

Canada's Energy Workforce

National Labour Market Outlook
to 2035



February 2024

Canada

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Foreword



Canada's energy industry significantly contributes to national and global markets. It directly **employs about 200,000 individuals across the country**, and indirectly supports hundreds of thousands more.

The diverse workforce encompasses roles in everything from business and operations support to engineers and field workers, all of whom are instrumental in developing and delivering energy to customers around the world. Canada's energy is essential, not only for moving people, goods and services and heating homes, but also for manufacturing everyday products and powering other Canadian industries.

The global and national energy landscape is evolving, influenced by a variety of factors such as geopolitical shifts, technological advancements and a growing demand for sustainable practices. This evolution is underscored by industry's increasing commitment to support a net-zero economy through significant investments in low-carbon energy sources, the adoption of cutting-edge technologies and the implementation of ambitious emissions-reduction initiatives. These efforts demonstrate industry's dedication to a sustainable future, balancing economic goals with environmental responsibilities.

Canada will continue to play a key role in the global energy landscape as a responsible and secure supplier and will require a skilled and capable workforce to

meet the needs of the evolving industry. The *National Labour Market Outlook to 2035* provides an overview of Canada's energy workforce projections and examines the specific trends driving the outlook. For the first time, employment projections include the refining of petroleum products and emerging energy sectors and technologies in Canada. This report outlines two scenarios within a 13-year timeframe, considering the necessary time and development for supporting the expansion of Canada's energy industry.

Building on more than 20 years of experience, Careers in Energy's (CIE) outlook reports have always served as a valuable tool for industry leaders, labour market planners, post-secondary and other training institutions. In this report you will find labour market forecast data to inform strategic workforce planning, development and training. Furthermore, this outlook will help guide recruitment strategies and promotional initiatives while also providing career pathways across Canada's increasingly diverse energy industry.

Murray Elliott

President and CEO, Energy Safety Canada



Key Insights



Canada's energy industry is evolving

Canada's energy industry is tasked with a dual mandate of growing its production to meet national and global energy demand, while simultaneously pursuing a low-carbon future. The established energy industry remains critical to the country's energy system and economic well-being; at the same time, it's an asset to support lower-carbon energy sources.



An integrated energy system and workforce

Canada's energy industry is becoming increasingly integrated and so is its workforce. Foundational technology, equipment, skills and expertise are being expanded and applied in innovative ways to develop new low-carbon energy sources and deploy emissions-reduction technologies. Many of the qualifications required by Canada's emerging energy sectors already exist within the established energy sectors.

Canada's established energy industry workforce is critical

The established energy sectors continue to generate the majority of new jobs and grow their workforce to 2035. The emerging energy sectors' job creation accounts for 8-10% of projected new energy jobs.





Increase in quality energy jobs

Diversifying Canada's energy industry increases the number of quality jobs in both established and emerging sectors. Transferable foundational skills and expertise across sectors provide job security, opportunities for career growth and horizontal career pathways. Energy careers make meaningful contributions to society with their key role in ensuring a secure, affordable and low-carbon energy supply—all while offering fair and competitive wages.

Two scenarios for Canada's energy future

CIE evaluated two scenarios to project a potential range of workforce requirements to 2035. Many variables influence Canada's future energy workforce, such as uncertainty for how new energy sources will be scaled and the pace emissions-reduction technologies will be deployed. This national labour market outlook reflects the following scenarios:



Current Measures

Based on investment and development leading to energy production and carbon sequestration *most likely* to occur based on announced plans, policies and programs as of July 2023.



Opportunity

Based on investment and development leading to energy production and carbon sequestration that could *realistically* occur if competitive policies, programs, incentives and economic conditions are in place.



By the numbers



200,000

people are directly employed by
Canada's energy industry



400,000

indirect jobs are sustained annually
to support industry's operations
supply chain



5,400

indirect jobs are created across
the economy for every \$1 billion
spent on capital projects



9 Canadian energy sectors are included in this outlook:

conventional exploration and production (E&P), oil sands, energy services, pipelines, petroleum refining, liquefied natural gas (LNG), low-carbon hydrogen, biomass-based fuels and carbon capture and storage (CCS)



81 occupations

are included in Careers in Energy's
(CIE) labour market modelling
system



**41,600 to
46,500**

direct jobs are projected to be
added between 2022 and 2035



69,000

energy workers are eligible to
retire over the forecast period



2.4x

energy industry pays 2.4x the
Canadian average total
compensation



110,300 to 116,000

net hiring requirements are projected over the forecast period, if Canada's energy industry
fills all job openings created by industry activity and retirements



Canada's Energy Industry: Powering Growth and a Low-Carbon Future



Canada is in an excellent position to help meet growing global energy demand and **lead the way towards a responsible, low-carbon energy future.** Directly, the nation's energy industry employs about 200,000 people.¹

In addition, about 400,000 indirect jobs are sustained annually in support of the industry's operations supply chain and another 5,400 indirect jobs are created across the economy for every \$1 billion spent on capital projects.²

Canada's energy industry has a long and rich history of change and evolution, including the way natural resources are developed and used, the equipment and technology applied and the experience and knowledge of its diverse workforce. The energy industry is continually evolving and responding to the political and economic climate it operates in.

Meeting the challenge of sustainable, secure and stable supply

Global demand for energy continues to grow and evolve. Disruptions in global energy supply from Russia's invasion of Ukraine, conflicts in the Middle East and impact of the global pandemic have amplified the critical importance of energy security, reliability and affordability. Equally important is the need to address climate concerns, with Canada's industries and companies aligning environmental priorities with government commitments to reach net-zero by 2050.

Canada's energy industry is tasked with a dual mandate of growing its production to meet national and global energy demand, while simultaneously pursuing a low-carbon future. With its abundance of resources, existing expertise, regional strengths and skilled workforce, Canada is well-positioned to be the world's leading supplier of sustainable energy. A diverse portfolio of energy sources and technologies, alongside an approach that leverages all available solutions, will be required to support Canada's net-zero economy.

As industry works to reduce emissions and decarbonize, it's critical that Canadian energy gets to market and grows its international competitiveness. There is global demand for our energy. With some of the strictest regulations and best-in-class performance for producing oil and natural gas, we are leading with ESG (environment, social, governance) best practices, health and safety standards and general field operations.³

- Gurpreet Lail, President and CEO, Enserva



To advance the next generation of Canada's energy industry, a combination of supportive regulatory measures, incentive programs and collaboration between industries, companies, governments and research organizations is vital. Partnerships among interested parties and rights-holders to progress the economic and technical feasibility and massive infrastructure investment⁴ required are well underway. This includes engaging Indigenous communities and accelerating economic reconciliation through meaningful consultation and co-creating ways to share in the economic benefits associated with energy development.

Many Indigenous groups have natural resources they want to develop to make a future for themselves and provide wealth for generations to come. The energy industry has an opportunity (in fact, I feel an obligation) to help them become full economic partners.⁵

- Greg Ebel, Chief Executive Officer, Enbridge

Integrating Canada's established and emerging energy sectors

The International Energy Agency's (IEA) *World Energy Outlook 2023* indicates oil and gas remains a vital component of a reliable and affordable energy future, even as momentum for other energy sources increases.⁶ This is largely due to the time and trillions of dollars of investment required to decarbonize the global energy system. While electrification—using low or no-carbon power generation technologies as the energy source—is a significant strategy for reaching net-zero, it is not a universal option. For energy-intensive industrial sectors such as oil and gas production, heavy-duty transportation, and cement and steel manufacturing, electricity is not technically or financially feasible.

Canada's established oil and gas industry remains critical to the country's energy system and economic well-being; at the same time, it's an asset to support lower-carbon energy sources. Decarbonization solutions for hard-to-electrify industries are required for Canada's environment and economy. Without them, Canada faces substantial impacts on the availability and cost of energy, products and materials key to building a low-carbon economy. Risks to the associated direct and indirect employment opportunities also increase.





Expanding Canada's energy industry labour market outlook

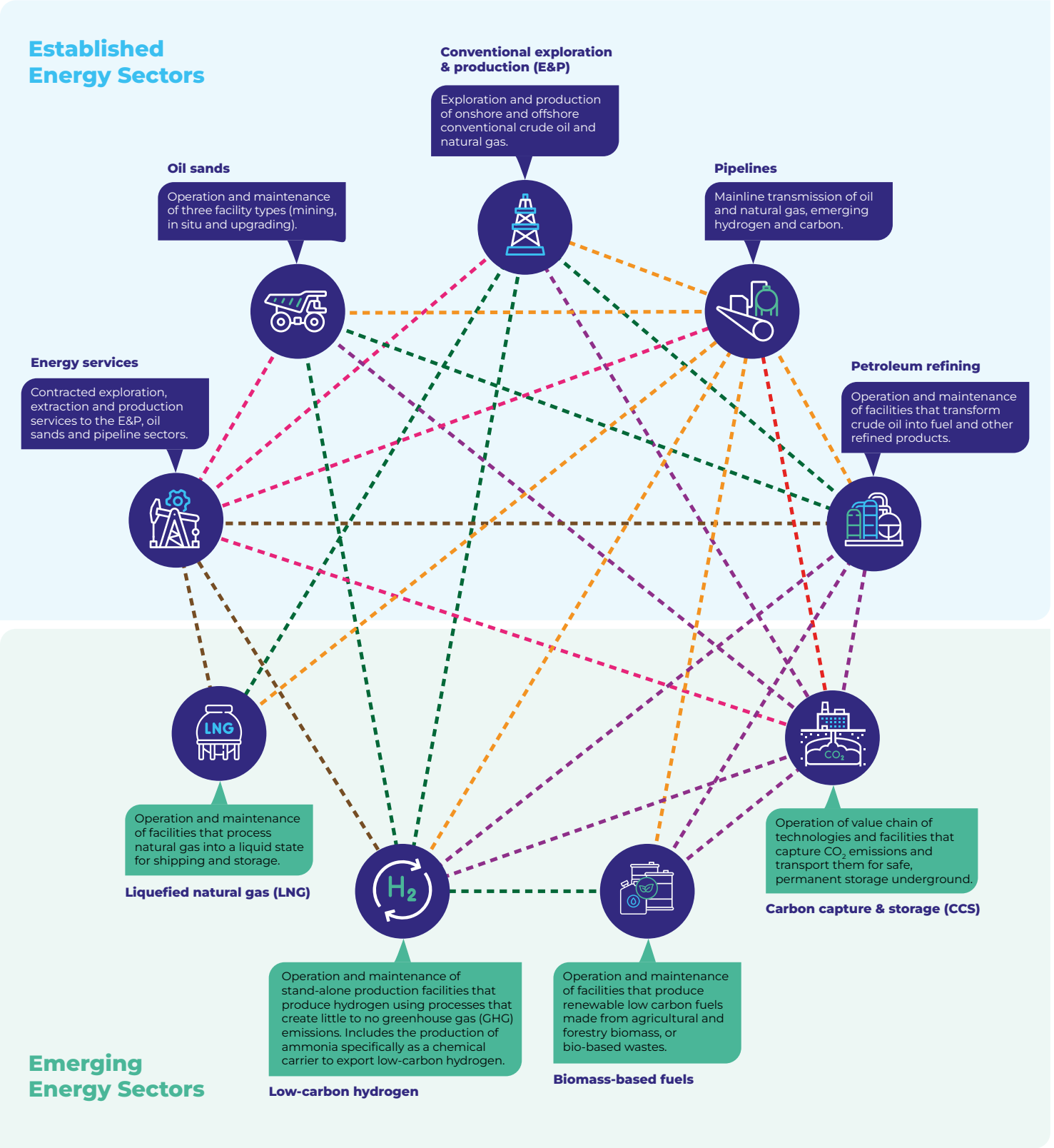
The key trends identified above—integration, collaboration and climate action—collectively shape and set the stage for this employment outlook to 2035. To more accurately reflect the changes to Canada's energy system, CIE has expanded its labour market modelling system beyond the established oil and gas industry, including exploration and production (E&P), oil sands, energy services, pipelines and petroleum refining. Canada's emerging energy sectors—liquefied natural gas (LNG), low-carbon hydrogen, biomass-based fuels, and carbon capture and storage (CCS)—have been included for the first time as part of the energy direct employment outlook (Figure 1).⁷

These emerging energy sources and technologies contribute to decarbonization in Canada and offer nearer-term national and global solutions, particularly for hard-to-electrify sectors. Established and emerging sectors working together to provide low-carbon energy solutions will contribute to a more robust and dynamic job market in Canada.

Global scientific, governmental and industry groups agree the world must move to net-zero GHG emissions by 2050. They also agree that to get us there, trillions of dollars of investment in the energy system are required every year – including in oil and gas. And since we can't realistically electrify everything, the only rational solution is to invest in all energy solutions, renewable and non-renewable, including the things the oil and gas sector is really good at, such as carbon capture, hydrogen and biofuels.⁸ - Kevin Krausert, CEO, Avatar Innovations



Figure 1: Expanded sector scope of Careers in Energy’s labour market modelling system



Legend	Transport product: required to transport product to customer	Transport CO ₂ : specific to CCS	Feedstock: produces raw materials required for energy source production	Feedstock production: key role in producing feedstock	Emissions reduction: energy source or technology that support reducing emissions	Contracted service: equipment, technology and workforce required for production process
	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■	■■■■■



Occupational scope

CIE's labour market modelling system includes 81 occupations as represented by the National Occupational Classification (NOC)⁹ system. Workforce projections are for those *directly* hired by companies¹⁰ involved in the forecasted production, operations and maintenance of in-scope sectors.¹¹

To assess what Canada's future energy workforce may look like compared to today's energy industry, CIE categorized the 81 in-scope occupations into 10 groups (Table 1). These 10 occupational groups account for a sizable proportion of all in-scope sectors' workforce—between 70 and 99%. The “other occupations” category represents the remaining workforce not represented within the 10 groups.¹²

Future energy workforce resembles the workforce of today

Canada's energy industry is becoming increasingly integrated and so is its workforce. Foundational technology, equipment, skills and expertise are being expanded and applied in innovative ways to develop new low-carbon energy sources and deploy emissions-reduction technologies. Many of the qualifications required by Canada's emerging energy sectors already exist within the established energy sectors. Workers possessing foundational skills and qualifications can

therefore leverage skills and experience gained in one sector for employment opportunities in another. Additional upskilling and reskilling through short, competency-based learning opportunities, such as those offered through micro-credential programs, may be required.










An evolving energy industry requires an adaptable workforce

Similarities between the occupational requirements of established and emerging sectors provides a tremendous opportunity for industry to build a resilient and adaptable workforce. In addition to upskilling and reskilling current workers, energy companies can benefit from assessing how their current skill requirements can be leveraged to address future skill needs. CIE's [Career Pathways](#) can help guide this assessment.

This report provides additional insights into the employment outlook for these occupations required to progress Canada's energy diversification and decarbonization goals and where potential hiring challenges exist.



Table 1: In-scope occupations by occupational group, all sectors

Occupational group	 E&P	 Oil sands	 Energy services	 Pipelines	 Petroleum refining	 LNG	 Biomass-based fuels	 Low-carbon hydrogen	 CCS
Business and operations support	6%	5%	4%	11%	4%	3%	3%	10%	11%
Energy drilling, servicing and field operations	11%	3%	22%	3%	2%	0%	0%	0%	3%
Engineers	11%	15%	3%	14%	9%	8%	8%	20%	26%
Facility operations	18%	24%	7%	20%	32%	31%	31%	30%	24%
Geoscientists	2%	1%	2%	0%	0%	0%	0%	0%	6%
Information technology	3%	4%	2%	7%	2%	3%	3%	3%	2%
Technical sales, procurement, supply chain and logistics	7%	4%	5%	9%	10%	15%	15%	7%	4%
Technicians and technologists	3%	4%	3%	4%	4%	5%	5%	8%	7%
Trades	12%	17%	13%	8%	17%	10%	10%	20%	14%
Transport and heavy equipment operators	7%	17%	10%	2%	3%	4%	4%	0%	2%
Representation of the workforce	80%	96%	70%	77%	83%	79%	79%	98%	99%
Other occupations	20%	4%	30%	23%	17%	21%	21%	2%	1%

Percentages may not add up due to rounding.



Outlook Scenarios: Current Measures and Opportunity



Given the variables that will influence Canada's future energy workforce, such as uncertainty for how new energy sources will be scaled and the pace at which emissions-reduction technologies will be deployed, **CIE has used a scenario approach for projecting workforce requirements to 2035.**¹³

CIE evaluated two scenarios to project a potential range of workforce requirements to 2035.

- **Current Measures**, based on investment¹⁴ and development leading to energy production and carbon sequestration *most likely* to occur based on announced plans, policies and programs as of July 2023 (Figure 2 and Figure 3).
- **Opportunity**, based on investment and development leading to energy production and carbon

sequestration that could *realistically* occur if competitive policies, programs, incentives and economic conditions are in place (Figure 2 and Figure 3).

Find detailed information on CIE's scenario approach and underlying assumptions online at [CareersinEnergy.ca](https://careersinenergy.ca)



Figure 2: Production by energy sector, 2022 and both scenarios in 2035

In thousands of barrels of oil equivalent per day (MBOE/day)

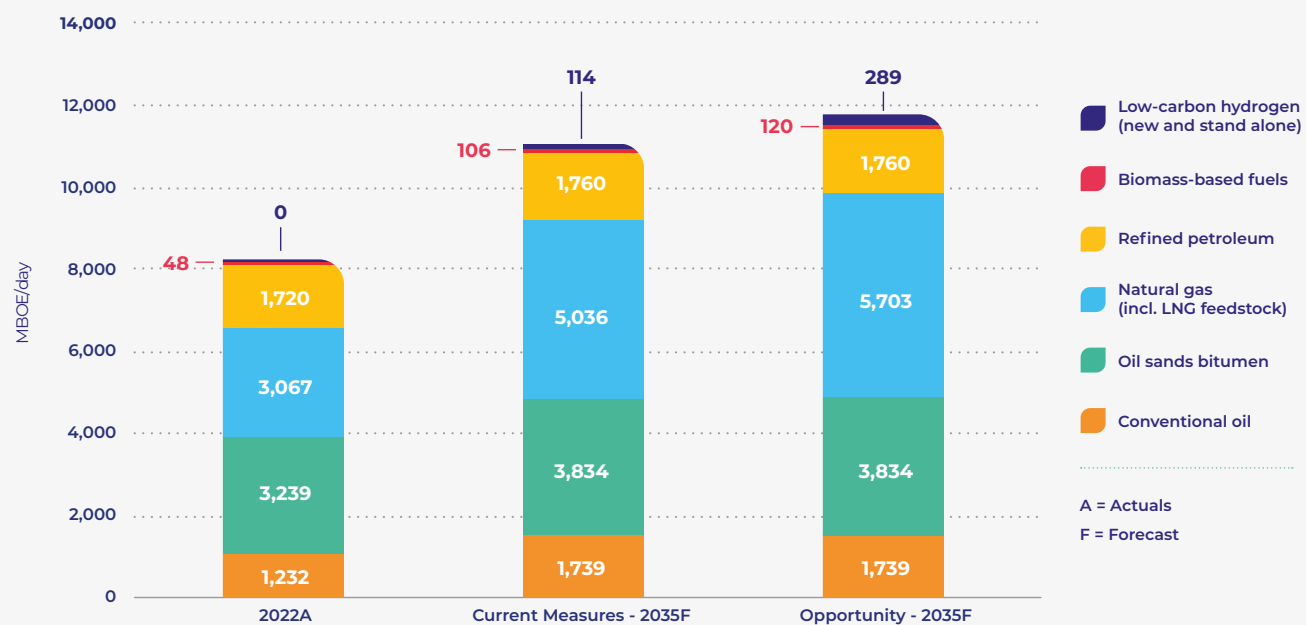
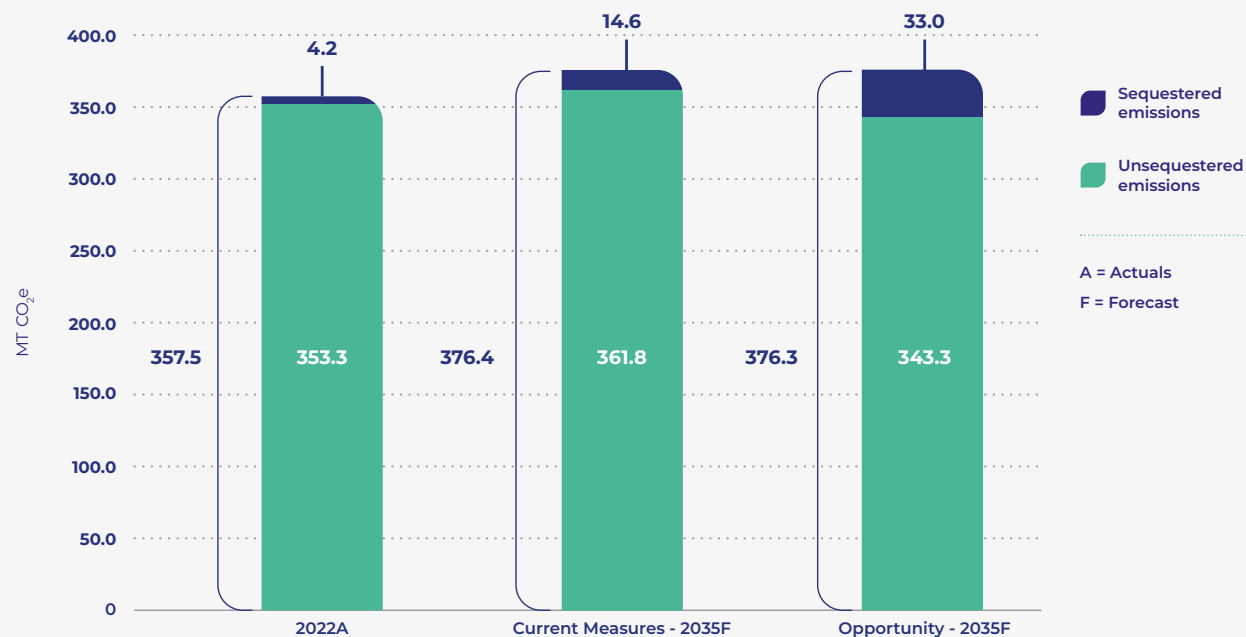


Figure 3: Oil and gas and industrial CO₂ emissions and sequestration, 2022 and both scenarios in 2035

In megatonnes of carbon dioxide equivalent (MT CO₂e)





Scenario assumptions

Oil and natural gas continue to play major role

Regardless of the scenario, oil and natural gas continue to play a major role in Canada's energy system and exports, but they have differing growth trajectories.

In the **Current Measures Scenario**, Canadian oil production from conventional and oil sands sources is projected to rise with steady demand, higher prices and additional pipeline capacity. The Trans Mountain Pipeline Expansion Project (TMPEP) and Bay du Nord project offshore Newfoundland and Labrador drive the activity. Oil sands production gains come from optimizing and expanding existing facilities and fields rather than new operations. Significant investment in emissions-reduction technologies and activities by oil sands companies is also anticipated.

The **Opportunity Scenario** does not project additional oil production increases as long-term global demand for crude oil is less certain and industry focuses on production efficiency rather than expansion through major oil sands or offshore projects. Significant additional takeaway capacity for Western Canada's production beyond TMPEP is not anticipated.

Natural gas production is anticipated to increase due to rising national and global demand in both the **Current**

Measures and Opportunity Scenarios. Canadian natural gas supports the global evolution to cleaner-burning fuel by facilitating fuel-switching from coke, coal and diesel for power generation. It is also feedstock for LNG export facilities on Canada's West Coast and low-carbon hydrogen. Some of Canada's most prolific natural gas reserves are also rich with liquids such as propane and ethane, providing production companies additional revenue streams.

The **Opportunity Scenario** sees potential upswing for natural gas production beyond the **Current Measures Scenario**, mainly driven by demand to meet the needs of expanded LNG export capacity.

LNG ranked top opportunity for industry over the next 3-5 years

According to ATB Capital Markets' Fall 2023 Energy Sector Survey, "West Coast LNG expansion" was ranked by energy executives and institutional investors as the top opportunity for the industry. Just over 60% of respondents viewed it as the top opportunity, and 99% selected it in their top three opportunities.¹⁵



Canada's LNG export sector gains momentum

Canada's developing LNG sector takes a significant step forward with the first major export facility coming into operation on the west coast in 2025. The **Current Measures Scenario** includes production and export capacity from four LNG processing units, also known as an LNG liquefaction train. The **Opportunity Scenario** anticipates the potential for two additional LNG trains.

Refining Canada's petroleum remains stable

Production of refined petroleum products in Canada is expected to remain stable for the forecast period in both the **Current Measures and Opportunity Scenarios**.

Rather than investing in production increases, companies in this sector are anticipated to focus on reducing emissions generated from the refining process. Emissions reductions are expected to be realized by deploying CCS and co-processing the end-use petroleum products with biomass-based fuels to create a lower-carbon fuel.

We're already seeing billions of dollars of investments from our members towards made-in Canada lower-carbon fuels, with the potential to significantly reduce emissions and create sustainable, well-paying jobs throughout the value chain. These projects take years of planning, from permitting to production, and regulatory certainty is key.¹⁶ - Bob Larocque, President and CEO, Canadian Fuels Association

Biomass-based fuels for transportation grow

In the **Current Measures Scenario**, biomass-based fuels production is projected to grow as Canada's transportation sector looks for decarbonization solutions. In particular, heavy transport and aviation are anticipated to look to biomass-based fuels rather than electrification to reduce emissions.



Canada has an abundant supply of sustainable clean fuel feedstocks, such as canola and soybean oil, animal fats, crop and forestry biomass residues, and wastes, to support domestic production capacity expansion to meet 2030 demand for LCIF [low-carbon intensity fuels]. New clean fuel refining capacity is under construction or approaching final investment decisions; production in Canada is poised to double or triple in the next five years.¹⁴

- Ian Thomas, President, Advanced Biofuels Canada

While there is additional biomass-based fuels production forecast in the **Opportunity Scenario**, competitive policies, programs and incentives need to be implemented. Canada currently imports biomass-based fuels, and

those supplies could be expanded to meet demand. Neither scenario, however, suggests Canada's demand for biomass-based fuels is met by domestic supply.

Low-carbon hydrogen a pan-Canadian opportunity

Low-carbon hydrogen has the potential to be produced in every province, representing a national opportunity. At three million tonnes per annum (MTPA), Canada is already one of the top 10 global hydrogen producers.¹⁸ This production, however, is used as feedstock and integrated into other industrial processes such as upgrading, refining and petrochemical manufacturing. Low-carbon hydrogen production included in this outlook is from stand-alone hydrogen facilities or ammonia production plants purposely built to export hydrogen. Low-carbon production technologies vary based on feedstock available in each Canadian region.





For example, the majority of low-carbon hydrogen produced in Western Canada is likely to come from using high-temperature steam to reform natural gas into hydrogen, coupled with CCS to reduce emissions produced by this technology. The Atlantic region will leverage the availability of renewable wind power and electrolysis technology.

Hydrogen might be nature's smallest molecule, but its potential is enormous. It provides new markets for our conventional energy resources and holds the potential to decarbonize many sectors of our economy, including resource extraction, freight, transportation, power generation, manufacturing, and the production of steel and cement.¹⁹ - The Honourable Seamus O'Regan, Federal Minister of Natural Resources, Hydrogen Strategy for Canada

The key differentiator for hydrogen production between the two scenarios is based on the levels of domestic deployment and demand for export. As with other emerging sectors, policies, programs and incentives will be required to enhance economic feasibility and attract investment in low-carbon hydrogen beyond the forecast of the **Current Measures Scenario**.

CCS moves the decarbonization needle

Canada has already deployed CCS technology to coal-fired power generation, oil sands upgrading, oil refining and petrochemical manufacturing. However, given the projected energy mix suggested in both scenarios, Canada will need to leverage its CCS advantage further to move the decarbonization needle. This advantage includes its expertise, regulatory frameworks and sub-surface geology.





The **Current Measures Scenario** anticipates expanded use of CCS to reduce GHG emissions from Canada's oil and gas industry, including oil sands operations and refining, and industry processes that burn fossil fuels, such as natural gas power generation, and cement and steel manufacturing. Achieving the higher levels of CO₂ sequestration outlined in the **Opportunity Scenario** will depend on the implementation of policies, programs and incentives to make CCS economically feasible and attractive for investment in Canada.

Canada has pledged to cut its emissions by 40 – 45% below 2005 levels by 2030 and to reach net-zero emissions by 2050. Canada's current federal emissions-reduction plan expects national CCS capacity to more than triple, adding facilities to capture and store at least 15 million tonnes per year by 2030. Meeting this goal will rely heavily on implementing CCS in heavy industries across the country, including power generation; cement, steel and fertilizer manufacturing, mining, petrochemical processing, and oil and gas production.²⁰

- International CCS Knowledge Centre



National Labour Market Outlook to 2035

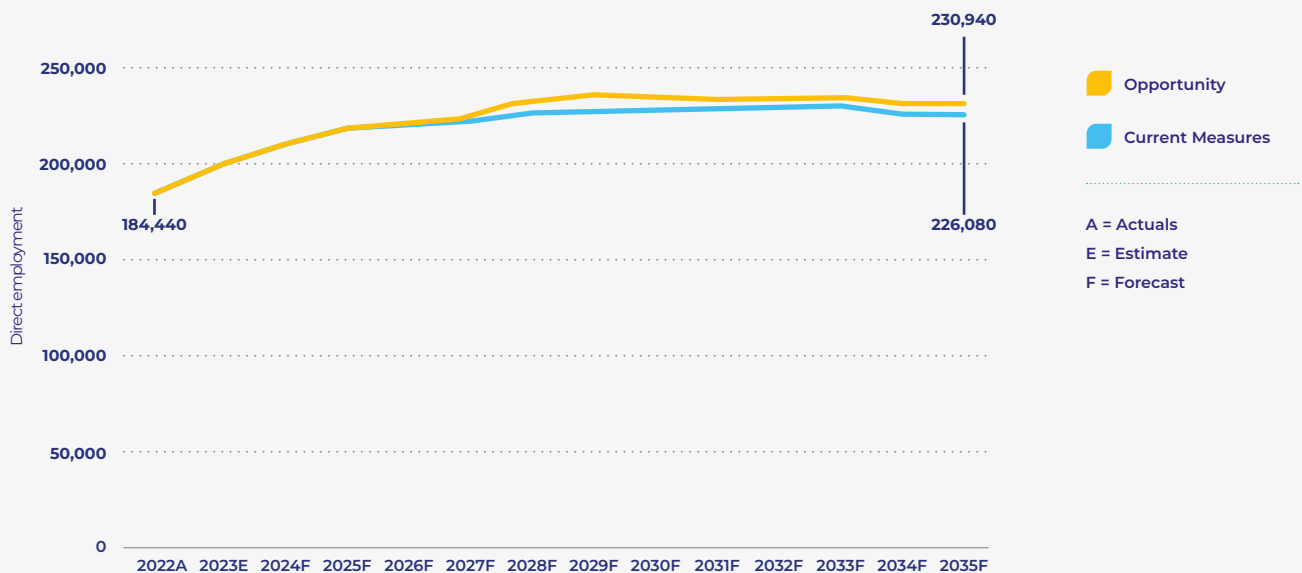


Canada's expanded energy industry is **projected to generate between 41,640 and 46,500 direct jobs** between 2022 and 2035.

In 2022, the baseline year for this outlook, in-scope sectors accounted for 184,440 direct jobs across Canada. This reflects the recovery of 15,000 jobs following the COVID-19 pandemic, but still short of peak oil and gas employment of 225,350 in 2014.²¹

It is anticipated **41,640 new jobs will be generated by industry activity under the Current Measures Scenario** for a total of **226,080 direct jobs** by 2035. If the greater investment, production and industry activity assumptions are realized, **46,500 new jobs will be generated in the Opportunity Scenario**, for a total of **230,940 direct jobs** (Figure 4).

Figure 4: Direct employment by year, by scenario, 2022-2035



Workforce projections for the **Current Measures and Opportunity Scenarios** look very similar until 2027, after which differences in employment come from emerging energy sectors. The **Opportunity Scenario** forecasts more industry activity in emerging sectors based on a higher degree of certainty on the return of capital and ability to attract new investment for the infrastructure required.

While established energy sectors continue to generate the majority of new jobs and will grow their workforce to 2035, not all sectors will add jobs through the forecast period (Table 2). The oil sands sector is not projected to add to its headcount as it focuses on achieving operational efficiencies to increase production rather than developing new major projects. However, oil sands

sector investment in emissions-reduction technologies, including CCS, will generate direct employment opportunities and is reflected in employment growth projected for that emerging sector.

Conversely, energy services and conventional E&P are projected to see job growth of approximately 30%. This growth is primarily in the early years of the forecast period when oil prices and takeaway capacity encourages industry activity and increased natural gas production is required to meet demand.

With a focus on providing affordable, accessible and reliable energy to Canadians and the world, the emerging sectors—biomass-based fuels, low-carbon hydrogen, LNG and CCS—also add direct jobs.

Table 2: Direct employment and number of new jobs by sector, by scenario, 2022-2035

	Sector	Employment in 2022A	Current Measures		Opportunity	
			Estimated employment in 2035F	# of new jobs and % change	Estimated employment in 2035F	# of new jobs and % change
	TOTAL	184,440	226,080	41,640 (23%)	230,940	46,500 (25%)
Established energy sectors	Conventional E&P	73,250	92,990	19,740 (27%)	95,050	21,810 (30%)
	Oil sands	24,650	22,770	-1,880 (-8%)	22,770	-1,880 (-8%)
	Energy services	62,130	80,570	18,440 (30%)	81,750	19,620 (32%)
	Pipelines	13,700	15,650	1,950 (14%)	15,750	2,050 (15%)
	Petroleum refining	8,830	9,040	210 (2%)	9,040	210 (2%)
Emerging energy sectors	Biomass-based fuels	1,750	3,910	2,150 (123%)	4,430	2,670 (153%)
	Low-carbon hydrogen	minimal*	340	340 (all new jobs)	850	850 (all new jobs)
	LNG	minimal*	450	450 (all new jobs)	700	700 (all new jobs)
	CCS	130	370	240 (185%)	600	470 (362%)

* The small number of workers currently working in these emerging sectors in 2022 were not quantified for this outlook. Numbers may not add up due to rounding



Energy jobs are quality jobs

Pay, hours of work, future prospects, hard work, job content, interpersonal relationships and alignment of skills are seven essential factors that emerge as indicators of job quality, or what is considered a “good” job.²²

Energy jobs demonstrate many of these qualities.

- Greater job security and opportunities for career growth as the diversification of Canada’s energy industry will rely heavily on similar occupations, skills and expertise of the established energy workforce to deploy emerging energy sources and emissions-reduction technologies.
- The opportunity to make a meaningful contribution to society as the globe looks to decarbonize while addressing growing demand for affordable, accessible energy.
- Workers seek fair and competitive pay that reflects and recognizes the value of their skills, experience and ensures financial stability.

Jobs in the energy industry are the highest paying amongst the country’s largest sectors. In 2022, established and emerging energy sectors included in CIE’s outlook paid an average total compensation of \$173,760—2.4x more than the Canadian average of \$72,640.²³



Emerging sectors outperform in job growth

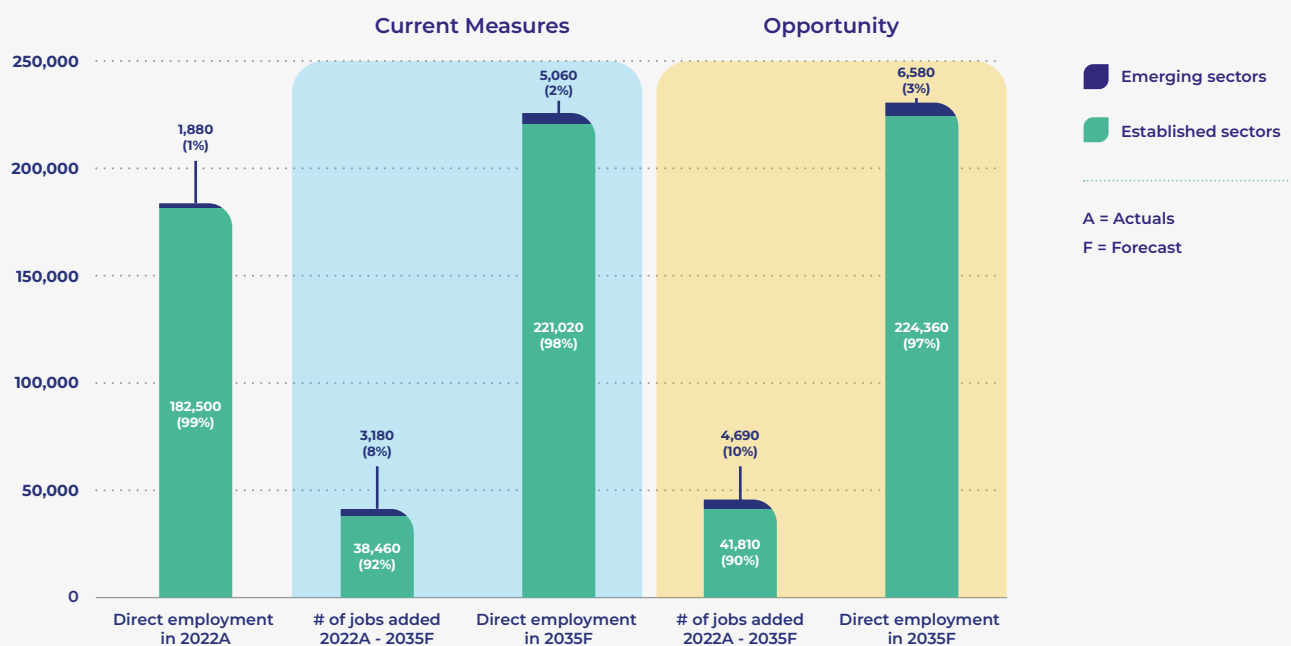
Emerging sectors outperform in employment growth compared to their percentage of the overall workforce, especially later in the forecast period after related infrastructure is built and they move into operations.

In 2022, emerging energy sectors made up only 1% of direct employment. In the **Current Measures Scenario**,

they are expected to account for 8% of projected new jobs to 2035 and increase their percentage of the total workforce to 2% by 2035. In the **Opportunity Scenario**, emerging energy sectors are projected to account for 10% of estimated new jobs generated and 3% of the total workforce in 2035. (Figure 5).



Figure 5: New jobs and percentage of workforce, established and emerging sectors, by scenario, 2022–2035



CIE's labour market modelling system also provides projections for job growth due to industry activity at an occupational level. Table 3 lists the top 20 occupations projected to experience the most hiring. Looking at the percentage of increase across the industry, the average rate of occupational growth between 2022 and 2035 is between 23 and 25%, depending on the scenario. Occupations experiencing a higher-than-

average growth rate are those more likely needed across both established and emerging sectors. Occupations experiencing lower-than-average growth may be more focused on a particular energy sector. They may also represent occupations impacted by deployment of technologies designed to increase operational efficiency.

Table 3: Top 20 occupations with greatest hiring due to industry activity, by scenario, 2022- 2035

Occupation (NOC)	Current Measures	Opportunity
	# of new jobs added and % change	# of new jobs added and % change
TOTAL	41,640 (23%)	46,500 (25%)
Central control, process and plant operators (9210, 9310, 94110, 9414)	4,500 (22%)	5,070 (25%)
Energy drilling, servicing and related labourers, workers and operators (83101, 84101, 85111)	3,210 (29%)	3,440 (31%)
Contractors and supervisors, energy drilling and services (82021)	1,990 (28%)	2,150 (31%)
Transport truck drivers (73300)	1,550 (30%)	1,680 (32%)
Heavy equipment operators (73400)	1,080 (10%)	1,220 (12%)
Information technology (20012, 21211, 2122, 2123, 21311, 2222)	1,050 (19%)	1,160 (21%)
Managers in natural resources production (80010)	920 (22%)	1,020 (24%)
Petroleum engineers (21332)	910 (23%)	1,010 (25%)
Construction millwrights and industrial mechanics (72400)	910 (23%)	1,010 (26%)
Geoscientists and oceanographers (21102)	710 (24%)	790 (27%)
Technical sales (6001, 6210, 6410, 6440)	710 (25%)	800 (28%)
Procurement and purchasing agents and officers (12102)	680 (22%)	780 (25%)
Mechanical engineers (21301)	590 (18%)	680 (21%)
Welders and related machine operators (72106)	570 (21%)	620 (23%)
Industrial instrument technicians and mechanics (22312)	560 (22%)	640 (25%)
Trades helpers and labourers (7511)	560 (23%)	590 (25%)
Plumbers, pipefitters and gas fitters (7230)	550 (24%)	610 (27%)
Heavy-duty equipment mechanics (72401)	530 (14%)	590 (16%)
Supply chain logistics, tracking and scheduling coordination (1440)	520 (24%)	590 (28%)
Industrial electricians (72201)	470 (18%)	560 (21%)



Of note:

- > **Central control, process and plant operators** will be in greater demand to operate facilities that produce and transport low-emission fuels such as low-carbon hydrogen and biomass-based fuels. These complex facilities will use state-of-the-art technologies similar to those already found in established energy sectors.
- > **Energy drilling and servicing labourers, workers, operators, contractors and supervisors** will still be largely employed by the energy services sector, but their role in the emerging sectors will grow, primarily for natural gas production to support national and global emissions-reduction measures, and low-carbon hydrogen production. These operators will also drill, complete and service wells used to sequester CO₂ underground for CCS. While the related sectors of helium, lithium and geothermal energy are not in-scope for CIE's current model expansion, these occupations and the equipment and technology they operate are integral components in their production.
- > **Transport truck drivers and occupations involved in the distribution of energy by pipelines** will face continued demand.
- > **Heavy equipment operators** play a key role in the construction of oil and gas well sites and an important role within oil sands mining.
- > **Information technology occupations** play an increasingly important role as advanced technologies are deployed industry-wide to automate some operations, improve safety, enhance decision making and efficiency, and conduct real-time monitoring of assets. New energy infrastructure will utilize the most advanced digital technologies available.

- > **Engineers** continue playing a vital role in designing and delivering sustainable energy production as well as implementing CCS and emissions-reduction initiatives.
- > **Geoscientists and petroleum engineers** will be in demand to support development of oil and gas resources and provide vital expertise for development of secure and permanent underground storage of CO₂.
- > **Technical sales and procurement occupations** will grow, driven by needs to diversify customers for Canada's low-carbon energy sources and develop new supply chains to produce low-carbon hydrogen and biomass-based fuels.
- > **Trades occupations** will be required across all energy-producing facilities and pipeline infrastructure to ensure efficient and safe operations.

If Canada is not able to recruit and be able to build the expertise needed to grow our industry, we're not going to be able to, not only supply our domestic market with responsible energy products, but we're also not going to be able to support the growing energy demands and energy security issues that many of our key allies are looking for.²⁴

– Mark Scholz, President and CEO, Canadian Association of Energy Contractors

Access detailed data on CIE's interactive dashboard
Find all the information and data from this labour market outlook—including projections by year, region, sector and occupation—online at [CareersinEnergy.ca](https://careersinenergy.ca)



Net Hiring Requirements



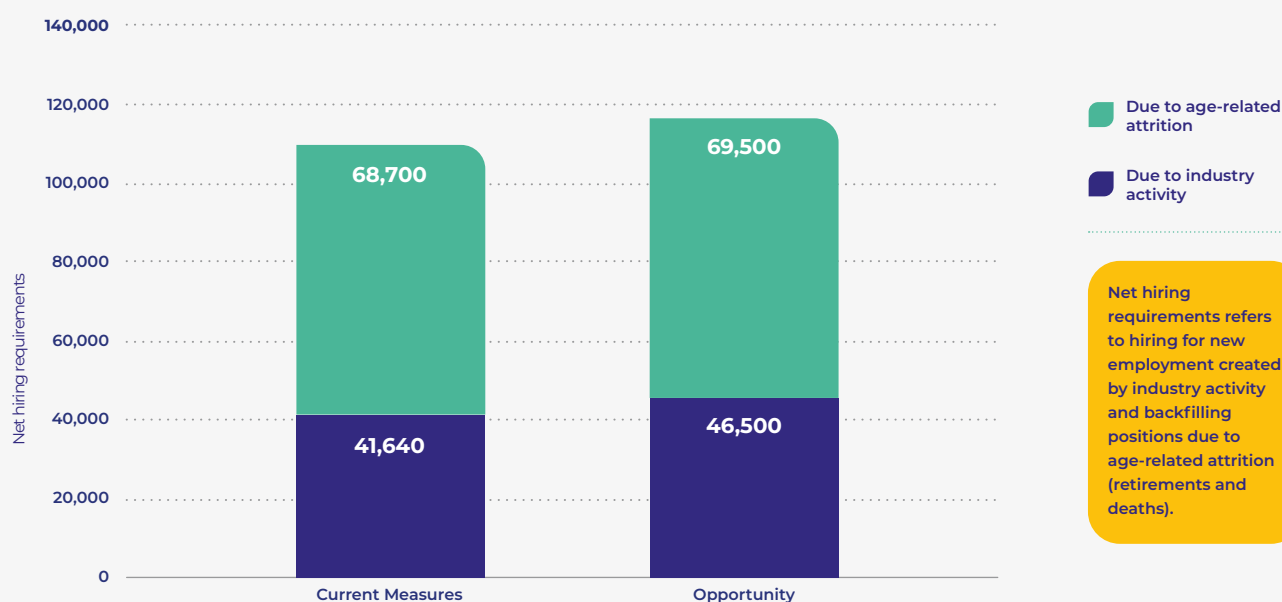
Based on annual age-related attrition rates, approximately **69,000 energy workers are eligible to retire** over the forecast period to 2035.

Hiring for age-related attrition outpaces industry activity

If Canada's energy industry replaces all job openings created by age-related attrition, when combined

with industry activity, it could result in **net hiring requirements of between 110,340 and 116,000 jobs** over the forecast period, depending on the scenario (Figure 6).

Figure 6: Industry net hiring requirements forecast, by scenario, 2022-2035



Regardless of scenario, hiring for age-related attrition has the potential to outpace hiring due to industry activity and warrants special attention.

Near-term risk of an aging workforce

Having already realized efficiencies and a leaner workforce due to restructuring during the COVID-19 pandemic and the preceding industry downturn, companies will likely need to fill job openings created by both expanded activity levels *and* age-related attrition in the near-term. Attracting enough talent to maintain productivity is likely to be a challenge and could impact the ability to expand and decarbonize the energy system at the expected pace. Over time, shifting skill requirements due to the adoption of digital solutions

such as automation, remote monitoring, artificial intelligence (AI) and machine learning (ML) may decrease urgency to replace retiring workers. However, industry may not be able to implement digital solutions at the same pace as the growing talent gap.

The industry’s average annual age-related attrition rate across all occupations is forecast to be 2.3%. Table 4 lists the occupations expected to have higher-than-average age-related attrition rates due to greater loss of experienced workers through retirements. Potential workforce shortages in these occupations present the greatest risk of skill gaps to industry.



Table 4: Occupations with higher-than-average annual age-related attrition rates

Occupation (NOC)	Annual age-related attrition rate
ACROSS ALL OCCUPATIONS	2.3%
Construction inspectors (22233)	3.6%
Occupational health and safety specialists (22232)	3.5%
Geological and mineral technologists and technicians (22101)	3.4%
Purchasing managers (10012)	3.3%
Engineering managers (20010)	3.3%
Transport truck drivers (73300)	3.3%
Facility operation and maintenance managers (70012)	3.3%
Managers in natural resources production (80010)	3.3%
Metallurgical and materials engineers (21322)	3.2%
Procurement and purchasing agents and officers (12102)	3.2%
Managers in transportation (70020)	3.2%
Survey, statistical and data entry occupations (1411)	3.2%
Supply chain logistics, tracking and scheduling coordination occupations (1440)	3.2%
Geoscientists and oceanographers (21102)	3.1%
Supervisors, petroleum, gas and chemical processing and utilities (92011)	3.1%
Engineering inspectors and regulatory officers (22231)	2.9%
Public and environmental health and safety professionals (2112)	2.7%
Construction millwrights and industrial mechanics (72400)	2.7%
Automotive service technicians (7241)	2.7%
Technical occupations in computer and information systems (2222)	2.6%
Contractors and supervisors, technical maintenance trades and heavy equipment and transport operators (7202)	2.6%
Electrical and electronics engineers (21310)	2.6%
Computer and information systems professionals (2122)	2.6%
Contractors and supervisors, energy drilling and services (82021)	2.5%
Professional occupations in advertising, marketing and public relations (11202)	2.5%
Technical occupations in architecture, drafting, surveying, geomatics and meteorology (2221)	2.4%
Civil engineers (21300)	2.4%
Construction managers (70010)	2.4%
Electrical and electronics engineering technologists and technicians (22310)	2.4%



The magnitude of hiring requirements due to age-related attrition will have greater impact on established energy sectors simply due to the size of their existing workforce (Table 5). For emerging sectors, where seasoned workers can assist with knowledge gaps and problem-solving during start-up phases of new operations and technologies, the loss of experienced workers may be felt more keenly. The need to hire experienced sub-surface professionals such as geoscientists and petroleum engineers for the CCS sector is an example of this.

Table 5: Net hiring requirements (NHR) by sector, by scenario, 2022-2035

	Sector	Current Measures			Opportunity		
		Industry activity	Age-related attrition	NHR	Industry activity	Age-related attrition	NHR
	TOTAL	41,640	68,700	110,340	46,500	69,500	116,000
Established energy sectors	Conventional E&P	19,740	28,250	47,990	21,810	28,710	50,520
	Oil sands	-1,880	7,100	5,220	-1,880	7,070	5,190
	Energy services	18,440	24,240	42,680	19,620	24,480	44,100
	Pipelines	1,950	4,930	6,880	2,050	4,940	6,990
	Petroleum refining	210	3,310	3,520	210	3,310	3,520
Emerging energy sectors	Biomass-based fuels	2,150	670	2,820	2,670	680	3,350
	Low-carbon hydrogen	340	50	390	850	70	920
	LNG	450	100	550	700	140	840
	CCS	240	50	290	470	100	570

Numbers may not add up due to rounding

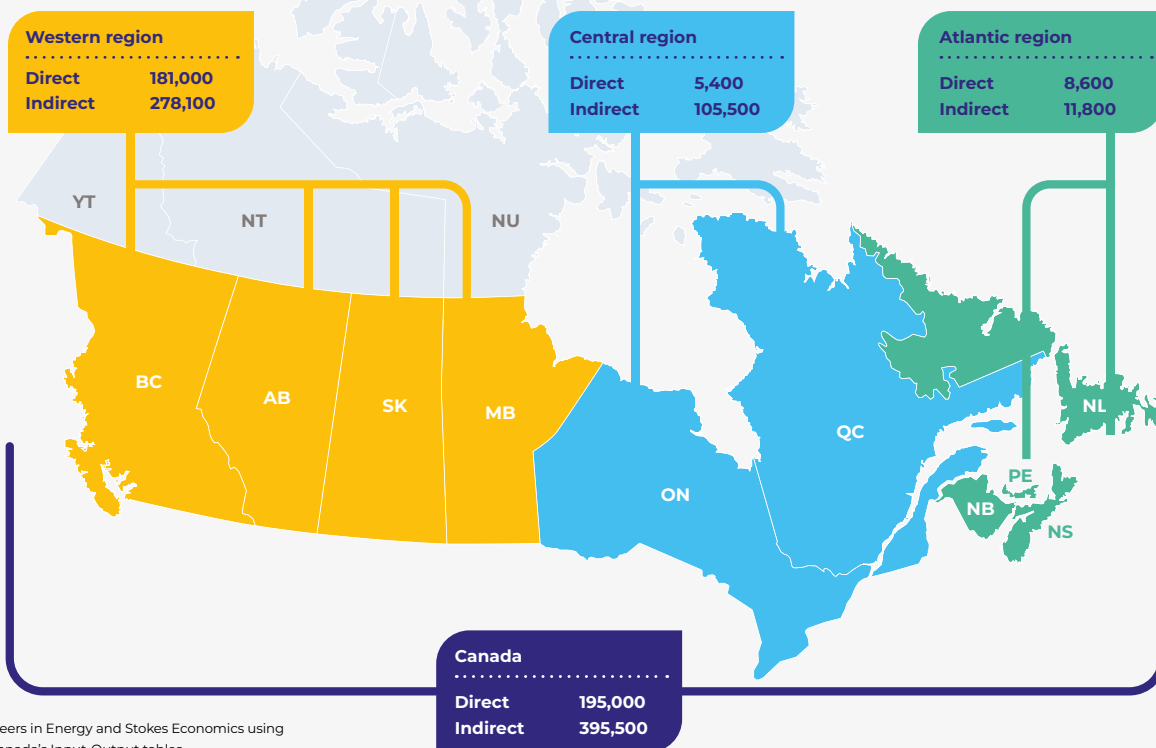


Indirect Employment



In addition to the jobs directly hired for production, operations and maintenance of CIE's in-scope energy sectors, **hundreds of thousands of jobs are generated across the Canadian economy** in sectors providing goods and services to the industry's operations supply chain and capital projects.

Figure 7: Direct employment and indirect jobs supported by established energy sector operational spending in 2023



Source: Careers in Energy and Stokes Economics using Statistics Canada's Input-Output tables

Table 6: Indirect jobs supported by established energy sector operational spending in 2023, by industry

Industry	# of jobs and % of total
Professional, scientific and technical services	69,900 (18%)
Wholesale and retail trade	63,100 (16%)
Finance, insurance, real estate, rental and leasing	59,600 (15%)
Administrative and support, waste management and remediation services	49,400 (12%)
Transportation and warehousing	33,200 (8%)
Manufacturing	32,400 (8%)
Repair construction	20,100 (5%)
Accommodation and food services	14,400 (4%)
Mining and quarrying	11,600 (3%)
Government services	9,500 (2%)
Utilities	8,300 (2%)
Information and culture	8,200 (2%)
Other	16,100 (4%)
TOTAL ANNUAL JOBS	395,500

Source: Careers in Energy and Stokes Economics using Statistics Canada's Input-Output tables

These opportunities, referred to as the energy industry's "indirect jobs", are significant in numbers. In 2023, close to **400,000 indirect jobs** were generated from operational spending by established energy sectors. These indirect jobs are in sectors that provide a broad range of goods and services required to sustain ongoing operations in conventional E&P, oil sands, energy services, pipelines and refineries. As the energy industry expands as projected in this outlook, the number of indirect jobs required to sustain operations is also expected to increase.

Energy-related construction drives thousands of jobs

An additional **5,400 indirect jobs** are created across the economy for every **\$1 billion spent on developing and constructing energy infrastructure projects**.²⁵ Sectors that see the greatest employment benefit from the energy industry's capital project spending include:

- Oil and gas engineering construction
- Legal, accounting and architectural, engineering and related services

- Wholesale trade
- Machinery and fabricated metal manufacturing

Canada's major energy projects

In 2023, there were 223 planned—announced, under review or approved—energy projects worth \$294 billion, and 120 energy projects under construction worth \$180 billion, for a combined total of \$474 billion. Oil- and gas-related projects accounted for the largest portion of the project value at \$319 billion.²⁶

The methodology used to determine the number of indirect jobs generated by energy spending relies on a historical relationship, so only indirect jobs associated with investment by established energy sectors can be estimated.²⁷ The relationship between investment in emerging energy sectors and generation of indirect jobs is yet to be determined.



Labour Supply and Demand Analysis



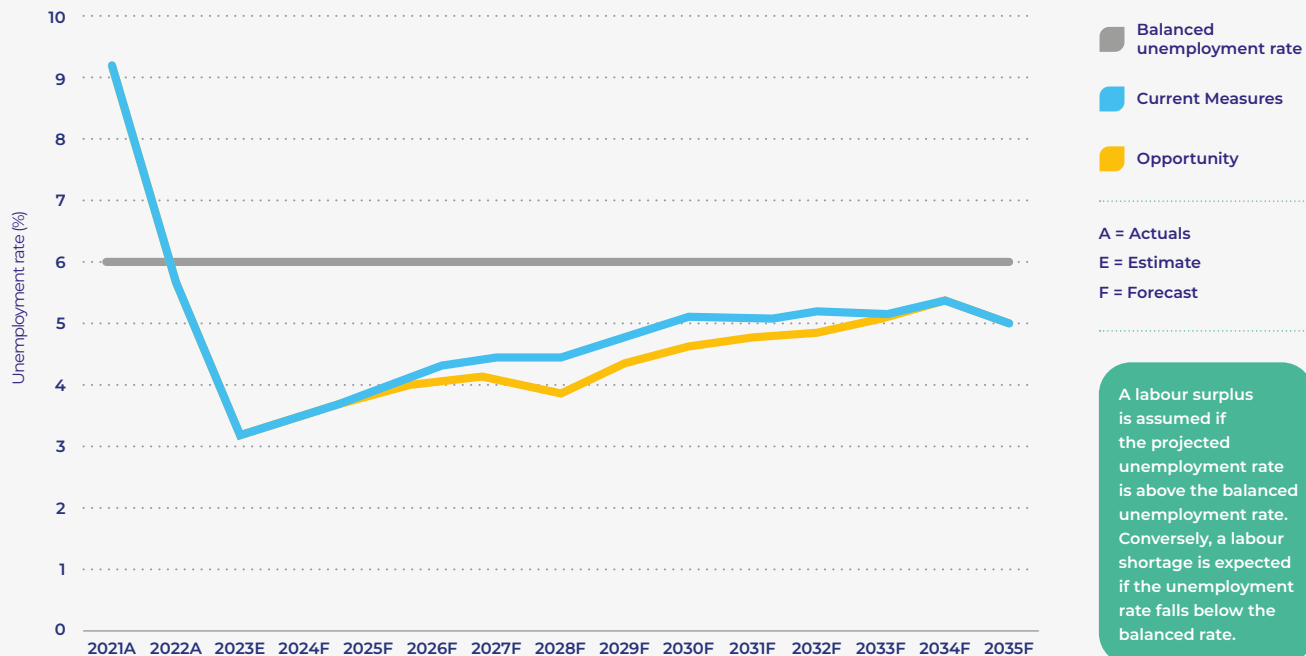
Labour shortages in the energy industry returned with recovery from the impacts of COVID-19.

Tight labour market anticipated

The energy industry lost workers to other sectors during the COVID-19 pandemic. As the world recovered, industry experienced a relatively rapid ramp-up

of activity but has not seen workers return at pre-pandemic levels, leading to the current talent shortage. While some relief is projected after 2023, a tight labour market is anticipated for the forecast period (Figure 8).

Figure 8: Energy industry unemployment rates, by scenario, 2021-2035



Labour shortages impact both established and emerging sectors

Labour shortages are projected for all 81 energy occupations included in this outlook. Several occupations are forecast to experience more significant shortages as increased industry activity and age-related attrition drive hiring requirements (Table 6). Talent shortages in these occupations will impact established and emerging energy sectors alike:

- > **Manager and supervisor roles** across all disciplines; the need for effective career development and succession planning will be paramount.
- > **Trades** across all sectors to ensure safe and efficient operations; amplifies ongoing hiring challenges, especially in relation to attracting youth and under-represented talent pools.
- > **Geoscientists** with specialized training for the exploration and development of oil and gas resources. They also play a key role in the CCS sector, including assessing and monitoring secure underground storage of CO₂. This occupation experienced significant disruption during the oil and gas industry downturn preceding the COVID-19 pandemic, impacting talent attraction for related training programs.
- > **Engineers** across Canada's economy; it is a very competitive labour market for the energy industry.

- > **Information technology occupations** to deploy solutions that increase productivity and sustainability across the energy sectors. New LNG, low-carbon hydrogen and biomass-based fuel processing plants will use the most up-to-date digital technologies. As all industries across the economy transform digitally, competition for these occupations will increase.
- > **Energy drilling, servicing and related labourers, workers and operators** for the production of natural gas feedstock for LNG and low-carbon hydrogen. They're also required for drilling, well completions and ongoing servicing of carbon sequestration, contributing to a tight labour supply. The vast majority of these roles are only hired directly by the energy services sector, but the ripple effect of hiring challenges can impact both established and emerging sectors. There is a risk of a bottleneck in activity if shortages of these occupations continue.

Access to labour and energy services a prominent risk

According to ATB Capital Markets' Fall 2023 Energy Sector Survey, energy services companies ranked "access to labour/services" as the second-most prominent risk to the Canadian energy sector over the next 3-5 years.²⁸

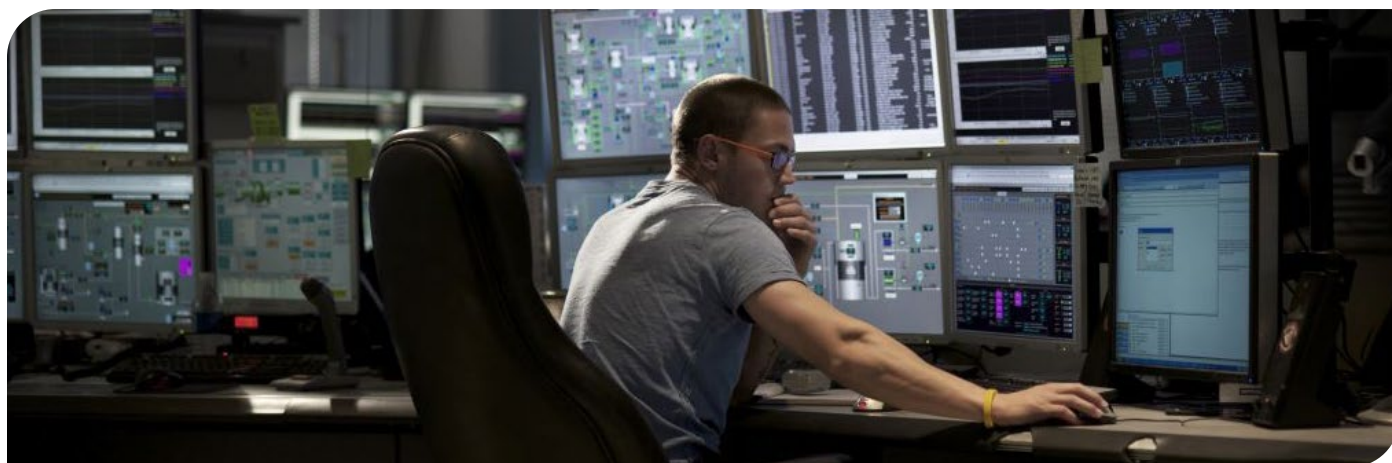











Table 7: Occupations projected to experience significant labour shortages, 2022-2035

Occupational group	 E&P	 Oil sands	 Energy services	 Pipelines	 Petroleum refining	 LNG	 Biomass-based fuels	 Low-carbon hydrogen	 CCS
Business and operations support	✓	✓	✓	✓	✓	✓	✓	✓	✓
Energy drilling, servicing and field operations			✓						
Engineers	✓	✓	✓	✓	✓	✓	✓	✓	✓
Facility operations	✓	✓	✓	✓	✓	✓	✓	✓	✓
Geoscientists	✓	✓							✓
Information technology	✓	✓	✓	✓	✓	✓	✓	✓	✓
Technical sales, procurement, supply chain and logistics	✓	✓	✓	✓	✓	✓	✓	✓	✓
Technicians and technologists	✓	✓	✓	✓	✓	✓	✓	✓	✓
Trades	✓	✓	✓	✓	✓	✓	✓	✓	✓
Transport and heavy equipment operators			✓						
Business and operations support:	Energy drilling, servicing and field operations:		Engineers:		Facility operations:		Geoscientists:		
<ul style="list-style-type: none">Professional occupations in advertising, marketing and public relationsSurvey, statistical and data entry occupationsPublic and environmental health and safety professionals	<ul style="list-style-type: none">Managers in natural resources productionAll energy drilling and servicing operators, contractors and supervisors		<ul style="list-style-type: none">Engineering managersIndustrial and manufacturing engineers		<ul style="list-style-type: none">Facility operation and maintenance managersCentral control, process and plant operators		<ul style="list-style-type: none">Geoscientists		
Information technology:	Technical sales, procurement, supply chain and logistics:		Technicians and technologists:		Trades:		Transport and heavy equipment operators:		
<ul style="list-style-type: none">Data scientistsComputer, software and web designers and developers	<ul style="list-style-type: none">Supply chain logistics, tracking and scheduling coordination occupationsAll technical sales occupations		<ul style="list-style-type: none">Geological and mineral technologists and techniciansIndustrial engineering and manufacturing technologists and technicians		<ul style="list-style-type: none">Managers and supervisorsIndustrial instrument technicians and mechanicsWelders and related machine operatorsIndustrial electriciansPlumbers, pipefitters and gas fittersConstruction millwrights and industrial mechanicsHeavy-duty equipment mechanics		<ul style="list-style-type: none">ManagersTransport truck drivers		



Potential for workforce synergies through mergers and acquisitions

An increase in mergers and acquisitions (M&A) activity across the energy industry accompanied recovery from the global pandemic. M&A drivers may differ from company to company, from seeking opportunities to transform or expand portfolios to deepening their focus

in a particular geographic region or area of expertise. Regardless, workforce synergies are typically achieved by reducing companies' headcount. As a result, an experienced talent pool becomes available, expanding supply for other industry companies to hire.



Conclusion: Building a Workforce for Canada's Energy Future



Looking ahead to 2035, Canada's energy industry—in either scenario presented in this report—will **need to manage dual priorities** of growing production to meet global energy demand while addressing climate concerns.

While established energy sectors will continue as a mainstay of new job creation, emerging sectors and technologies such as LNG, biomass-based fuels, low-carbon hydrogen and CCS will also create new opportunities. Over the forecast period, they are projected to outperform job growth relative to their percentage of the total energy workforce.

To date, there has been a gap in information and resources for workers—particularly under-represented groups and those shifting into new careers—about the skills and competencies required to advance their careers in a changing energy industry.

While specific knowledge and skills may be required as a result of this evolving energy landscape, the similarity of occupations across the in-scope sectors is high. Many of the foundational core skills and qualifications required by emerging energy sectors already exist within Canada's established sectors.

This means workers possessing foundational qualifications are likely able to leverage their skills and experience gained in one sector for employment opportunities in another. It also offers an opportunity for deployment of the workforce across established and emerging energy sectors. Upskilling, such as those offered through micro-credentials, may be required to fill knowledge gaps.

This outlook forecasts a tight labour market, with several occupations projected to experience more significant labour shortages. Two key drivers of total workforce demand during the outlook period are retirements and increased activity across the expanded energy industry. The risk of an aging workforce and inability to replace talent lost exists, especially in the near-term. Established sectors will feel the loss due to the sheer number of retirements, whereas emerging sectors will feel the loss of experience and knowledge.



To attract and retain talent, Canada's energy industry needs to continue focusing on:

- Advocating for its role as a global leader in providing secure, stable and sustainable energy and solutions to global climate concerns.
- Strengthening the opportunity for talent to build resilient energy careers with flexible career paths, training and development opportunities, career mobility and succession planning.
- Implementing policies and programs for diverse, equitable and inclusive workplaces to enhance the ability to tap into under-utilized talent pools.

This *National Labour Market Outlook to 2035* is one of a number of tools and resources developed by CIE to build a roadmap that will support a robust energy sector for decades to come.

Dig deeper into regional labour market data

Find regional labour market information and data in CIE's regional labour market outlook reports online at [CareersinEnergy.ca](https://careersinenergy.ca)



Endnotes

- ¹ Careers in Energy, 2023 estimate for in-scope sectors.
- ² Careers in Energy and Stokes Economics using Statistics Canada's Input-Output tables, 2023.
- ³ Lail, G. (2023, May 2). *If Canada Fails to Seize Energy Opportunity, Other Countries Will*. Calgary Herald. <https://calgaryherald.com/opinion/columnists/opinion-if-canada-fails-to-seize-the-opportunity-other-countries-will>
- ⁴ Bolano, A., Lodesani, F., Pachod, D., Polymeneas, E., Pratt, M. P., Samandari, H., & Tai, H. (2022, December 15). *The energy transition: A region-by-region agenda for near-term action*. McKinsey & Company. <https://www.mckinsey.com/industries/electric-power-and-natural-gas/our-insights/the-energy-transition-a-region-by-region-agenda-for-near-term-action#/>
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- ⁷ Workforce requirements for Canada's electricity sector are produced by Electricity Human Resources Council (EHRC). EHRC. (2023). *Electricity in Demand: Labour Market Insights 2023-2028*. https://electricityhr.ca/wp-content/uploads/2023/10/EHRC_LMIReport-EN-2.pdf
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- ⁹ Statistics Canada uses the National Occupational Classification (NOC) system to identify and categorize jobs (occupations) based on the training, education, experience and responsibilities they require. Statistics Canada. (2023, September 14). *Introduction to the National Occupational Classification (NOC) 2021 version 1.0*. Statistics Canada. <https://www.statcan.gc.ca/en/subjects/standard/noc/2021/introductionVI#a1>
- ¹⁰ Investment in the in-scope sectors will generate further indirect employment opportunities across other industries such as engineering, finance and insurance, fabrication, accommodation and transportation. Analysis of indirect employment associated with the in-scope sectors can be found on pages 31 and 32.
- ¹¹ Construction workforce is not included in this forecast, although it is recognized expanding Canada's energy system will require significant new infrastructure. Construction workforce is a critical component to seeing necessary builds being completed on-time and on-budget. Workforce projections for Canada's construction workforce can be found at BuildForce: <https://www.buildforce.ca/en>
- ¹² Labour demand projections include hiring due to industry activity, age-related attrition and net hiring requirements and have been produced using CIE's modelling system for the energy industry. This system projects labour demand by sector and industry for the 81 occupations mapped according to the National Occupational Classification (NOC) 2021. An "other occupations" category is used to capture any residual occupations and ensure the total energy industry workforce is accounted for.
- ¹³ Scenarios were developed with guidance of an Energy Scenarios Working Group and in consultation with industry which helped finetune energy production assumptions from a variety of sources including Canada Energy Regulator, Environment and Climate Change Canada, and Rystad Energy.

- ¹⁴ CIE's labour market model takes capital and operational expenditures into account for the conventional exploration and production, oil sands and energy services sectors. Further details can be found in the methodology report. <https://careersinenergy.ca/>
- ¹⁵ ATB Capital Markets. (2023, October 17). *Fall 2023 Energy Sector Survey Results*. <https://atbcapitalmarkets.bluematrix.com/sellside/EmailDocViewer?encrypt=0ac86060-d648-42c6-8174-5623bdc639b0&mime=pdf&co=atbcapitalmarkets&id=rroach@atb.com&source=mail>
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- ²⁰ International CCS Knowledge Centre. (2023, March 28). *Government of Canada Reaffirms Support for CCS Projects – Statement from the International CCS Knowledge Centre*. International CCS Knowledge Centre. <https://ccsknowledge.com/news/government-of-canada-enhances-support-for-ccs-projects--statement-from-the-international-ccs-knowledge-centre>
- ²¹ Stokes Economics using Statistic Canada Labour Force Survey data and other industry sources.
- ²² LMIC (2023, November 14). *What is a "good" job?* Labour Market Information Council. <https://lmic-cimt.ca/what-is-a-good-job/>
- ²³ Statistics Canada. Table 36-10-0489-05. Total compensation per job, by NAICS industry
- ²⁴ Scholz, M. (2022, April 5). *As Alberta's oil and gas industry rebounds, there's a new problem: not enough workers*. CBC News. <https://www.cbc.ca/news/canada/edmonton/shortage-workers-oil-prices-1.6404716>
- ²⁵ Careers in Energy and Stokes Economics using Statistics Canada's Input-Output tables
- ²⁶ Natural Resources Canada. (2023). *Natural Resources: Major Projects Planned or Under Construction 2023 to 2033*. https://natural-resources.canada.ca/sites/nrcan/files/emmc/pdf/2023/2023-Major-Projects-Inventory-Report_EN_14Nov2023_OP.pdf
- ²⁷ The methodology used to determine the indirect employment generated by investment in Canada's established energy industry is separate from Careers in Energy's modelling system used to determine direct employment. The economic impact analysis presented uses interprovincial, inter-industry input-output tables of the economy published by Statistics Canada to estimate the economic impacts (including employment impacts) of specific industry expenditures on other industries and across provinces.
- ²⁸ ATB Capital Markets. (2023, October 17). *Fall 2023 Energy Sector Survey Results*. <https://atbcapitalmarkets.bluematrix.com/sellside/EmailDocViewer?encrypt=0ac86060-d648-42c6-8174-5623bdc639b0&mime=pdf&co=atbcapitalmarkets&id=rroach@atb.com&source=mail>



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Careers in Energy, a division of Energy Safety Canada, is the leading authority on labour market information and trends in Canada's energy industry. We engage and inform people about careers in energy, removing barriers to information, addressing industry and worker needs, and providing the resources and tools needed to maintain and build a skilled energy workforce for today and tomorrow.

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