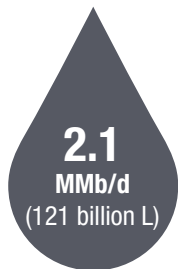
REFINERY OUTPUTS

- transportation fuels: gasoline, diesel, aviation fuels, heavy fuel oil
- heating oil
- liquid petroleum gases: propane and butane from refineries
- petrochemical feedstock
- other products: e.g. kerosene, lubricating oils, greases, waxes, asphalt

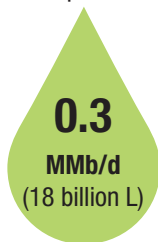


SUPPLY AND DEMAND* (2023)

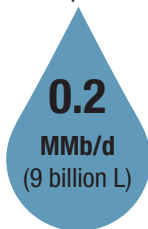
Canadian net production



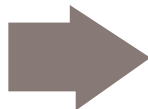
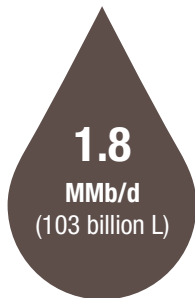
Exports



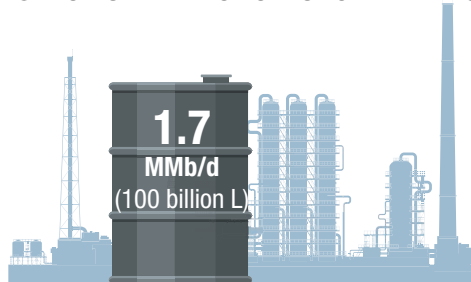
Imports



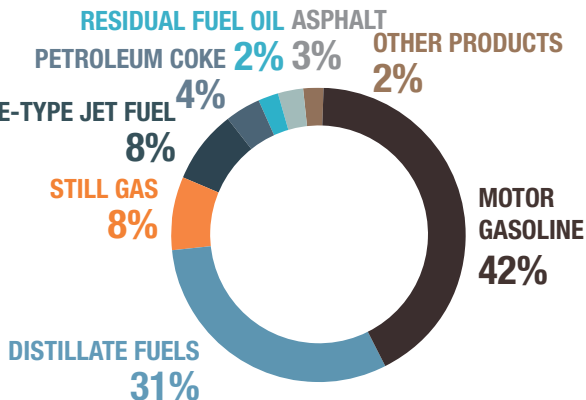
Domestic Consumption



CRUDE OIL SHIPPED TO DOMESTIC REFINERIES

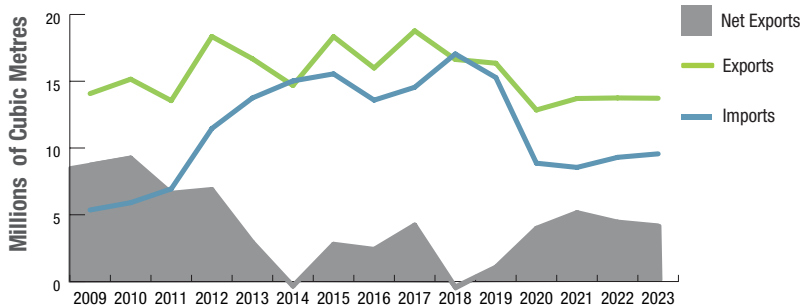


DOMESTIC CONSUMPTION BY PRODUCT, 2023

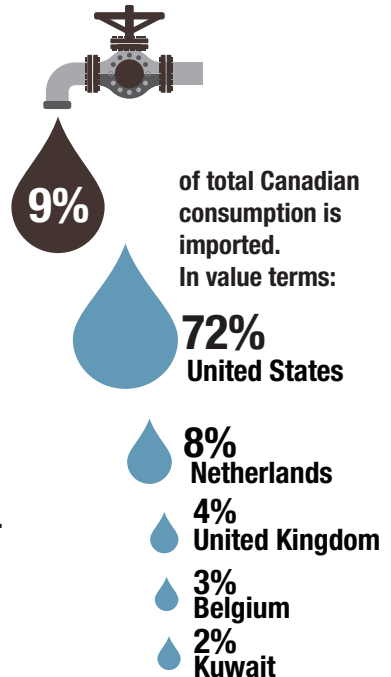
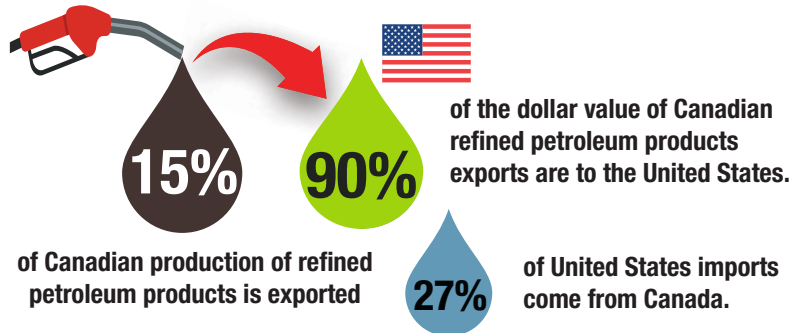


TRADE

CANADIAN TRADE OF MAJOR REFINED PETROLEUM PRODUCTS

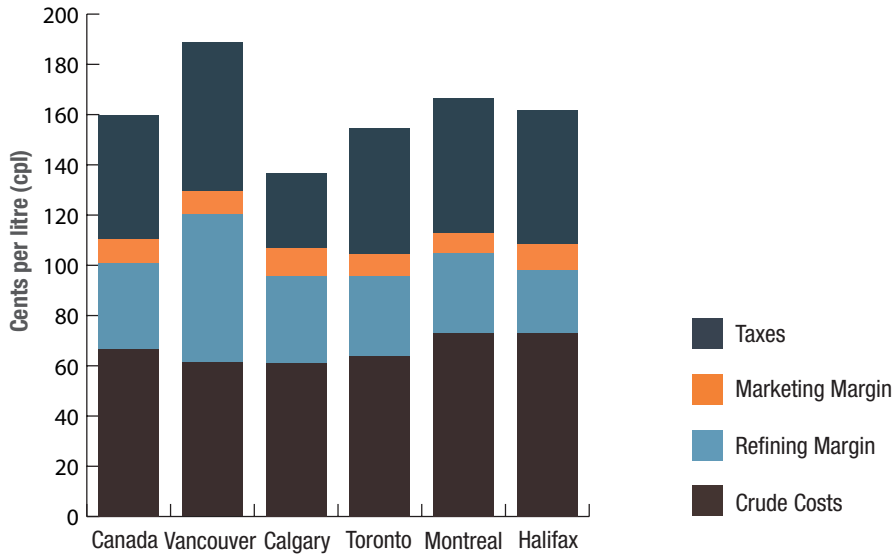


Primarily motor gasoline, diesel, jet fuel, fuel oil, and kerosene



RETAIL PRICES

AVERAGE CANADIAN REGULAR GASOLINE PRICES, 2023



REFINERY CAPACITY

CANADIAN PETROLEUM REFINERIES BY COUNT AND CAPACITY*, 2023

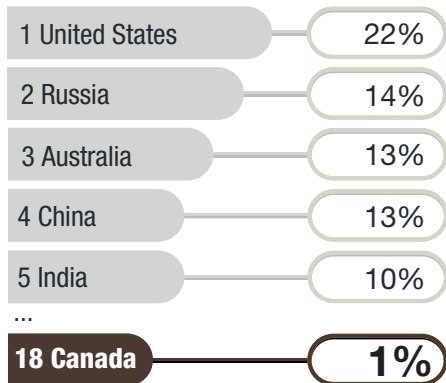
Province	Petroleum refinery		Asphalt plants		Lubricant plants (using crude oil as feedstock)		Total	
	Count	Capacity	Count	Capacity	Count	Capacity	Count	Capacity
Alberta	4	530	-	-	-	-	4	530
British Columbia	2	67	-	-	-	-	2	67
New Brunswick	1	300	-	-	-	-	1	300
Ontario	4	393	-	-	1	16	5	409
Quebec	2	372	-	-	-	-	2	372
Saskatchewan	1	135	2	52	-	-	3	187
Total	14	1,797	2	52	1	16	17	1,865

*Capacities are in Mb/d. The Come by Chance Refinery in Newfoundland and Labrador is being converted into a biofuel refinery.

COAL

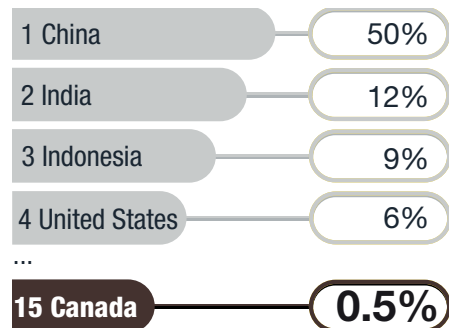
INTERNATIONAL CONTEXT

**World proved reserves –
1,141 BILLION TONNES** (2022)



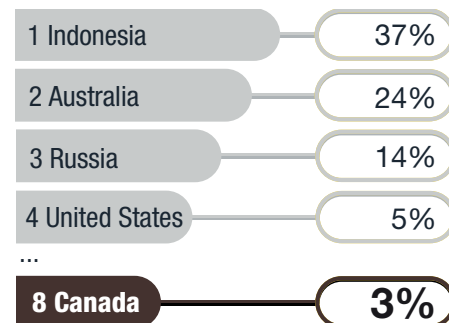
World production – 8.7 BILLION TONNES

(2023)



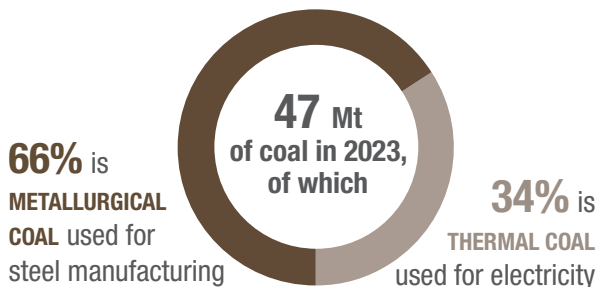
World exports – 1.4 BILLION TONNES

(2023)

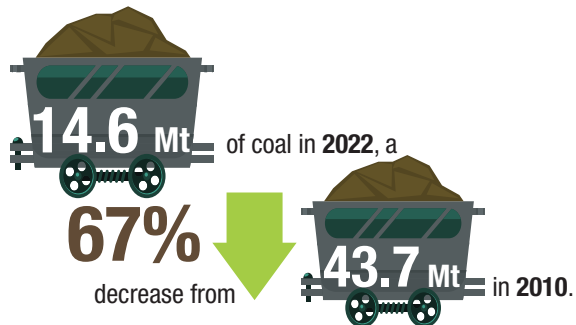


PRODUCTION AND USE

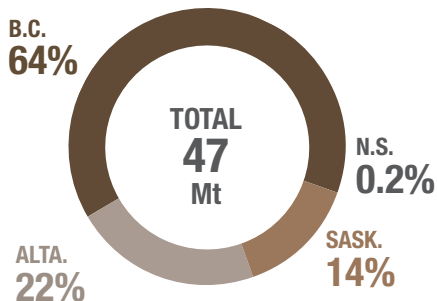
Canada produced



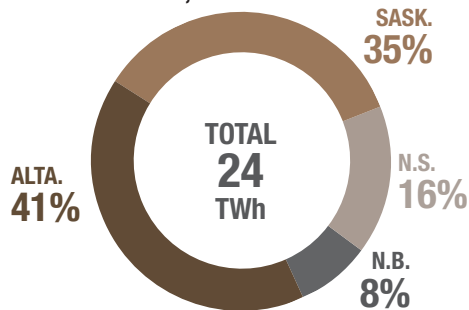
Electricity generation consumed



COAL PRODUCTION BY PROVINCE, 2023



COAL-FIRED ELECTRICITY GENERATION BY PROVINCE, 2022



DOMESTIC DEMAND (2023)



Mostly for electricity generation in Alberta and Saskatchewan

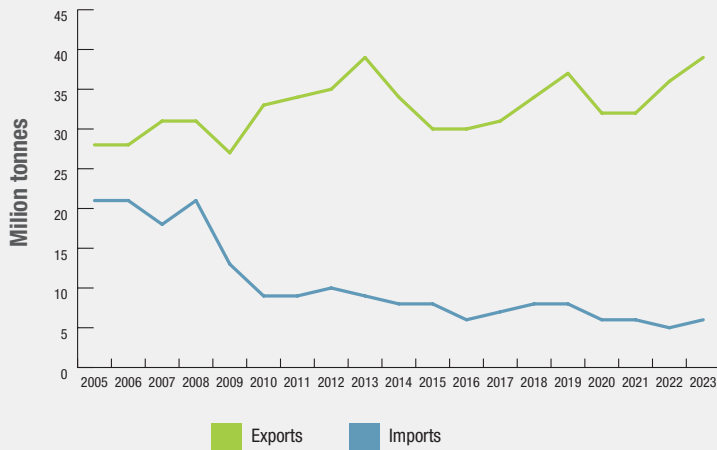


Also for metallurgical applications



TRADE

CANADIAN TRADE OF COAL



Canada's exports are primarily metallurgical coal (**79%** in 2023).

TRADE (2023)

EXPORTS



\$12 billion in coal exports



major export destinations

30% Japan
26% China
17% South Korea

2% of Canadian exports are to the U.S.,



representing **19%** of U.S. coal imports.

IMPORTS



\$1.5 billion in coal imports

76% of Canadian imports are from the U.S.



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
EGS	enhanced geothermal system	LPG	liquefied petroleum gases
		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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