

25 Facts About Oil and Gas: A Summary Research Brief

Research Brief 31

Canadian Energy Centre

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A note from the author

The following summary facts and data were drawn from 30 Fact Sheets and Research Briefs and various Research Snapshots that the Canadian Energy Centre released in 2023.

For sources and methodology and for additional data and information, the original reports are available at the research portal on the Canadian Energy Centre website: canadianenergycentre.ca.

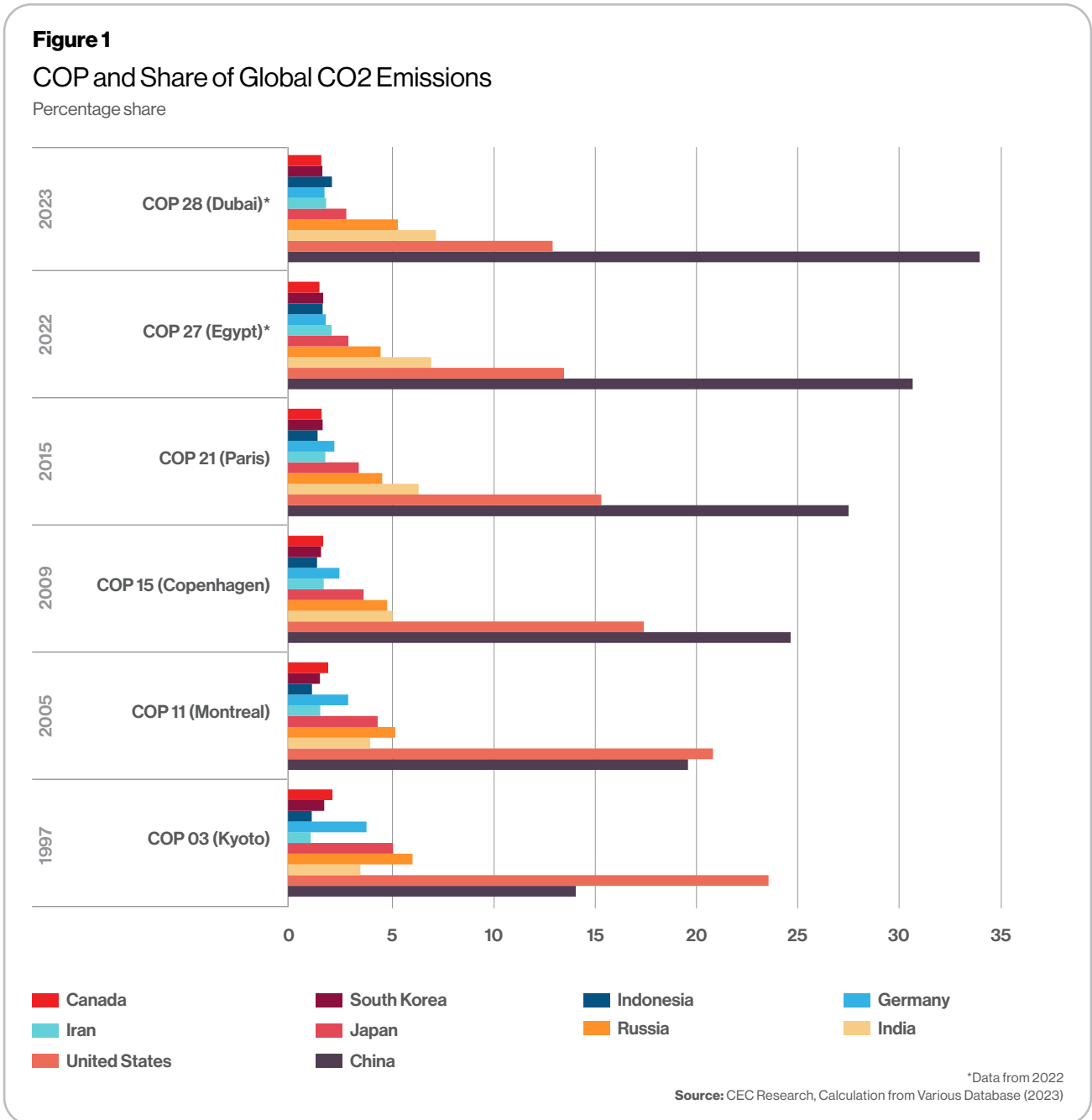
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Environment

1. Canada's share of Global CO2 emissions is dropping

Since the Kyoto Summit in 1997, Canada's share of the world's CO2 emissions has fallen from [2.2 percent to 1.6 percent](#). Canada's share of world CO2 emissions decreased by 25 per cent from the Kyoto climate summit to the recent Dubai climate summit.



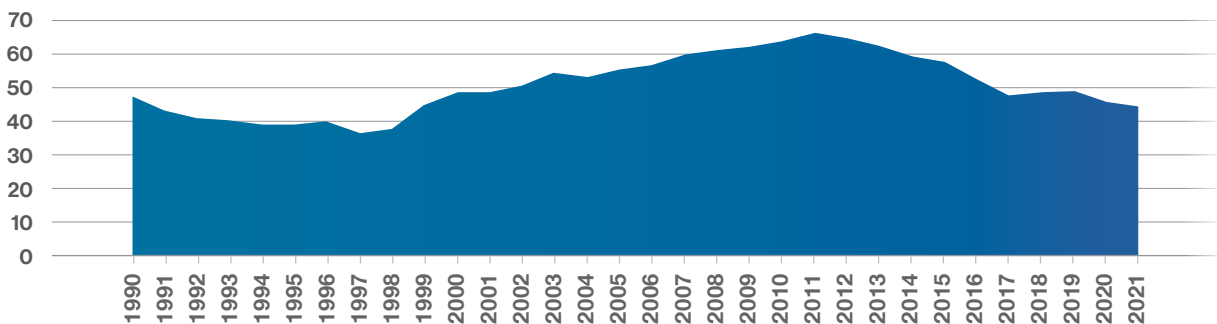
2. Canadian natural gas is getting cleaner

Emissions intensity is the emission rate of a given pollutant relative to the intensity of a specific activity or industrial production process. Emissions intensity is determined by dividing the number of absolute emissions by some unit of output, such as GDP, energy used, population, or barrel of oil produced. Between 2010 and 2021, the CO₂ emissions intensity of Canadian natural gas production fell from 63.5 kilograms CO₂e per barrel of oil equivalent to 44.5 kilograms CO₂e per barrel of oil equivalent, a decline of nearly 30 percent.

Figure 2

Canadian Natural Gas Production and Processing Emissions Intensity

1990-2021 | Kilograms CO₂e per barrel of oil equivalent



Source: Derived from Rystad Energy.

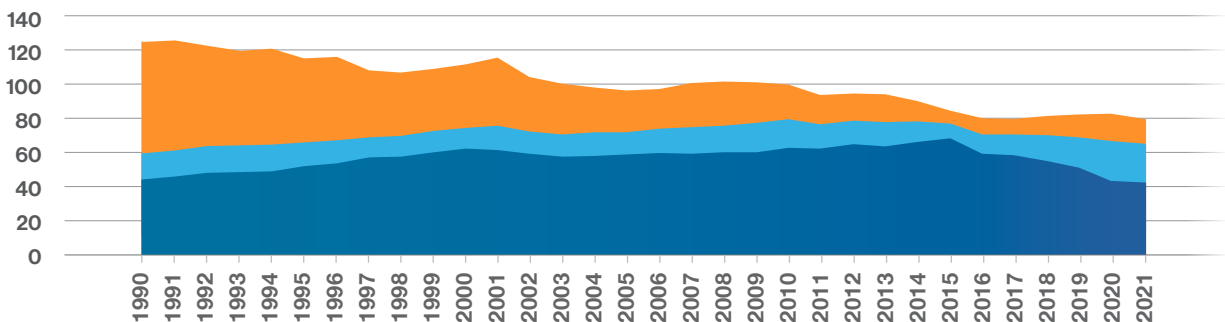
3. Canadian oil sands production is getting cleaner

Between 2000 and 2021, the emissions intensity of the oil sands subsector fell from 111.8 kilograms CO₂e per barrel to just under 79.3 kilograms CO₂e per barrel, a decline of over [29 percent](#). As GHG emissions intensity in the upstream oil sector continues to decline and because Canada’s ESG performance remains highly rated, Canadian oil has the potential to become the barrel of choice on the world stage.

Figure 3

Canadian Upstream Oil Emissions Intensity

1990-2021 | Kilograms CO₂e per barrel



Source: Derived from Rystad Energy.

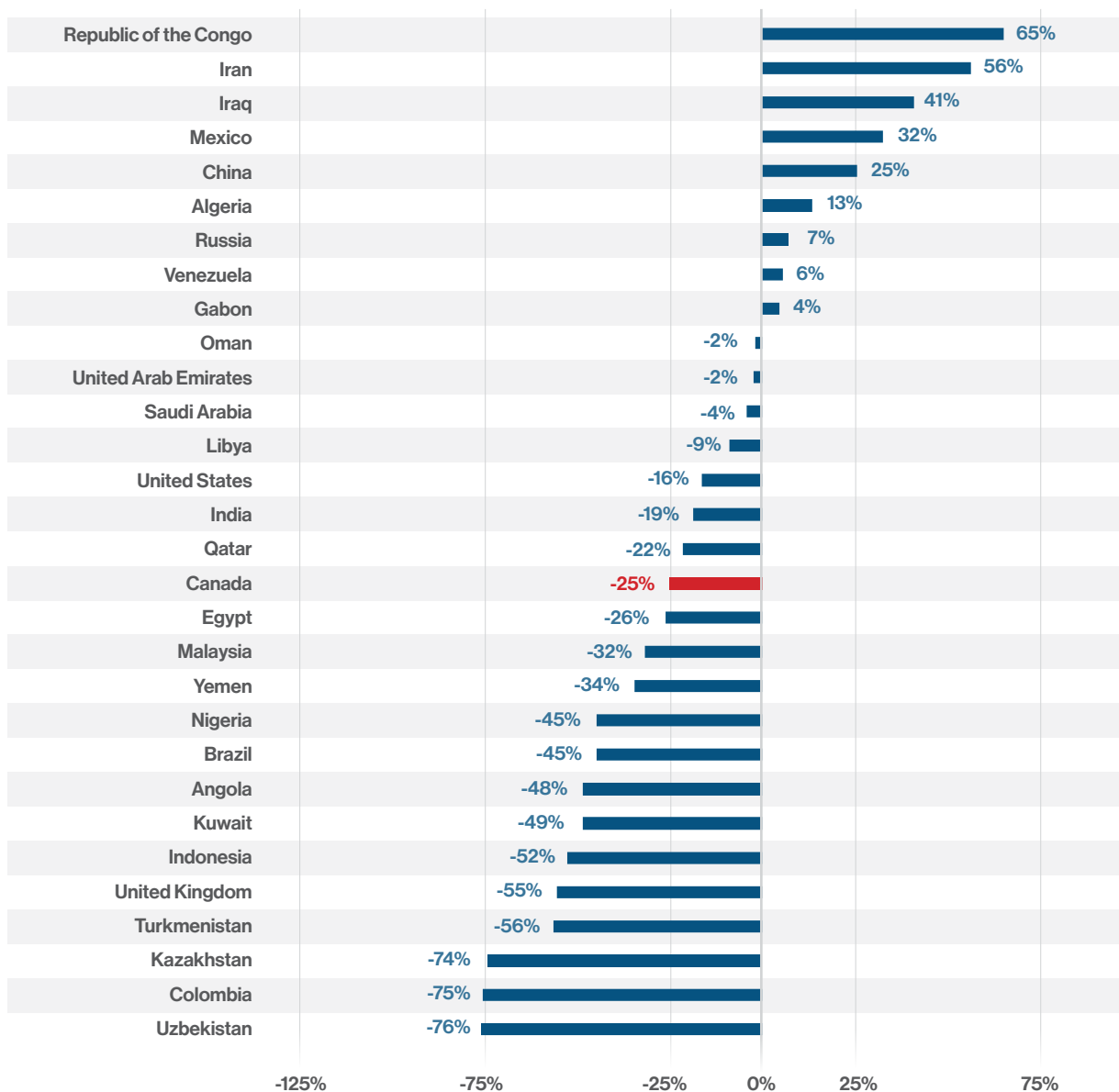
Notes: Intensities are based on total subsector emissions and relevant production amounts. They represent overall averages, not facility intensities.

4. Canada’s oil and gas sector is doing its part to reduce methane emissions

Gas flaring is the burning off of the natural gas that is generated in the process of oil extraction and production. It is a significant source of greenhouse gas emissions (GHGs). In 2022, 138,549 million cubic meters (m3) (or 139 billion cubic meters (bcm)) of flared gases were emitted worldwide, creating 350 million tonnes of CO2 emissions annually. [At 945 million m3](#) in 2022, Canada was the eighth lowest flarer among the world’s top 30 oil and gas producers (23rd spot). Canada decreased its flaring emissions by 320 million m3 from its 2012 level of 1,264 million m3, a 25 percent drop. In 2022, Canada contributed just 0.7 percent of the global amount of gas flaring despite being the world’s fourth largest oil producer.

Figure 4
Global Gas Flaring, 2022 vs. 2012

Percent change in million m3 gas flared/year



Source: World Bank (undated)

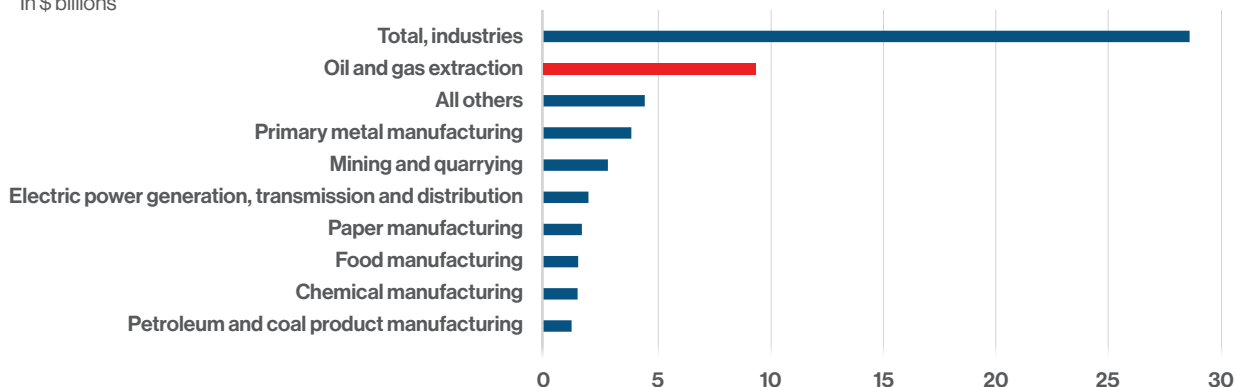
5. Environmental spending by Canada’s oil and gas sector remains high

Canadian businesses spent \$28.6 billion on environmental protection between 2018 and 2020. When capital and operating expenses on environmental protection are combined, out of that \$28.6 billion the oil and gas sector spent \$9.4 billion, or nearly 33 percent. In 2020 alone, when capital and operating expenses on environmental protection are combined, the oil and gas sector spent [\\$2.7 billion](#), or 27 percent of all Canadian business spending on the environment that year.

Figure 5

Cumulative total environmental protection spending in Canada by top industrial spenders from 2018-2020

In \$ billions



Source: Derived from Statistics Canada, Table 38-10-0130-01.

6. Alberta among top provincial spenders on environmental protection

Industries are not alone in spending money on environmental protection; provincial governments do as well. Total provincial government spending on environmental protection between 2008 and 2021 was nearly \$143.5 billion. In 2021, Alberta spent [\\$22.6 billion](#) or 15.7 percent of all provincial expenditures on the environment, while its proportion of the national population was 11.6 percent.

Table 1

Environmental spending by provincial governments
2008 to 2021

Province	Total environment spending, 2008-2021		Share of national population totals, 2021
	(\$ billions)	% of total	
Newfoundland and Labrador	1.4	1.0%	1.4%
Prince Edward Island	0.6	0.4%	0.4%
Nova Scotia	4.2	2.9%	2.6%
New Brunswick	2.1	1.5%	2.1%
Quebec	27.2	18.9%	22.5%
Ontario	55.8	38.9%	38.7%
Manitoba	4.1	2.9%	3.6%
Saskatchewan	4.6	3.2%	3.1%
Alberta	22.6	15.7%	11.6%
British Columbia	18.7	13.0%	13.6%
Yukon	1.1	0.8%	0.1%
Northwest Territories	0.9	0.6%	0.1%
Nunavut	0.3	0.2%	0.1%

Source: Statistics Canada, Tables 10-10-0005-01 and 17-10-0005-01; and authors' calculations.

Economics of the oil and gas sector

7. Revenue contribution from the oil and gas sector: \$578.7 billion between 2000 and 2021

The gross revenue contribution to federal, provincial, and municipal governments received exclusively from the oil and gas sector was \$578.7 billion between 2000 and 2021, an average of \$26.3 billion per year. The [\\$578.7 billion](#) figure includes \$461.6 billion in direct provincial revenues, \$99.6 billion in direct federal revenues, and \$17.3 billion in indirect federal, provincial, and municipal taxes.

8. Projected government revenues from Canada’s oil sands sector: US\$231 billion from 2023 to 2032

Government revenues from Canada’s oil sands sector (which includes provincial royalties and federal and provincial corporate taxes) are expected to rise from US\$17.1 billion in 2023 to US\$28.7 billion in 2032—nearly US\$231 billion cumulatively—assuming the price of oil is a flat US\$80 per barrel. Both projections would be about 20 percent more in Canadian dollars at the current exchange rate.

Table 2

The Oil and Gas Sector’s Revenue Contributions to Federal and Provincial Governments | 2000 to 2021

2000-2021 cumulative	\$ billions (2022 dollars)
Provincial	461.6
Provincial personal income taxes*	24.8
Provincial corporate tax revenues	25.0
Crown lease payments	45.2
Royalties	366.6
Federal	99.6
Federal personal income taxes*	55.3
Federal corporate income taxes	44.3
Federal, provincial and municipal	17.3
Federal, provincial and municipal indirect taxes**	17.3
Total federal, provincial and municipal revenues from the oil and gas sector	578.7

*Excludes personal income taxes 2000 to 2006, indirect taxes for 2020 and 2021, and personal income taxes for 2021.

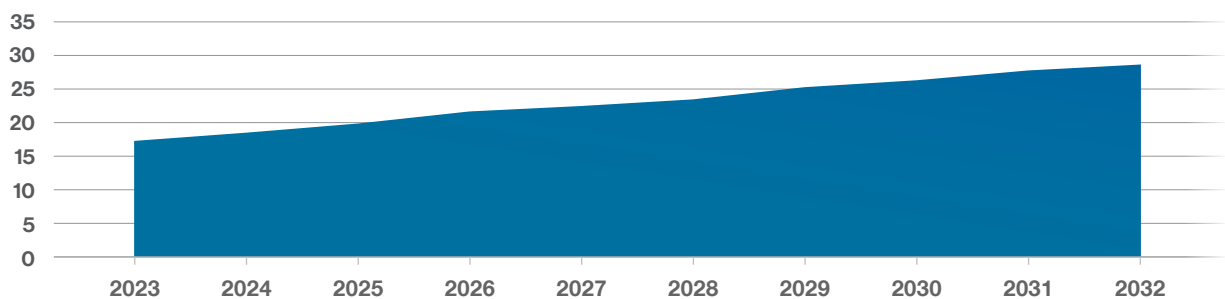
**Indirect taxes include sales taxes, fuel and excise taxes, import duties and others.

Sources: Statistics Canada, 2022 (a, b, c, d), Statistics Canada 2023 (a,b), and CAPP, 2022.

Figure 6

Projected Canadian Oil Sands Sector Government Revenue

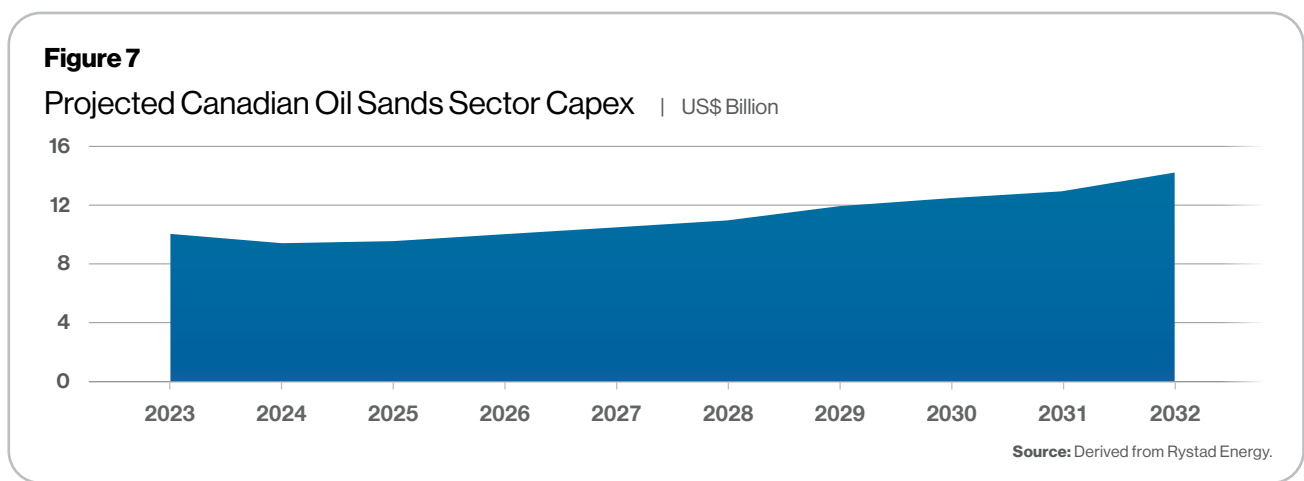
US\$ Billion



Source: Derived from Rystad Energy.

9. Projected capex from Canadian oil sands sector: nearly US\$113 billion over the next decade

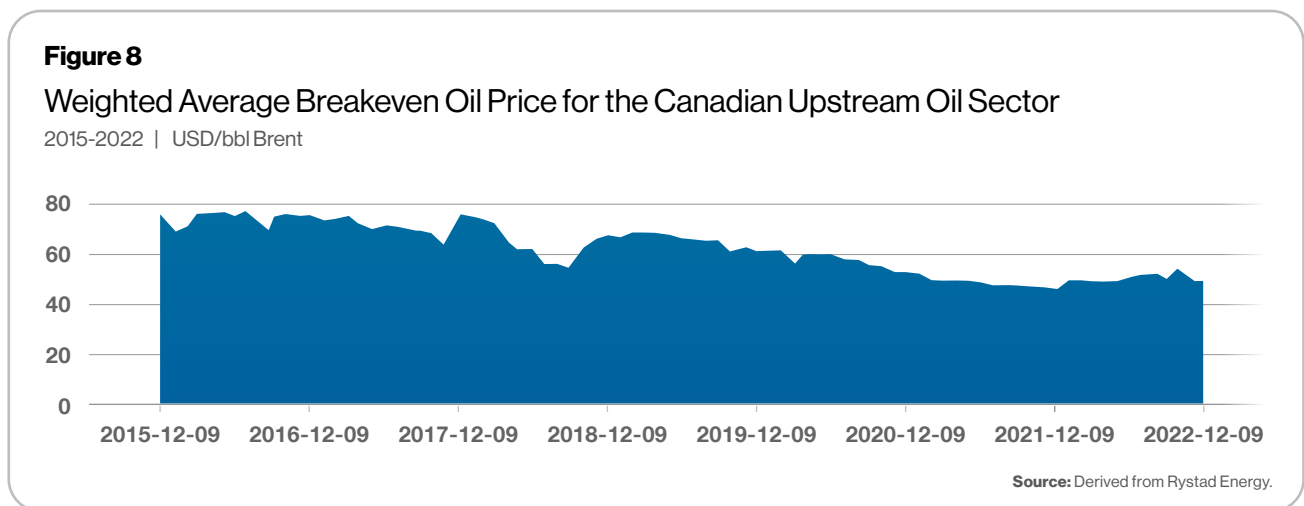
Capex from the Canadian oil sands sector is projected to reach [US\\$112.7 billion](#) over the next decade. Assuming a flat US\$80 per barrel for the price of oil, oil sands sector capex is expected to rise from US\$10.1 billion in 2023 to US\$14.2 billion in 2032. Those projections would be about 20 percent more in Canadian dollars at the current exchange rate.



10. Canadian overall upstream oil sector supply costs have declined over 35% since 2015

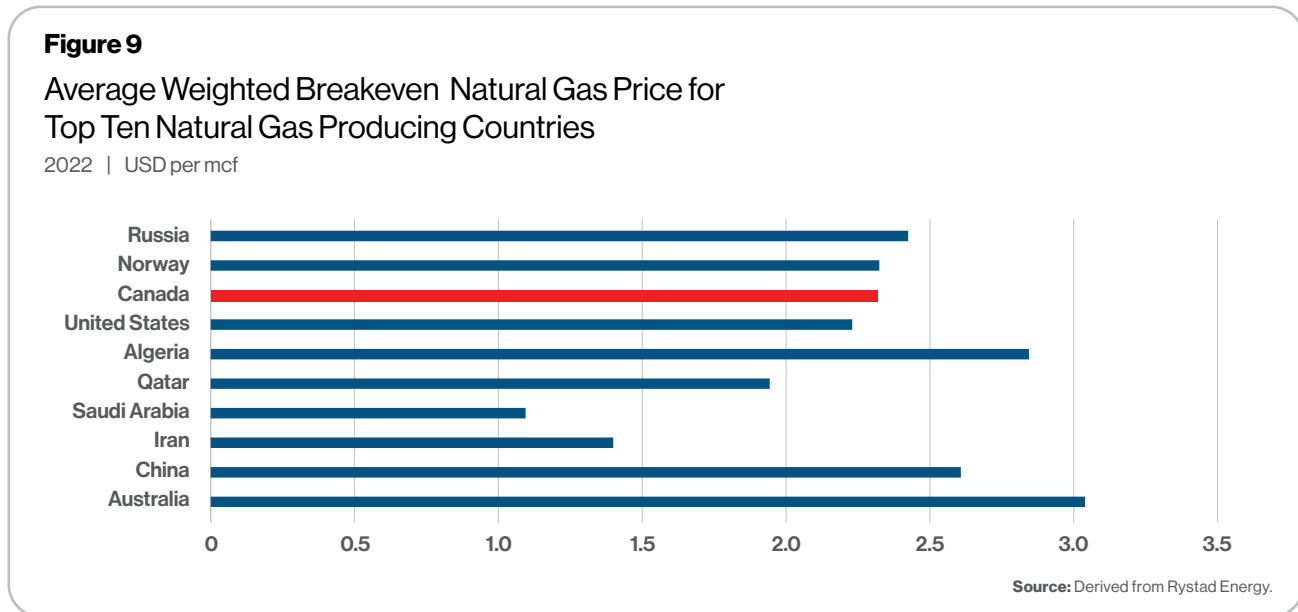
The cost of supply for the Canadian upstream oil sector is the minimum constant dollar price needed to recover all capital expenditures, operating costs, royalties, taxes, and earn a specified return on investment. Supply costs indicate whether the upstream oil sector is economically viable.

Supply costs within Canada's upstream oil sector declined significantly between 2015 and 2022. At the end of 2015, the Canadian upstream oil sector's weighted average breakeven price was nearly US\$76.00 per barrel of Brent. By the end of 2022, that weighted average breakeven price was [US\\$49.09 per barrel of Brent](#), a decline of US\$26.91 per barrel, or over 35 percent since 2015. This number incorporates different phases of oil production including producing, under development, and discovery.



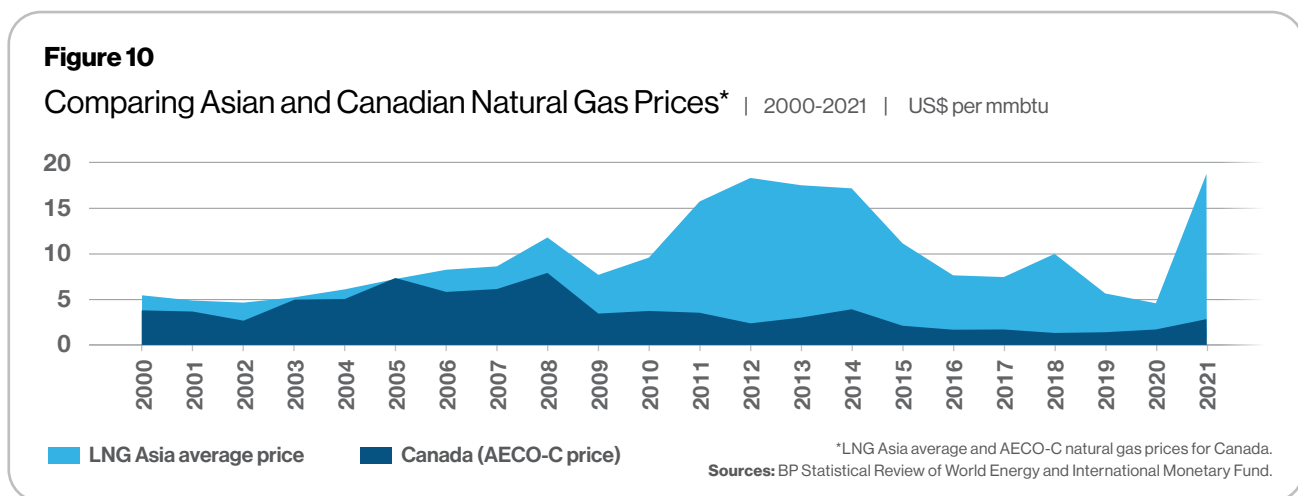
11. Breakeven costs in Canadian natural gas sector fifth lowest in the world

The Canadian natural gas sector had a weighted average breakeven gas price of [US\\$2.31](#) per thousand cubic feet (mcf) in 2022, fifth lowest among major natural gas producing countries. Only in Saudi Arabia (US\$1.09 per mcf), Iran (US\$1.39 per mcf), Qatar (US\$1.93 per mcf), and the United States (US\$2.22 per mcf) was the breakeven gas price lower. The weighted average breakeven costs for Canada's natural gas sector in 2022 were lower than in Russia, Norway, Algeria, China, and Australia.



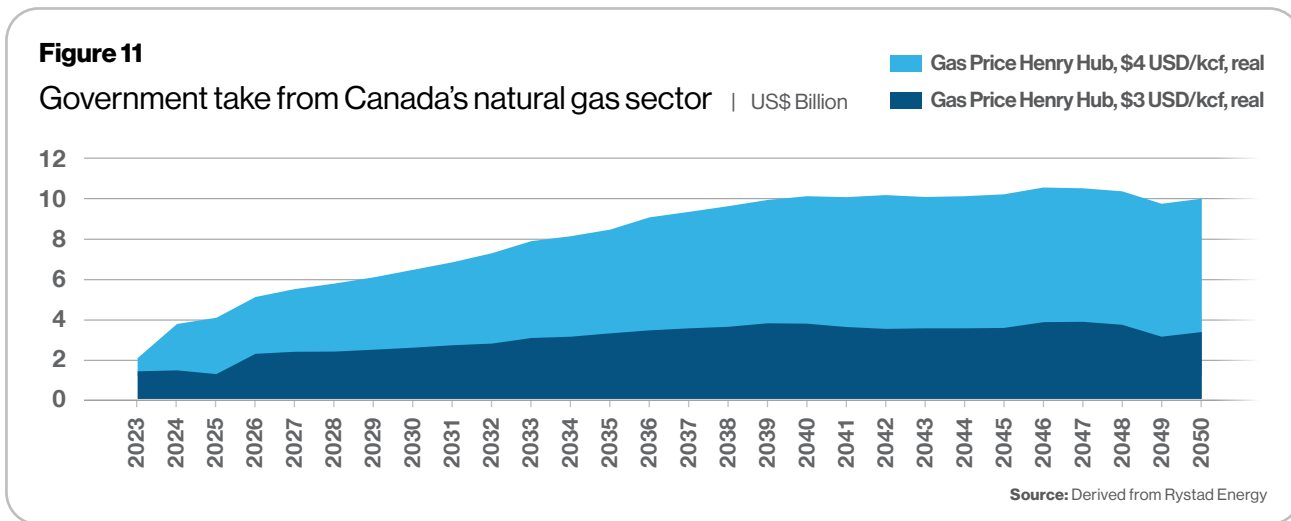
12. Natural gas prices have skyrocketed

Natural gas prices have skyrocketed around the world in the last two years. In 2021, the price of natural gas in Asia was [US\\$18.60 per million British thermal units](#) (mmbtu) compared to US\$4.40 per mmbtu in 2020—an increase of 323 percent in just one year. By comparison, in 2021 natural gas sold for US\$2.80 per mmbtu on Alberta's AECO-C trading hub; in Asia it was US\$15.88 per mmbtu more (or 564 percent higher). Between 2019 and 2021, the price gap between Henry Hub in the US and AECO-C natural gas fluctuated from a high of 98 percent in 2019 to a low of 26 percent in 2020. In 2021, U.S. natural gas sold for US\$3.84 per mmbtu, 40 percent higher than the US\$2.75 per mmbtu average price for AECO-C natural gas that year.



13. Projected government revenues from the Canadian natural gas sector: over US\$227 billion through 2050

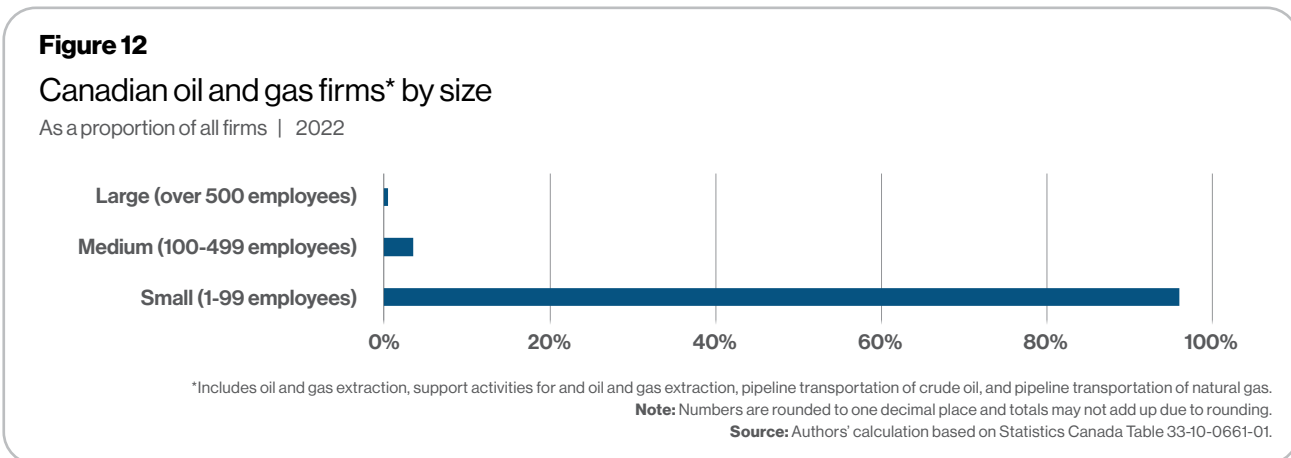
Government revenues from the Canadian natural gas sector are projected to reach over US\$227 billion through 2050. Under a Henry Hub price for natural gas of US\$3.00 per thousand cubic feet (kcf), government revenues from the country’s natural gas sector are expected to rise from US\$1.4 billion in 2023 to [US\\$3.4 billion](#) in 2050. Should the Henry Hub price reach US\$4.00 per kcf, government revenues from the country’s natural gas sector would be projected to rise from US\$2.0 billion in 2023 to US\$10.0 billion in 2050.



14. Small business plays a key role in the oil and gas sector

Small business plays a key job creation role in Canada’s economy. Statistics Canada defines small businesses as those with between one and 99 paid employees. Medium-size enterprises are those with 100 to 499 employees, while large enterprises have 500 or more employees. In 2022, of the oil and gas firms in Canada, [96.0 percent](#) were small, 3.5 percent were medium-sized, and 0.6 percent were large companies.

With the exception of construction, the oil and gas sector in Canada has a higher proportion of small businesses than other major industries. As of 2022, 96.0 percent of all oil and gas energy firms had between 1 and 99 employees compared with 93.2 percent in manufacturing, 89.6 percent in utilities, and 99.0 percent in the construction sector. The all-industry average is 98.0 percent.



15. Canada’s oil and gas sector has an impact on key industries across the Canadian economy

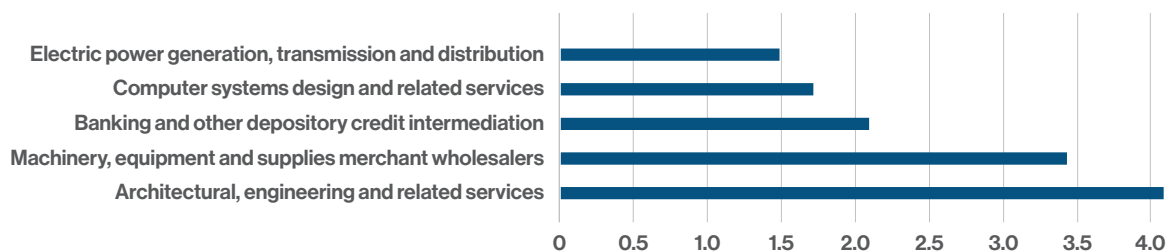
In 2019, the activities of the Canadian oil and gas sector were indirectly responsible for significant portions of the GDP created by other key industries across Canada. The sector’s activities generated \$100.9 million in GDP in the food and beverage merchant wholesalers industry that year and nearly [\\$4.1 billion](#) in GDP in architectural, engineering, and related services. In 2019, the top five industries whose GDP was most affected by their association with Canada’s oil and gas sector included:

- Architectural, engineering, and related services: \$4.1 billion
- Machinery, equipment, and supplies merchant wholesalers: \$3.4 billion
- Banking and other depository credit intermediation: \$2.1 billion
- Computer systems design and related services: \$1.7 billion
- Electrical power generation, transmission, and distribution: \$1.5 billion

Figure 13

Distribution of Indirect Activity Generated by the Canadian Oil and Gas Sector

2019 | Top Five Industries | GDP | \$ Billion



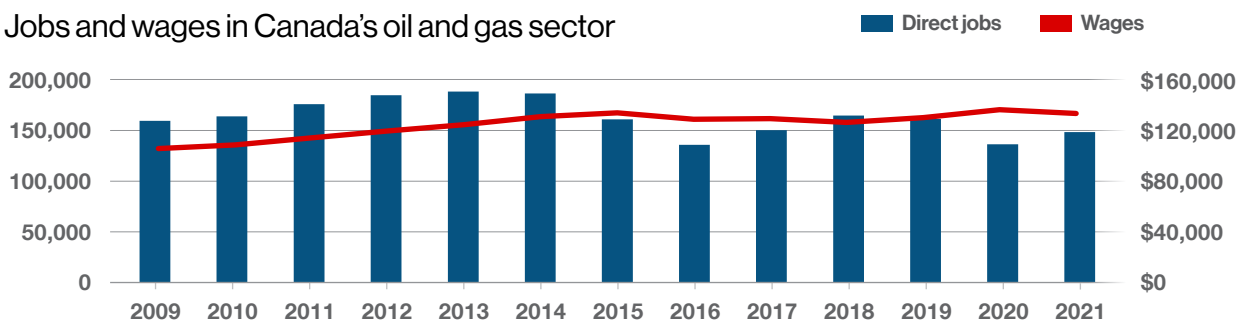
Source: Statistics Canada.

16. Employment and wages in the oil and gas sector remain high

In 2021, the oil and gas sector directly employed 147,371 Canadians. The number of direct jobs in the sector rose from 158,483 in 2009 to 185,393 in 2014, then fell to 134,939 in 2016, the result of the sharp decline in energy prices, before rising to 160,379 in 2019 as energy prices gradually recovered. The onslaught of COVID-19 in 2020 saw oil and gas sector jobs fall back to 135,475, before recovering to 147,371 in 2021. The average salary of a worker in the Canadian oil and gas sector in 2021 was \$133,293. The average salary for a worker in the sector had risen from \$103,448 in 2009 to \$133,776 in 2015, before leveling off to [\\$129,716](#) in 2019 due to the energy price slump. However, between 2009 and 2021, the average annual wage of a worker in the Canadian oil and gas sector increased by nearly 29 percent.

Figure 14

Jobs and wages in Canada’s oil and gas sector

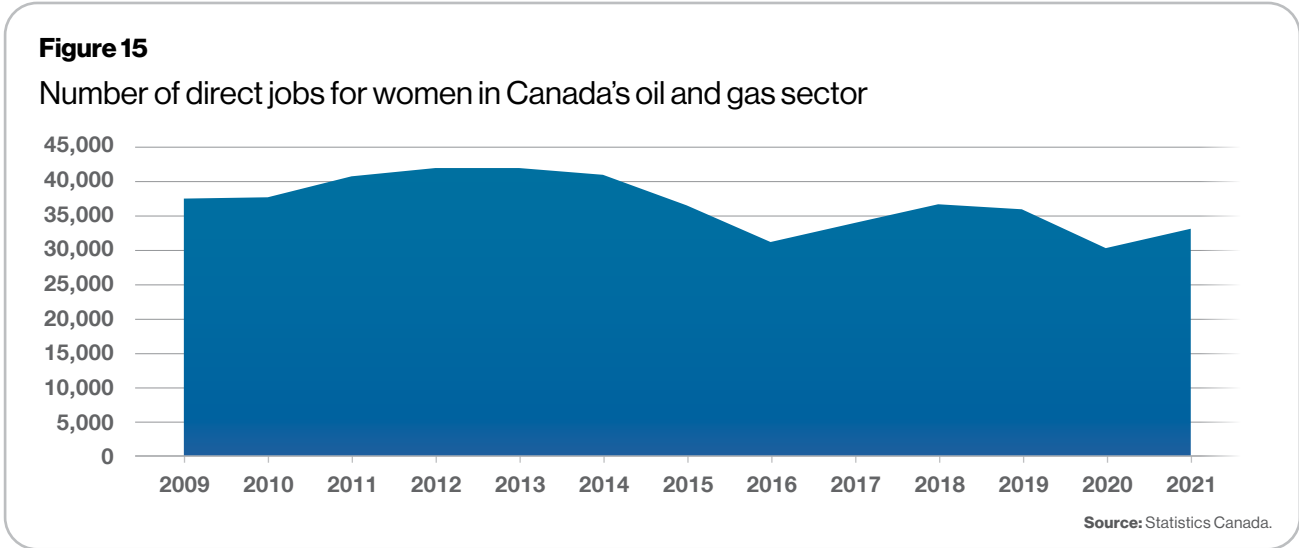


Source: Statistics Canada.

Social and governance

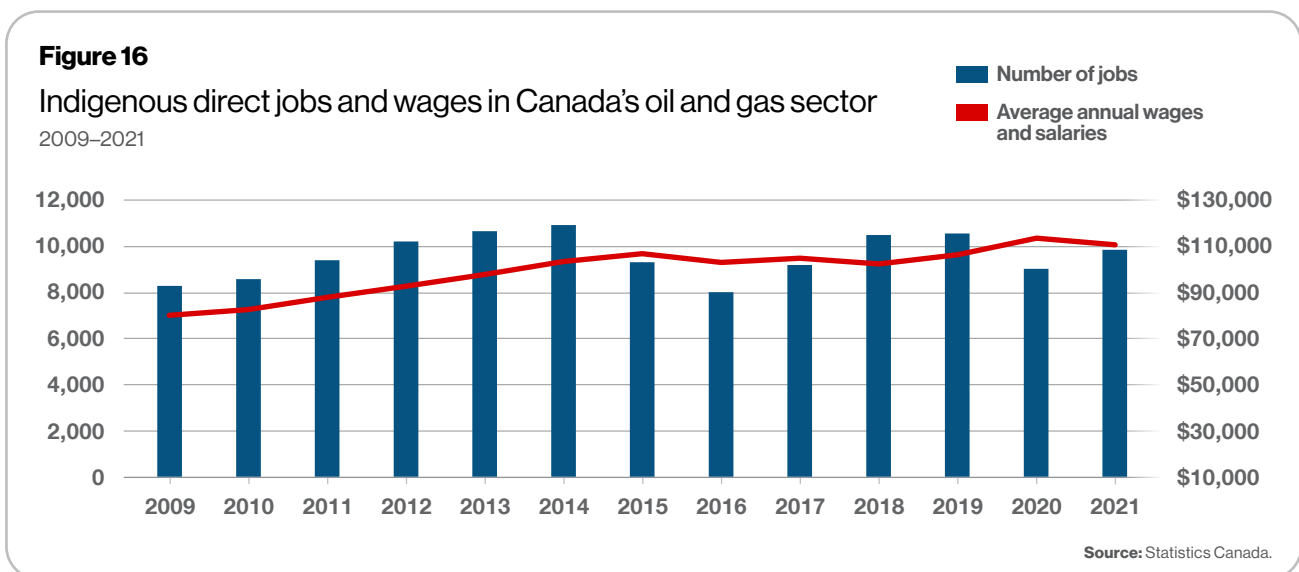
17. Women's employment in Canada's oil and gas sector is recovering

The number of females employed in the oil and gas sector reached a high of 42,440 in 2013, dipping to [30,285](#) in 2020 due to COVID-19, and then recovering somewhat to 33,068 in 2021. Between 2009 and 2021, the average wage for a female worker in the Canadian oil and gas industry increased by over 53 percent.



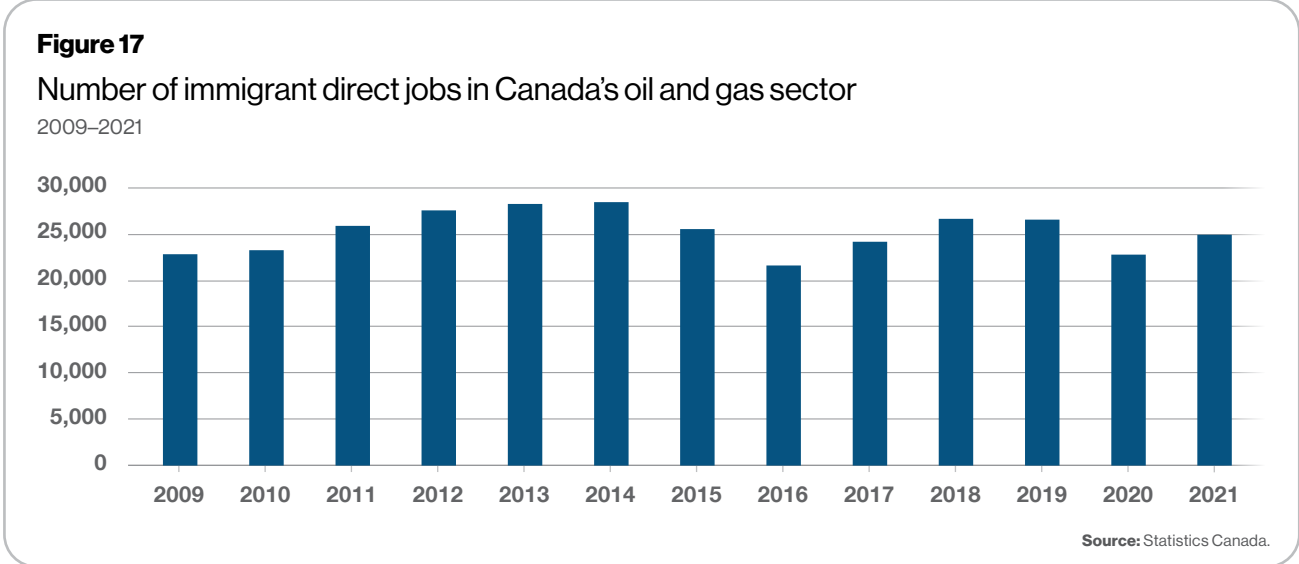
18. Diversity increasing in the oil and gas sector

Between 2009 and 2021, workers in the Canada's oil and gas sector who identified as Indigenous increased by nearly [17 percent](#). Between 2009 and 2021, the average salary of an Indigenous person employed in Canada's oil and gas sector increased by over 39 percent.



19. More new Canadians working in the oil and gas sector over the long term

In 2021, 24,931 immigrants were directly employed in the Canadian oil and gas sector. The number of immigrants employed in the oil and gas industry reached 28,469 by 2014, declining to 21,622 in 2016 before recovering to 26,569 in 2019. Between 2009 and 2021, immigrant employment in the Canadian oil and gas sector increased by over [9 percent](#). Between 2009 and 2021, the average wage and salary of an immigrant employed in the Canadian oil and gas sector increased by nearly 25 percent.



Carbon Capture, Utilization and Storage (CCUS)

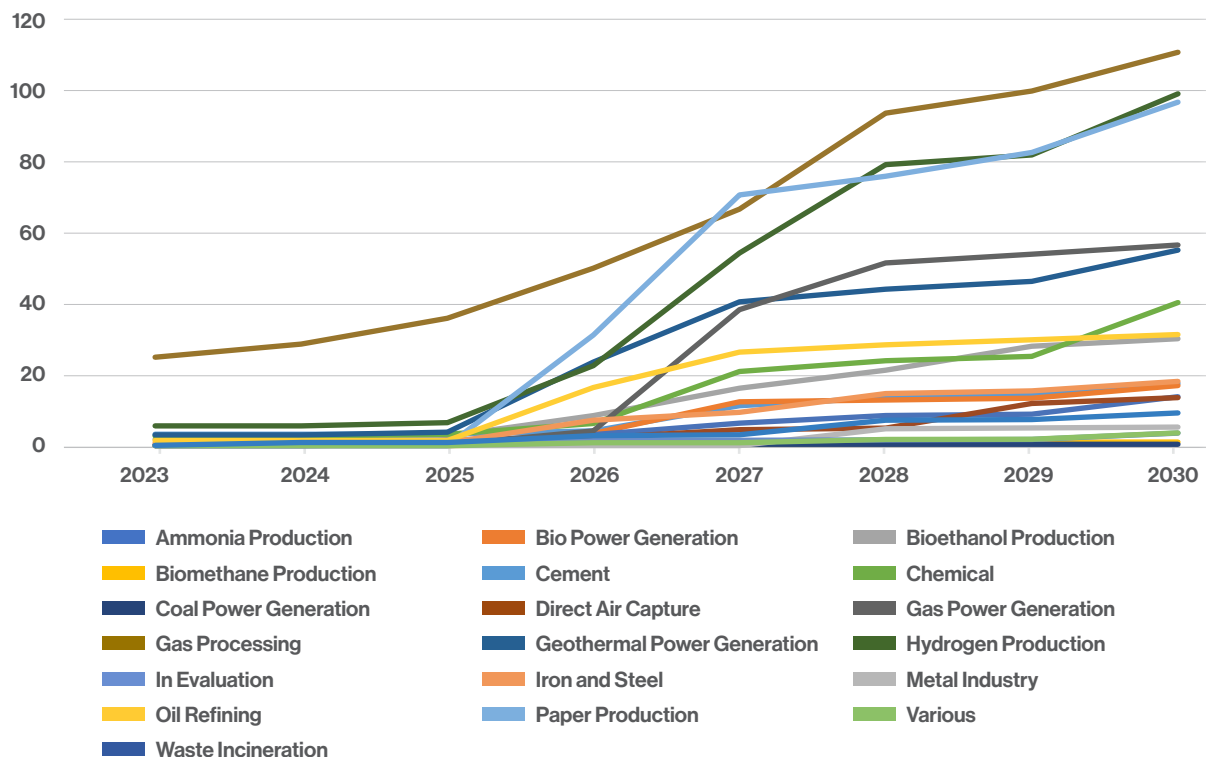
20. Carbon Capture, Utilization and Storage (CCUS) growing across the world

At the end of 2022, there were 65 commercial carbon capture, utilization and storage (CCUS) projects in operation globally capable of capturing nearly 41 million tonnes per annum (mtpa) of CO₂ across various industries, including the oil and gas sector. There are another 478 projects in various stages of development around the world that will be capable of capturing roughly another 559 mtpa of CO₂. These projects are in various stages of development: some are at the feasibility stage while others are in the concept and construction phases. If all projects move ahead as scheduled, by 2030 it is estimated that nearly 500 CCUS projects could be operating worldwide, having the ability to capture 623.0 mtpa of CO₂. In fact, between 2023 and 2030, global carbon capture capacity could grow from 43.5 mtpa to 623.0 mtpa, an increase of over 1,332 percent.

Figure 18

Projected global carbon capture capacity by sector

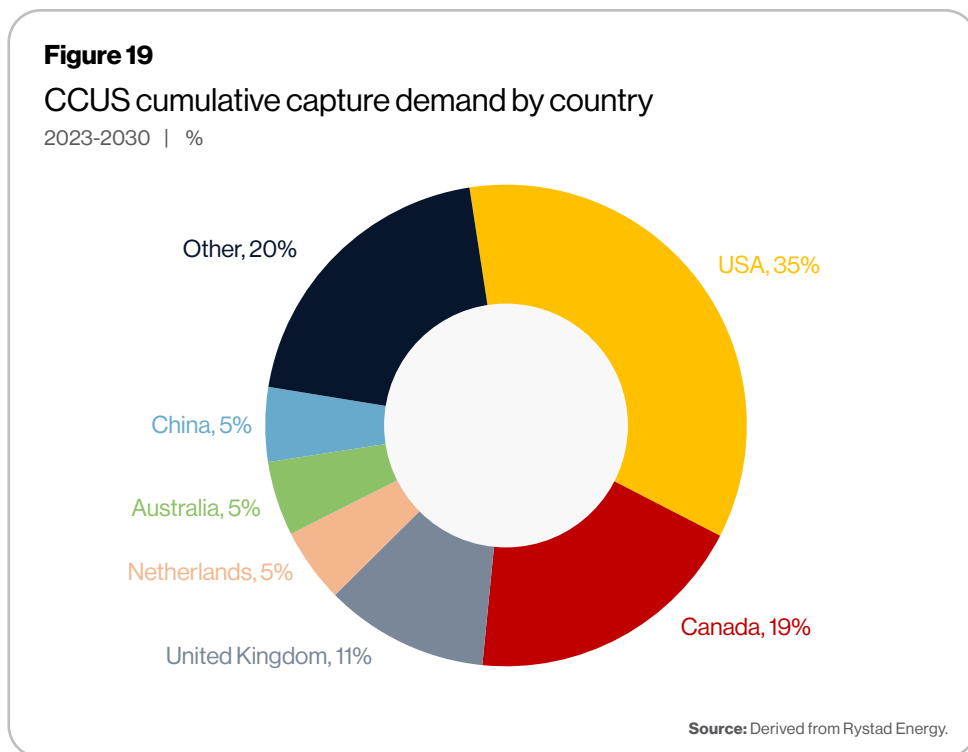
Millions of tonnes per annum (mtpa)



Source: Derived from Rystad Energy.

21. Projected Carbon Capture, Utilization and Storage (CCUS) in Canada has a bright future

Global carbon capture capacity and worldwide spending trends to date underline the fact that the future is bright for Canadian investments in CCUS. Assuming that appropriate government policies and regulations are put in place, Canada can expect to see further project announcements and increased investment in the technology. Canada will likely emerge as a CCUS heavyweight given the prevailing policy environment and the existential need for oil sands players to decarbonize. Rystad Energy estimates that Canada alone could account for around [20 percent](#) of cumulative carbon capture demand between 2023 and 2030.



Nuclear and renewables

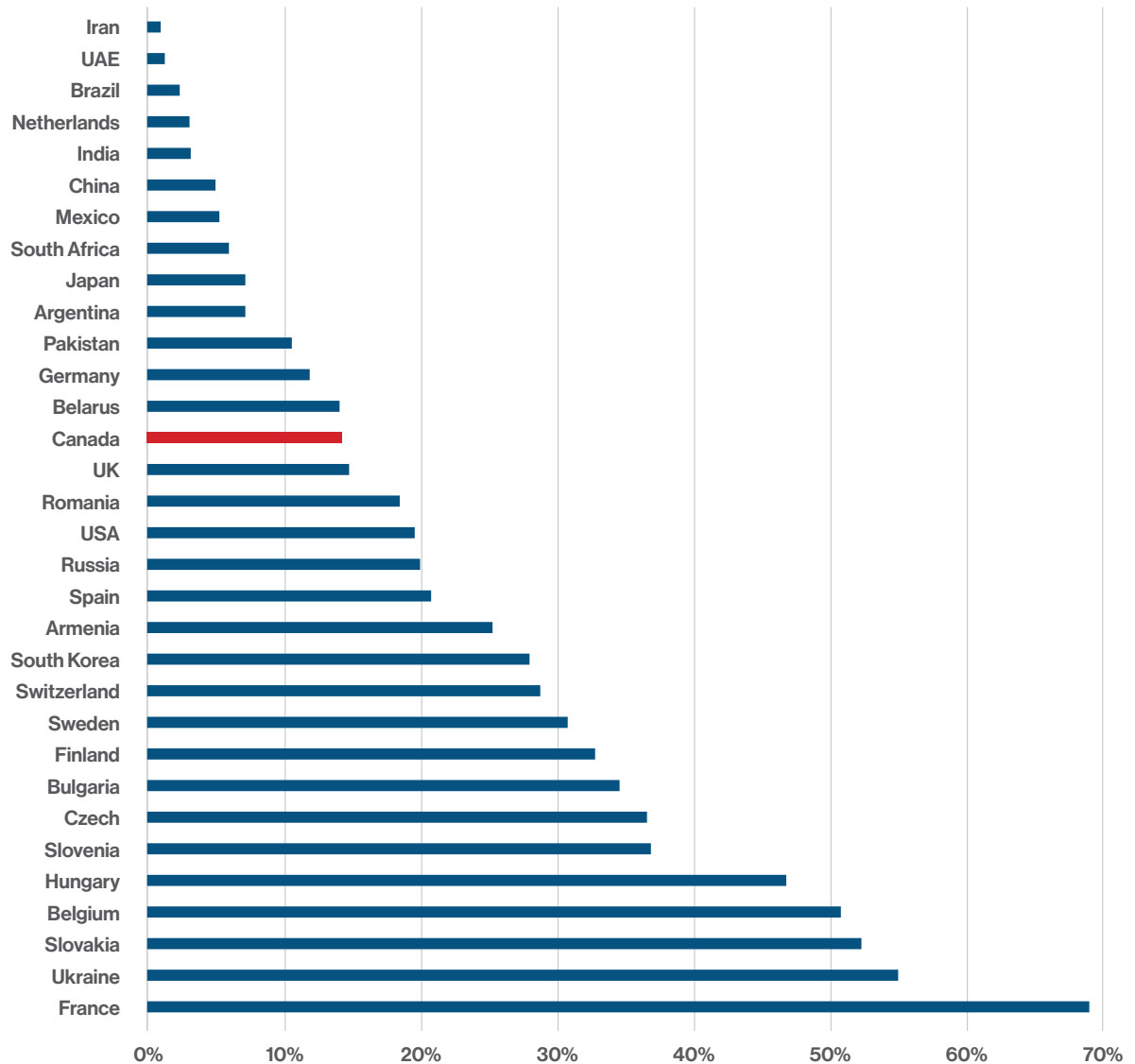
22. Nuclear energy a stable source of electricity production in Canada

Nuclear power plants have been producing electricity in Canada since the 1960s. As of 2022, four nuclear power plants operate in Canada: three in Ontario and one in New Brunswick. Canada's share of nuclear electricity production has remained relatively stable over the past few decades. In 1990, nuclear energy accounted for about [14.8 percent](#) of Canada's electricity production; by 2021, this share had decreased only slightly to about 14.3 percent.

Figure 20

Share of electricity generation from nuclear energy by country

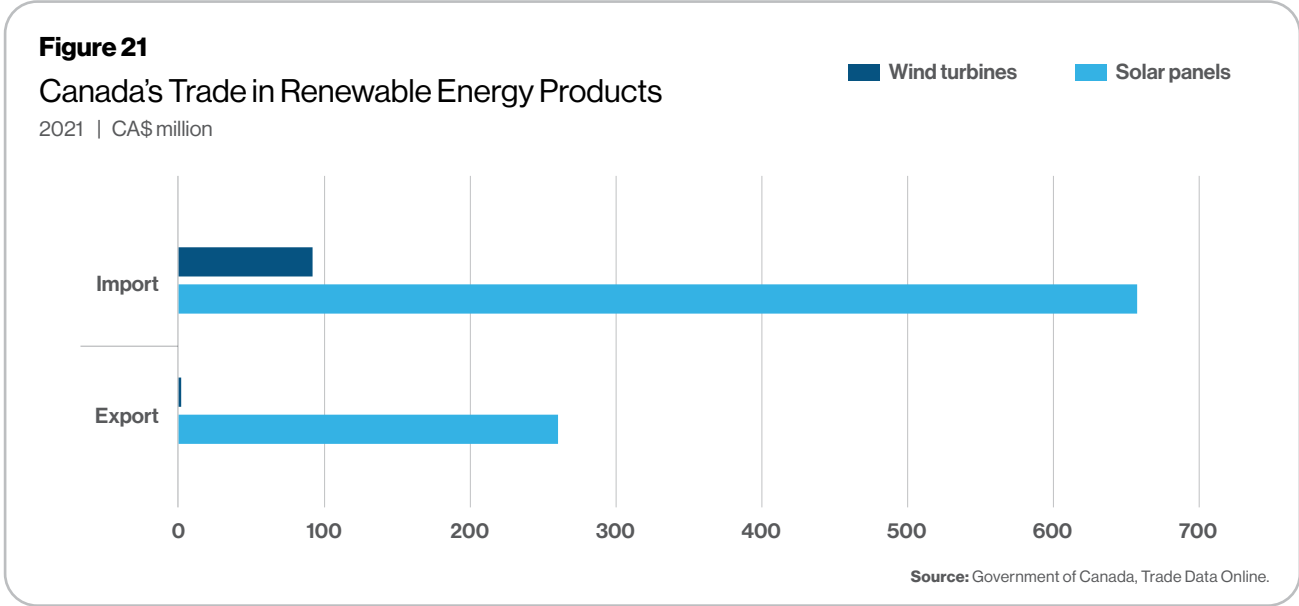
2021 | %



Source: International Atomic Energy Agency.

23. Canada’s trade in renewable products is modest

Trade is an essential component of Canada’s economic activity, accounting for about two-thirds of the economy and employing 3.3 million people. In 2021, Canada imported solar panel products with a value of CAN\$653 million and wind turbine products with a value of [CAN\\$91 million](#). The value of the solar panels and wind turbines Canada imported was much higher than the CAN\$260 million export value for both products.



Liquefied Natural Gas (LNG)

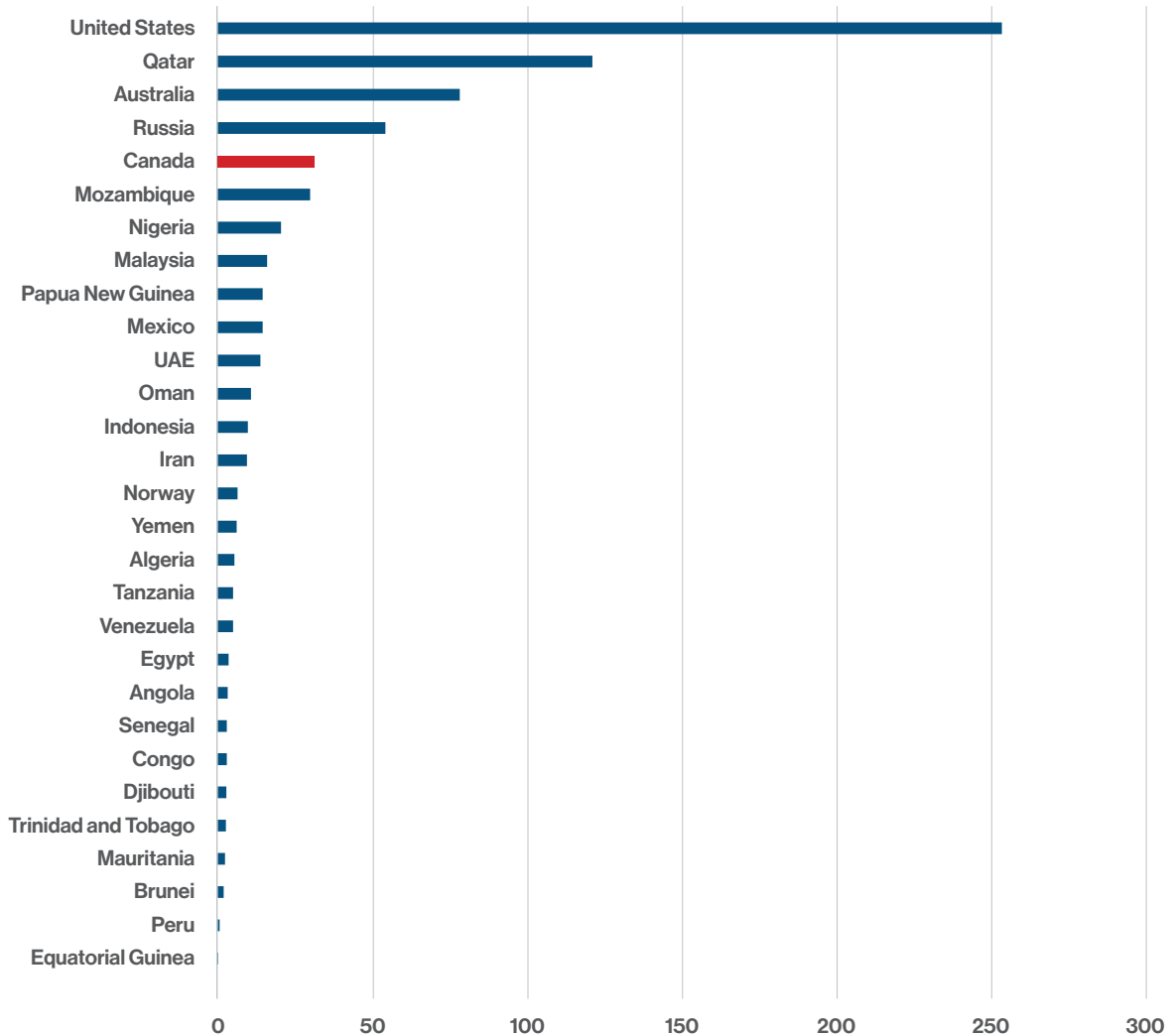
24. Global LNG production projected to rise

Global liquefied natural gas (LNG) production is expected to reach nearly [720 million](#) tonnes by 2035. That year the United States is projected to be the world's leading LNG producer at 259 million tonnes, followed by Qatar at 121 million tonnes, and Australia at 78 million tonnes. Russian LNG supply was expected to grow to 54 million tonnes by 2035, but this is now in question, leaving opportunities for countries such as Canada to fill the void. In fact, by 2035, Canada could be the fifth largest LNG producer at nearly 33 million tonnes of LNG.

Figure 22

LNG Production by Country

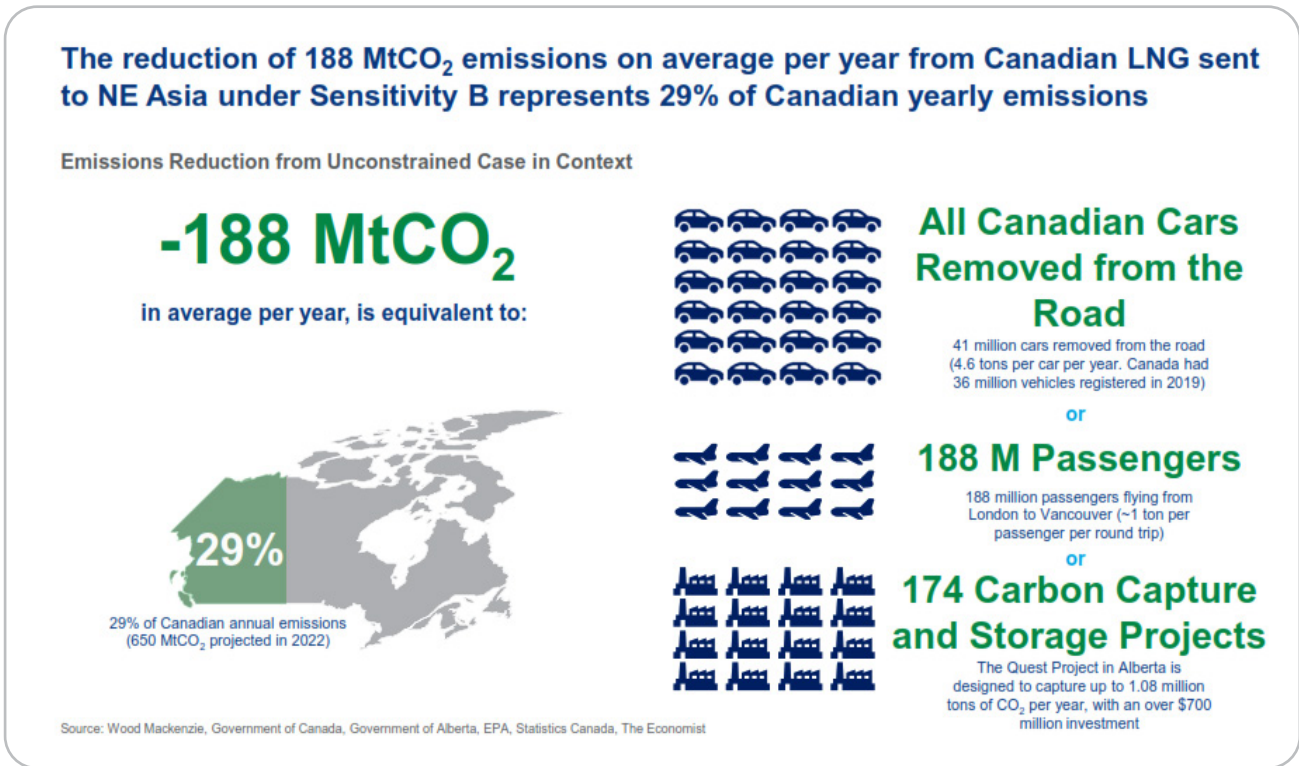
2035 | Million tonnes of LNG



Source: Derived from Rystad Energy.

25. Canadian LNG exports could help reduce global emissions

Asia is a significant source of [CO2 emissions](#). Canadian LNG exports can help in reducing emissions from the Asian energy mix. If Canada increases its LNG export capacity to Asia, by 2050 net global emissions could decline [by 188 million](#) tonnes of CO2 equivalent per year. That would have the annual impact of taking 41 million cars off the road.



About the Canadian Energy Centre

The Canadian Energy Centre's mandate is to promote Canada as the supplier of choice for the world's growing demand for responsibly produced energy. It is an independent provincial corporation that is primarily supported by the Government of Alberta's industry-funded Technology, Innovation and Emissions Reduction (TIER) fund: www.canadianenergycentre.ca.

CEC Research Briefs

Canadian Energy Centre (CEC) Research Briefs are contextual explanations of data as they relate to Canadian energy. They are statistical analyses released periodically to provide context on energy issues for investors, policymakers, and the public. The source of profiled data depends on the specific issue. This research brief is a compilation of previous Fact Sheets and Research Briefs released by the centre in 2023. **Sources can be accessed in the previously released reports.** All percentages in this report are calculated from the original data, which can run to multiple decimal points. They are not calculated using the rounded figures that may appear in charts and in the text, which are more reader friendly. Thus, calculations made from the rounded figures (and not the more precise source data) will differ from the more statistically precise percentages we arrive at using the original data sources.

About the author

This CEC Research Brief was compiled by Ven Venkatachalam, Director of Research at the Canadian Energy Centre.

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