PetroLMI
DIVISION OF ENERGY SAFETY CANADA

# THE LNG OPPORTUNITY IN CANADA

## EMPLOYMENT PROSPECTS AND REQUIREMENTS

JUNE 2020

Canada

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**Source:** BC LNG Alliance

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# FOREWORD

As Canada's energy industry emerges from the challenges brought on by the COVID-19 pandemic coupled with historically low oil prices, the development of a liquefied natural gas (LNG) sector could play an important role on the road to economic recovery.

Canada has an opportunity to develop its vast, low-cost natural gas reserves to meet burgeoning demand for energy from international markets and at the same time help to reduce global carbon emissions.

While the events of recent months have delayed or deferred decisions on some proposed LNG projects along Canadian coastlines, these projects present opportunities for the future. The construction and operation of LNG in Canada will create employment and grow business across a spectrum of sectors that supply the goods and services and natural gas needed. In addition, there will be growth in natural gas liquids production and Canada's petrochemical industry.

This report provides an overview of approved and proposed LNG projects and their required workforces. While much has been written about the need for thousands of workers to support construction, this report focuses on the opportunities for operations and maintenance jobs once the liquefaction plants and associated port facilities are up and running. This includes the potential size and makeup of the workforce, as well as detailed profiles of specific occupations with information on skills and qualifications.

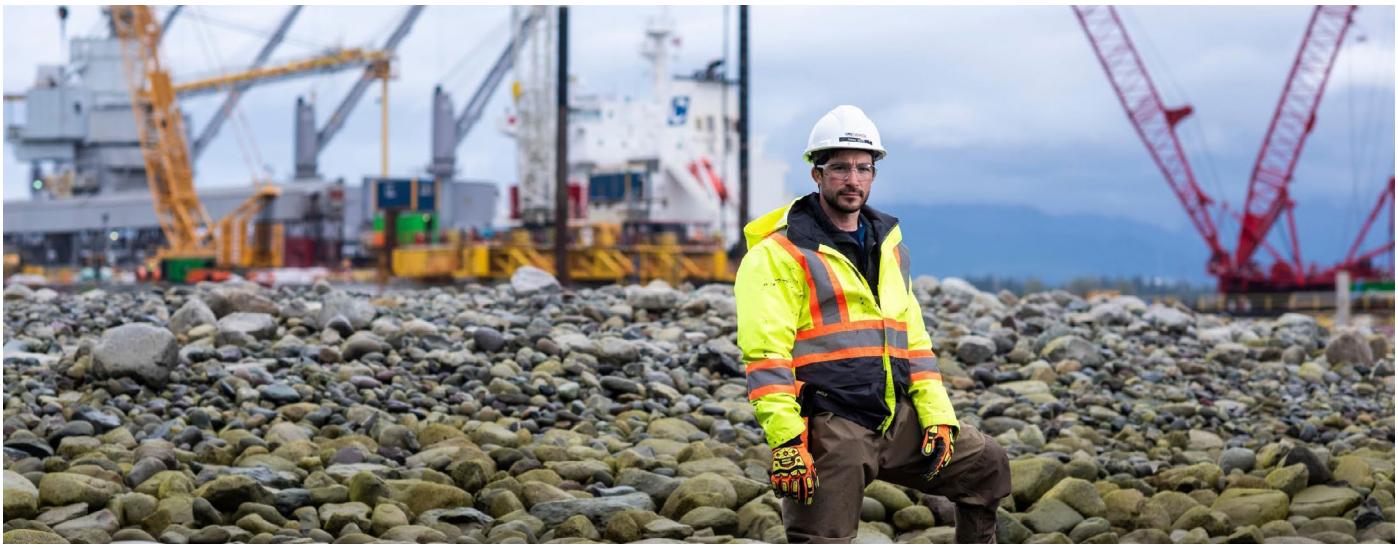
Although an LNG sector is just emerging in Canada, many of the required occupations, skills and qualifications for liquefication facilities' day-to-day operations are similar to other oil and gas industry processing operations, including natural gas processing, in situ oil sands, upgrading and refining. While more workers are generally involved in the construction stage, some of these workers can also transition to maintenance and operations roles.

The key to maintaining a successful career in any industry that has embarked on major and significant transitions, such as Canada's oil and gas industry, is to recognize and capitalize on the opportunities that come along. Changing technologies, new trends and different ways of operating and conducting business have impacted the careers in the energy sector. There is no time like the present to look at a different part of the industry, or a different occupation, and develop new skills to meet a changing job market.

Post-secondary students and institutions, new graduates, industry associations, as well as workers looking to transition from other sectors of the oil and gas industry, or other industries (e.g., agriculture, construction, manufacturing, mining and utilities), can benefit from this information.

Carol Howes

**Carol Howes**
Vice President, Communications and PetroLMI,
Energy Safety Canada



**Source:** LNG Canada

# LNG AND THE OPPORTUNITY FOR CANADA

**The development of a liquefied natural gas (LNG) sector represents a significant opportunity for Canada's energy industry. With its vast natural gas reserves – and the ability to develop those reserves responsibly and sustainably – investment in LNG projects can help the industry tap into new markets for its surplus production and meet growing global demand for natural gas. At the same time, Canada can help reduce global carbon emissions by replacing the use of more carbon-intensive fuels such as coal and diesel with natural gas, particularly in developing countries. By creating an export market to Asia and Europe, Canada will benefit from higher natural gas prices, industry revenues and job creation that can contribute to Canada's economic diversification.**

## What is LNG?

LNG serves markets for natural gas when pipeline access is not feasible. Unlike domestic distribution through North America's vast network of pipelines, shipping to markets overseas requires the natural gas to be cooled into a liquid state for ease, safe storage and efficient transportation of large volumes.

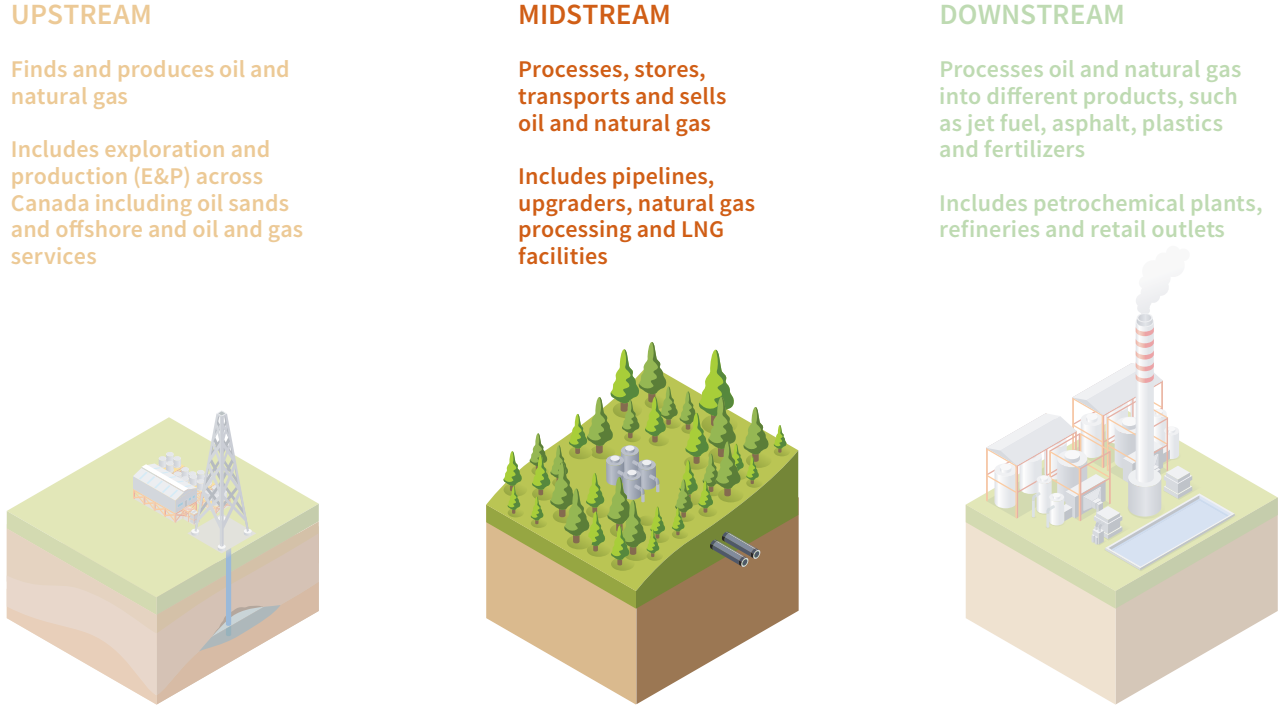
Canada's oil and gas industry is made up of three main sectors: upstream (exploring for and extracting oil and natural gas), midstream (storage and transportation) and downstream (processing and converting oil and natural gas to other products). As shown in Figure 1, LNG facilities fall into the midstream sector.

LNG activities include natural gas production, liquefaction, shipping, regasification and delivery. There are two types of LNG terminals required: liquefaction terminals, which liquefy and export LNG, and regasification terminals, which import and convert LNG back to natural gas. This report focuses on activities related to liquefaction terminals.

LNG is a clear, colourless, odourless, non-toxic liquid that has been safely transported by sea for more than 50 years. Globally, over 100,000 LNG cargoes have been delivered without major incident. There were more than 540 active vessels at the end of 2019, delivering LNG from 21 exporting countries to 42 importing countries.[1]

[1] International Group of Liquefied Natural Gas Importers (GIIGNL). *The LNG GIIGNL Annual Report.*

**Figure 1: Sectors of natural gas production and distribution**



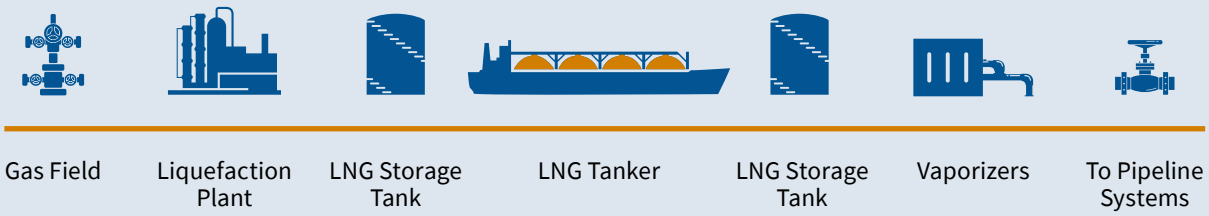
## Three primary steps to create LNG

**Liquefaction:** When raw natural gas arrives at a liquefaction plant, impurities are removed leaving a product that is primarily methane. The natural gas is cooled to about -162°C so it becomes liquid. The volume of natural gas in this liquid state is about 600 times smaller than its volume in its gaseous state. The LNG is then stored in insulated tanks to keep it cold until it's ready to ship.

**Transportation:** LNG is pumped into double-hulled LNG carriers designed to keep the LNG cold and minimize evaporation. LNG carriers can hold up to 9.4 million cubic feet of LNG – or approximately 106 Olympic-sized swimming pools – equivalent to 5.6 billion cubic feet of the gas in its natural gaseous state.

**Re-gasification:** When the LNG carrier arrives at its destination, the LNG is offloaded and stored in insulated storage tanks to keep it cold. When needed, the LNG is warmed to convert it back to a gas and then delivered by pipeline to customers.

**Figure 2: The LNG process**[2]




[2] Natural Resources Canada. *Liquefied Natural Gas.*

## Why develop an LNG sector?

Several factors have created a "perfect storm" to develop LNG projects in Canada for the benefit of investors, governments and all Canadians.

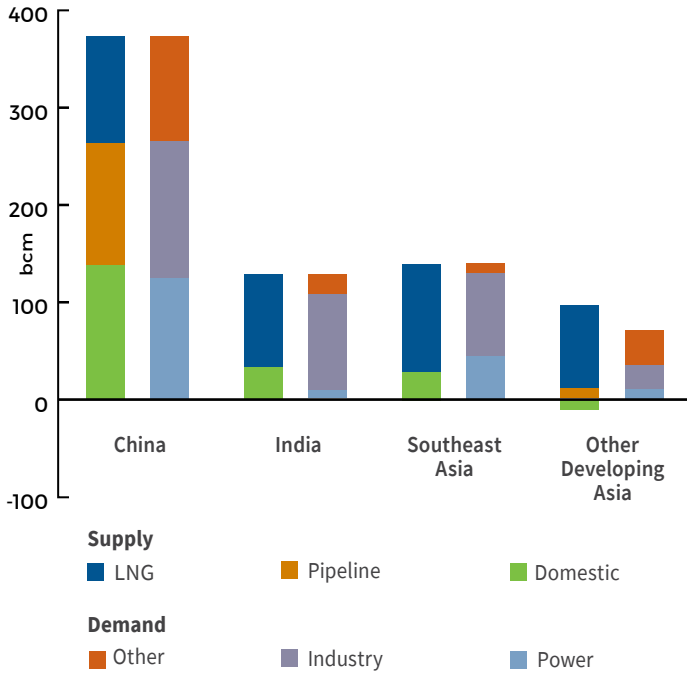
### Global demand has been growing

Natural gas consumption is surging in popularity around the world. In 2019, the LNG market grew by 13% worldwide from 2018 to 354.7 million tonnes, with almost 70% of the demand coming from developing economies in Asia. China led the world in demand growth for LNG imports, with an increase of 14% from 2018 to 61.7 million tonnes, making it the second-largest LNG importer globally.[3] In its 2019 report, the International Energy Agency (IEA) projected global demand for natural gas to increase 36% by 2040, supplying 25% of the total energy consumed worldwide,[4] with power generation and industrial applications remaining the largest use for natural gas. In the short term, there is expected to be a surplus of LNG worldwide and downward pressure on demand due to the global pandemic, but long term the market is forecast to remain strong.

### Governments and consumers are pushing to reduce carbon footprint

Worldwide, there is a shift to produce and use cleaner fuel sources as governments and consumers commit to reducing their carbon footprints. LNG can help to lower global emissions when used to displace higher carbon intensive fuels such as coal or diesel. Compared to coal, natural gas emits about half the carbon emissions when used for electricity generation and about 30% less than crude oil.[6]

**Figure 3: Forecasted change in gas supply and demand in developing Asian markets, 2018 – 2040**[5]




[3] GIIGNL. The LNG *GIIGNL Annual Report.*
[4] IEA. *World Energy Outlook 2019.*
[5] Ibid.
[6] Ibid.

## What's the opportunity for Canada?

Canada has many advantages that position it to become a significant LNG supplier:

**Reserves are plentiful:** Canada is the fifth-largest producer of natural gas worldwide, producing an average of 15.7 billion cubic feet per day (bcf/d) in 2019; there is enough natural gas at current consumption to meet domestic needs for more than 300 years. About 70% of Canada's reserves come from tight and shale gas formations in Alberta and British Columbia. The Montney formation in Northeast British Columbia and Northern Alberta – where most of the natural gas production for LNG in British Columbia will be sourced – accounts for 36% of Canada's total remaining natural gas resources.[9]

**Reserves are inexpensive and accessible:** Not only does Canada have access to world-class low-cost resources but also state-of-the-art and energy-efficient technologies. Natural gas can be delivered to markets on the West and East Coasts of Canada – where LNG export facilities are proposed or in development – through a sophisticated processing and pipeline infrastructure.

**Access to new markets:** About half of Canada's current natural gas production is exported to the United States.[10] Due to a shale gas revolution south of the border, Canada's long-time export customer has become a key competitor – the United States is now one of the largest producers and exporters of natural gas in the world. If Canada is to maintain and grow its natural gas sector, new international markets for the country's surplus production need to be developed.

**Geographic advantage:** Canada has more direct access and shorter distances to Asia and other markets than many of its competitors, particularly the United States, as shown in Figure 4. The United States primarily exports its LNG from facilities along the Gulf of Mexico (Louisiana, Texas) and East Coast (Georgia, Maryland). Canada's closer proximity to markets reduces travel time and transportation costs, making it an attractive location for project development.

[7] IEA. *World Energy Outlook 2019.*
[8] Wood Mackenzie. *International Maritime Organization (IMO) 2020.*
[9] National Energy Board. *Canada's Role in the Global LNG Market: Energy Market Assessment.*
[10] Natural Resources Canada. *Natural Gas Facts.*
[11] Natural Gas Advisory Panel. *Roadmap to recovery: Reviving Alberta's natural gas industry.*

## International Maritime Organization 2020

LNG is also becoming a preferred fuel for the world's merchant fleet as the International Maritime Organization (IMO) seeks to regulate progressive reductions in vessel emissions.

Additional demand for LNG is expected to rise due to regulation from *IMO 2020*, a new directive which took effect January 1, 2020. Under this regulation, ships must use marine fuels with a sulphur content of no more than 0.5%, as part of a major effort to reduce emissions from the marine sector.

Demand for more low sulphur transportation fuels – such as LNG and diesel – therefore has the potential to be highly disruptive to the pricing and availability of compliant fuels. There are currently around 130 orders for new LNG-fuelled ships, with two-thirds expected to be based in Europe where bunkering infrastructure is the most developed.[7]

The marine sector, which consumed 3.8 million barrels per day (mmb/d) of fuel oil in 2017, is responsible for half of global fuel oil demand.[8]

**Figure 4: Sailing days to key Asian markets from BC and U.S. Gulf Coast[11]**

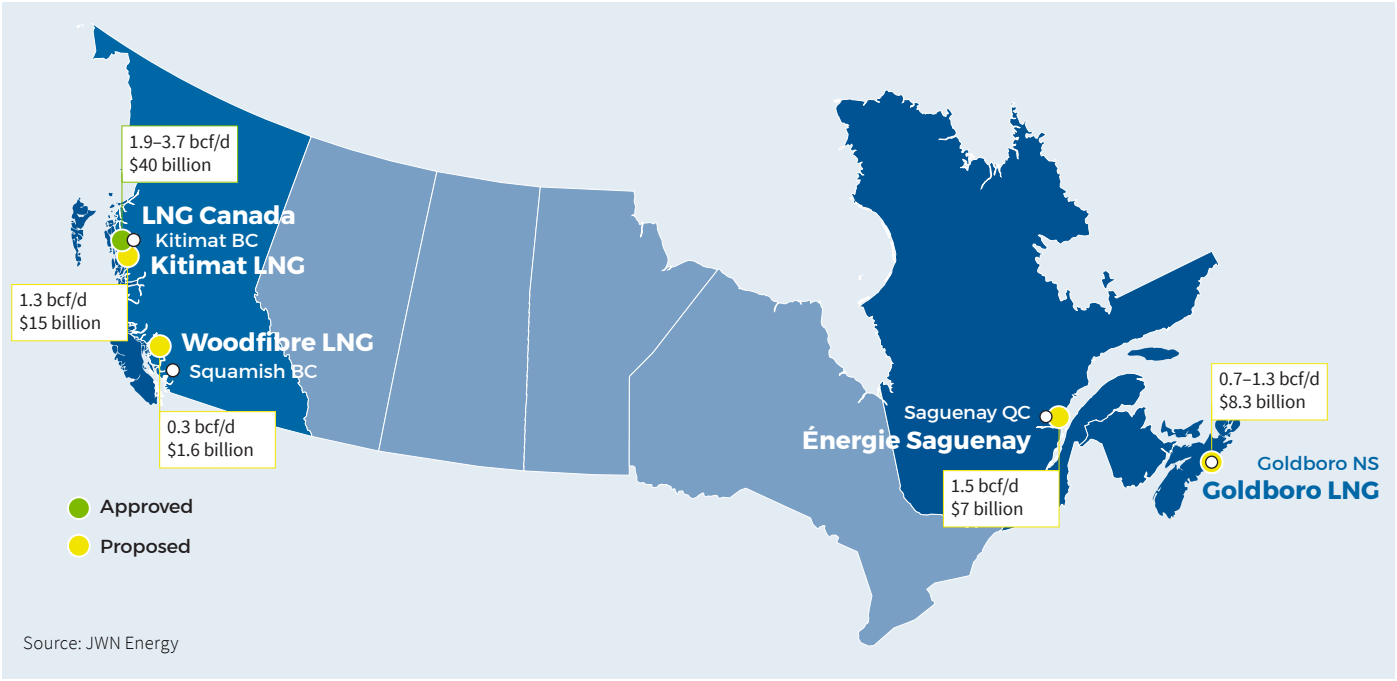
## Investment in LNG projects

To date, the $40-billion LNG Canada project with a liquefaction plant and marine export terminal in Kitimat, British Columbia is under construction and is expected to be in operation by the middle of this decade. Other LNG projects are at various stages of proposal, including awaiting final investment decision (FID). Table 1 provides more detail.

**Table 1: Selected key LNG projects in Canada[12]**

| Project | Owner(s) | Capacity | Capital Cost ($ billions) | Status |
|---|---|---|---|---|
| **Kitimat LNG** (British Columbia) | Woodside Energy | 1.3 bcf/d | $15 | Partner Chevron to exit the project; Woodside is seeking to reduce stake |
| **LNG Canada** (British Columbia) | Shell, PETRONAS, PetroChina, Mitsubishi Corporation, KOGAS | 1.9 – 3.7 bcf/d | $40 | Phase 1 is under construction; completion expected by the middle of this decade |
| **Woodfibre LNG** (British Columbia) | Pacific Oil & Gas | 0.3 bcf/d | $1.6 | Construction delayed to 2021 |
| **Goldboro LNG** (Nova Scotia) | Pieridae Energy | 0.7 – 1.3 bcf/d | $8.3 | FID delayed beyond September 2020 |
| **Énergie Saguenay** (Quebec) | GNL Quebec | 1.5 bcf/d | $7 | FID expected in 2020; completion in 2025 |

**Figure 5: Selected key LNG projects in Canada[12]**



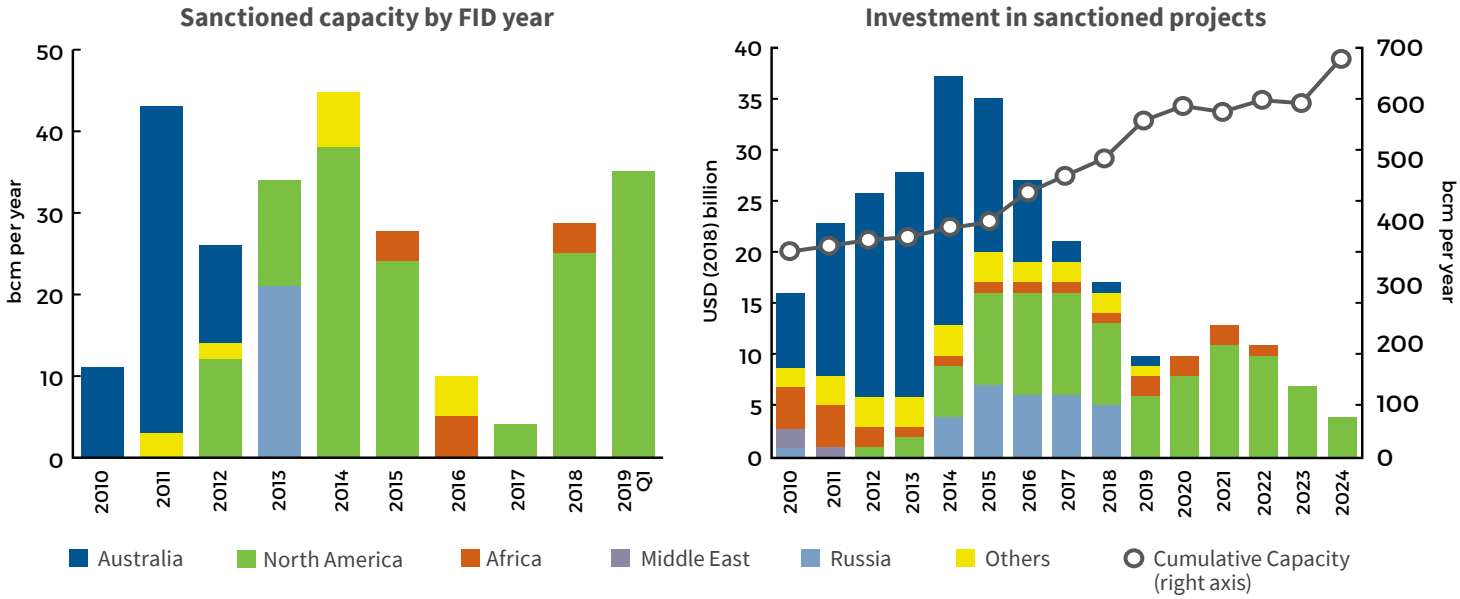

[12] JWN Energy. *LNG: Canada's Supply Chain Opportunities.*

## What are the challenges to overcome?

LNG development involves massive projects that, while bringing enormous potential, also bring their share of challenges and risks. There is a sense of urgency to move forward on LNG projects in Canada due to the following:

**Competition from other countries:** Canada's LNG projects will enter a competitive marketplace. Countries such as Australia, Malaysia, Qatar, Russia and the United States are leading exporters of LNG.[13] In 2019, there were 21 countries exporting to 42 countries. Five new large-scale liquefaction projects started commercial operations – four of them in the United States and the fifth in Australia.[14] There are up to 30 LNG projects proposed globally with large investment commitments, as shown in Figure 6. If they were all to come on stream, there would be enough LNG to meet demand until 2035. Many of these projects can move ahead with attractive costs, favourable regulation and political support. Canada's approved LNG capacity is currently about 2.5% of existing (or under construction) global capacity. Pipelines under construction (by kilometre) represent about 1.4% of total global projects under construction in 2019.[15]

**Figure 6: Global LNG FID and investments, 2010 – 2024[16]**




**LNG plants are capital- and time-intensive to construct:** Canada has relatively higher costs associated with building and operating in what are often remote locations and the additional investment required for procuring material, equipment and labour. The timeframe from FID to actual LNG plant operation, takes approximately five years.[17]

**Environmental, stakeholder and regulatory considerations are extensive:** Canada's regulatory process has proven challenging, with protracted timelines and activist activity delaying projects and driving up costs. At the same time, however, due to Canada's stringent regulations for environment and stakeholder engagement, projects' design, build and operation must consider community interests and provide economic and social benefits.

**Pipeline capacity lag:** Canada's natural gas transportation infrastructure (e.g., pipelines transmission system) is stretched to capacity. Expansion and optimization has not kept pace with growth in natural gas production, resulting in an over supply and infrastructure bottlenecks.

Source: TC Energy

[13] International Gas Union. *2020 World LNG Report.*

[14] GIIGNL. *The LNG GIIGNL Annual Report.*

[15] Canadian Energy Research Institute (CERI). *Canadian Crude Oil and Natural Gas Production, Supply Costs, Economic Impacts and Emissions Outlook (2019–2039).*

[16] Ibid.

[17] PwC Canada. *The Progression of an LNG Project: Canadian LNG Projects.*

# Employment opportunities in LNG

## An LNG sector will create employment opportunities across all sub-sectors of Canada's oil and gas industry.

### By the numbers

LNG projects developed on the West Coast of Canada will be particularly beneficial to the upstream sector in British Columbia and Alberta as workers prepare, drill and complete the wells required to meet the natural gas demand for the projects. According to a recent study by the Petroleum Services Association of Canada (PSAC), which examined the workforce impacts of the first project phase of LNG Canada, an estimated 3,600 – 4,200 direct and indirect jobs per year would be created in the upstream sector.[18] If all proposed projects identified in Figure 5 move ahead, an additional 8,300 direct and indirect jobs per year could also be created in Canada's upstream natural gas sector.[19]

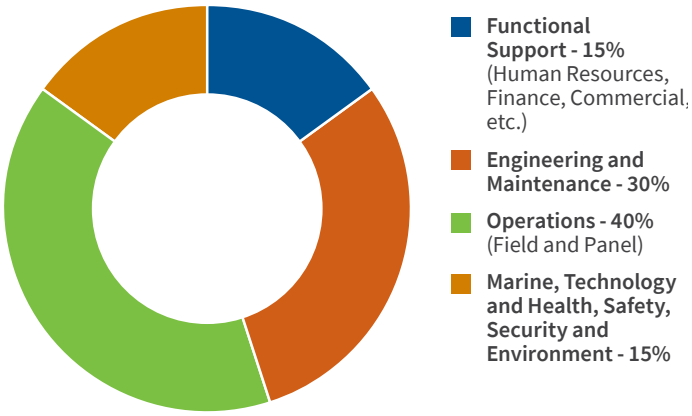
According to Canadian Energy Research Institute (CERI) estimates, LNG development will lead to a consistent increase in production. Natural gas developed for LNG is expected to constitute approximately 30% of total Canadian production by 2039.[20]

A developing LNG sector would also create thousands of construction jobs and drive employment opportunities across a spectrum of other industries that supply goods and services, such as repair maintenance, waste management, truck transportation, security and professional, scientific and technical services. During peak construction, up to 7,500 people will be required to build the LNG Canada plant. LNG Canada will spend between $6 billion and $10 billion on goods and services. The associated Coastal Gaslink pipeline is expected to generate 2,000 – 2,500 construction jobs at peak, provide $1 billion in employment and contracting opportunities, and spend about $42 million annually in operating costs.[21] Other projects, such as Goldboro LNG and Woodfibre LNG, have announced anticipated construction workforces of 3,500[22] and 650, [23] respectively. Further still, is the job growth associated with increased natural gas liquids and petrochemical upgrading and manufacturing.

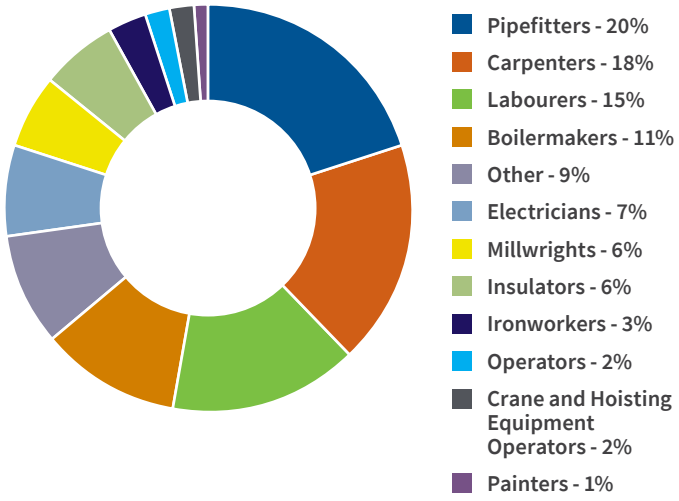
Operations and maintenance jobs at liquefaction plants and the associated port facilities are the focus of this report. Direct employment varies from 100 workers for a small plant to 800 workers for a large plant with a typical Canadian plant employing 200 – 350 direct roles. Employment also varies depending on the technologies implemented. Hiring typically ramps up 12 – 18 months in advance of operations to ensure that workers are adequately trained and available to assist with plant commissioning and start-up activities.

An LNG facility relies largely on traditional trades such as mechanics, electricians, labourers and plant operators. It will also need administrative and managerial positions to oversee operations, ensure compliance and perform accounting, procurement and other supporting, central functions. As Figure 7 shows, about 70% of the roles are expected to be in

**Figure 7: Composition of LNG operations and maintenance workforces**




**Composition of ongoing maintenance workforce[24]**




[18] PSAC. *Canadian LNG Upstream Workforce Study.*

[19] Ibid.

[20] CERI. *Canadian Crude Oil and Natural Gas Production, Supply Costs, Economic Impacts and Emissions Outlook (2019–2039).*

[21] JWN Energy. *LNG: Canada's Supply Chain Opportunities.*

[22] Nova Scotia Canada. *Nova Scotia's LNG Opportunity.*

[23] Woodfibre LNG. *Ask Woodfibre LNG.*

[24] PetroLMI. *Exploring LNG in Canada.*

operations (e.g., power engineers and control room operators) and engineering and maintenance (e.g., mechanical and chemical engineers and industrial electricians); with the balance in functional support, marine, technology and HSSE (health, safety, security and environment) roles. Based on a typical plant with 200 – 350 workers, this would mean approximately 80 – 140 roles in operations; 60 – 105 roles in engineering and maintenance; and 60 – 105 roles for centralized functions.

Many of the occupations, skills and qualifications required for the day-to-day operations of liquefaction facilities are similar to other oil and gas processing operations, including those in natural gas processing, in situ oil sands, upgrading and refining, making transferability from those operations relatively easier.

Skilled trades workers will also be required for the ongoing maintenance of these facilities where plant reliability and safety are imperative to minimize unplanned facility outages and production downtime. There is potential for workers to transfer from shorter-term construction jobs into roles in maintenance and operations.

A large percentage of LNG operations positions will be jobs that require a minimum of trade school or a two- or four-year technical degree. Table 2 outlines typical occupations in greater detail.

[25] CAPP. *Leveraging Opportunities: Diversifying Canada's Oil and Gas Markets 2018 Economic Series.*

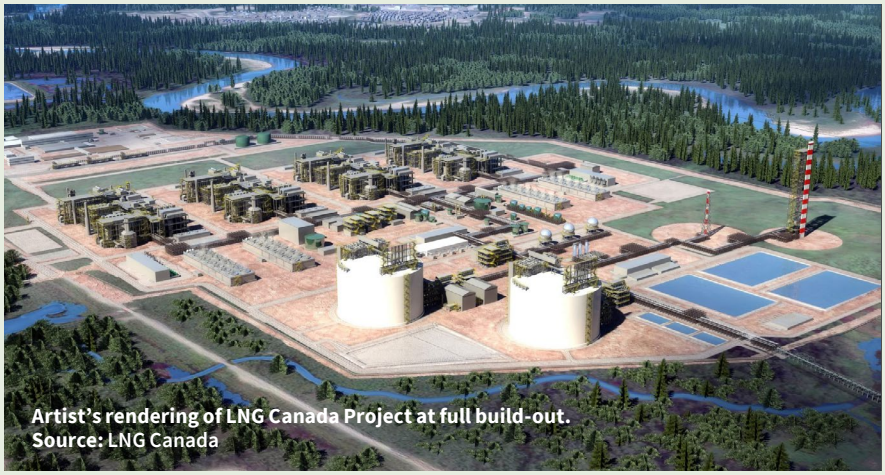
## Economic impacts of a Canadian LNG industry

**The economic impacts of supporting a Canadian LNG industry are significant. In a 2018 Economic Series Report,[25] the Canadian Association of Petroleum Producers (CAPP) estimates every 1 bcf/d of incremental natural gas production to serve LNG exports would:**

- **Generate $2.4 billion towards Canada's GDP in direct or indirect activity.**
- **Create or sustain 10,000 direct or indirect jobs nationally.**
- **Generate annual federal and provincial government revenues of $340 million (from corporate, personal, indirect taxes and royalties), which helps pay for roads, schools and hospitals.**

## LNG Canada

LNG Canada is building Canada's first LNG export terminal, designed to ship Canadian natural gas to international markets in Asia. The largest private sector construction project in the country's history will transport Canada's excess natural gas supply to the industrial economies (e.g., China, India) that need it. In the process, cleaner-burning natural gas will displace more carbon-intensive power sources in use overseas (i.e., coal) and will contribute to the reduction of global emissions internationally.



**Artist's rendering of LNG Canada Project at full build-out.**
**Source: LNG Canada**

**Owners:** Shell, PETRONAS, PetroChina, Mitsubishi Corporation, KOGAS

**Location:** Kitimat, British Columbia

**Current status:** Phase 1 (processing trains 1 and 2) under construction; Phase 2 (processing trains 3 and 4) in design.

**Anticipated on stream date:** mid-2020s for Phase 1

**Capacity:** Approximately 2 bcf/d for Phase 1

**Associated infrastructure:** Coastal GasLink pipeline* is expected to supply the feedstock, carrying natural gas from British Columbia's Peace Region to LNG Canada's plant in Kitimat.

**Cost:** $40 billion

**Construction jobs:** 10,000 at peak across plant and pipeline.

**Operations jobs:** Approximately 400 for Phase 1

**The Coastal GasLink pipeline is being built and will be owned and operated by TC Energy.*

**Table 2: LNG facility operations – typical job titles and estimated labour demand[26]**

| JOB FAMILY | NATIONAL OCCUPATIONAL CLASSIFICATION | TYPICAL JOB TITLES | ESTIMATED NUMBER OF WORKERS |
|---|---|---|---|
| Operators | Petroleum, gas, chemical process operators (9232) or power engineers and power systems operators (9241) | LNG plant/process operator, control room operator, utilities operator, panel operator, outside marine operator | 100–170 |
| Managers and supervisors | Facility operations and maintenance managers (0714) | Operations manager, maintenance manager, shift lead, superintendent, process manager | 20–35 |
| Trades | Construction millwrights and industrial mechanics (7311) | Millwright, rotating equipment technician | 20–30 |
| | Industrial electricians (7242) | Electrician | 20–30 |
| | Instrumentation technicians (2243) | Instrumentation technician, automation technician | 20–30 |
| Engineers | Electrical/instrumentation engineers (2133) | Electrical and instrumentation engineer | 10 |
| | Mechanical engineers (2132) | Mechanical engineer, rotating equipment engineer, reliability engineer, static equipment engineer | 10 |
| | Chemical engineers (2134) | Chemical engineer, process engineer, production engineer | 10 |
| Business and operations support | Other | Functions: Administrative assistant, Finance, Procurement, HR, HS&E, IT | 20–30 |

[26] PetroLMI. *Exploring LNG in Canada.*

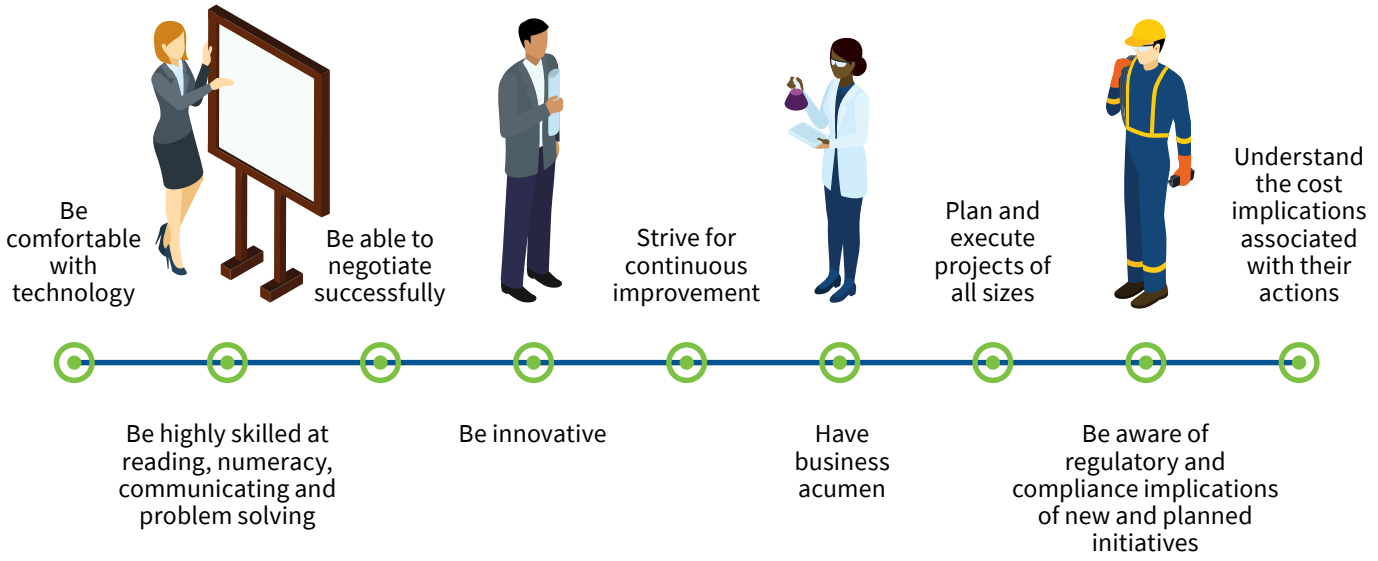
**Source:** LNG Canada

# THE MODERN ENERGY WORKER IN LNG AND BEYOND

**As companies across Canada's energy sector turn to new technologies, digitize their operations, work towards lowering carbon emissions and continue to scale up or down to meet changing market dynamics, expectations of workers are changing. Teams and individuals must be flexible and adapt their roles accordingly. This is particularly true of those choosing to work at LNG facilities, which will leverage state-of-the-art technologies and the most cost-effective and efficient equipment. One example is the all-electric facility being proposed by Kitimat LNG, which would make it one of the lowest emitters of any large project in the world.**

Similarly, good corporate practice means energy companies are not only building environmental, social and governance (ESG) metrics, but are also ensuring their organizational structures reflect roles and responsibilities aligned to creating, measuring, monitoring and reporting these metrics to various stakeholders, including regulators. For LNG operations, there will be roles in environment, safety, community/stakeholder relations, regulatory, government affairs and sustainability. These roles require employees to understand the importance of the environment, social impacts, safety and sustainability. Workers who increase their comfort with changing trends and a digital, data-driven, less-structured environment will be ahead of the game.

**Figure 8: Persona profile of the modern energy worker**



## Working conditions at an LNG facility

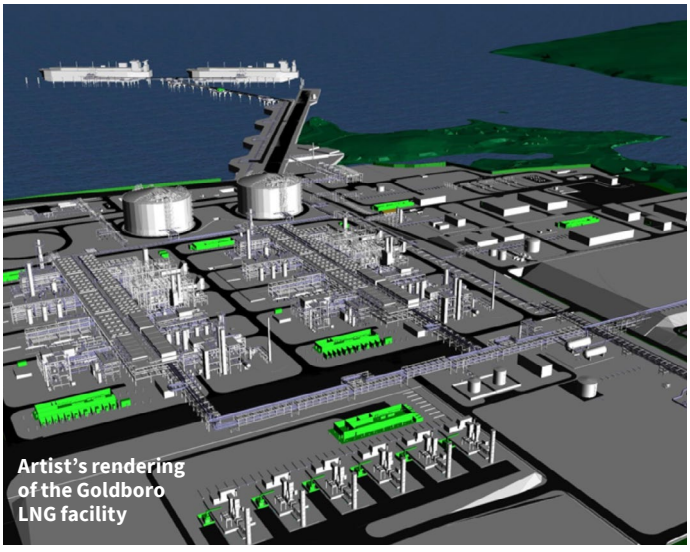
Under construction for the LNG Canada project, this town-sized Cedar Valley Lodge will have 4,500 rooms to house workers and will feature an entertainment and recreation complex with a movie theatre.

**Source:** LNG Canada

| | |
|---|---|
| Work hours | Varies; majority of work is expected to be shift work for facility positions. |
| Work environment | Combination of indoor and outdoor; facilities generally located remotely. |
| Accommodation | Workforce housing at worksites (mostly during construction and turnaround/maintenance phases); or renting/owning in nearby communities for permanent operations positions. |
| Weather | Moderate; proposed/planned LNG projects would be located in coastal communities. |
| Wages | Competitive; reflecting the skills required and the remote working conditions; housing allowances may or may not be provided for permanent operations positions. |
| Area infrastructure / recreational opportunities | Plentiful for those who enjoy an active lifestyle. Recreation facilities and surrounding wilderness provide opportunity for an active, outdoor, coastal lifestyle. There is access to elementary and secondary schools, local colleges and nearby regional universities, local hospital and regional airports for workers with families. |

### The gig economy

The gig economy is a labour market characterized by the prevalence of short-term contracts or freelance work rather than permanent jobs. A growing segment of Canada's workforce is interested in these gig assignments, including both younger workers and those nearing or in retirement. For energy workers, the gig economy offers both benefits and challenges. Opportunities exist to work for more than one company or work on several projects within the same company. This can build new skills and a broader industry understanding, making a worker more marketable. The growth of the gig economy reinforces the need to build communication and critical thinking skills, as well as a willingness to be adaptable and learn continuously. At the same time, the gig economy can result in less job stability, especially for those who have not focused on developing people skills.



**Artist's rendering of the Goldboro LNG facility**

**Source:** Pieridae Energy

# Day in the life profile: Alexandra Benko, LNG Canada

**Alexandra Benko is a civil engineer working for LNG Canada. She started on the project in 2016 straight out of graduate school from the Royal Military College of Canada in Kingston, Ontario, where she completed her Master's in Structural Engineering, specializing in blast-proof structures. She has an undergraduate degree in Civil Engineering from Queen's University.**

***Q. How would you describe your job?***

**A.** Right now I am working to support expansion (LNG Canada – Phase 2) which is the eventual addition of processing trains 3 and 4 to the plant. I am involved in the front-end engineering design work and will help put together the technical requirements and preliminary drawings that will go out for contract. Previously, I worked on Phase 1, which is currently under construction. I was involved with the early field engineering and earthworks including the workcamp and habitat offsets (steam diversions) and working in our contractor's office for the detailed design of Phase 1.

***Q. What's your favourite part about your work?***

**A.** How varied it is. This is an enormous project and I've bounced around on so many different aspects of it so far. One day I could be talking to an interior designer about paint colours inside a building, the next to a retired sea captain about marine vessel design, and the next to an interested community member at an open house in Kitimat.

***Q. What do you find the most challenging?***

**A.** Because the project is so immense and the work so varied, I can't possibly know everything. I have to rely on experts a lot to get my work done. I was pleasantly surprised, though, when a couple of buildings designed for the project had to be blast-proof. My master's degree was in blast-proof structures, so in that instance at least I felt pretty confident – and actually got to see my research applied to a real-life situation!

***Q. What skills best prepared you for success in this role?***

**A.** Definitely my soft skills/people skills have helped me the most. I'm in so many meetings and you need to communicate well and have positive interactions with others to be successful.

***Q. What was it like working in Kitimat?***

**A.** I travelled to Kitimat for work when I was involved with the early field engineering and earthworks and camp construction. I liked the town of Kitimat and working there really kept me motivated to be on this project and support the local community. One of my favourite parts of my job when I was there was going to open houses and talking to community members and seeing how positive they were about this project and the positive benefits it would bring to the community. They were excited to see it completed. I'm now working on the expansion from Calgary.

***Q. How do you feel about working in the LNG industry?***

**A.** This is a great opportunity for Canada, and I'd love to see Canada be a major player in LNG. We have the capacity and ability to do it responsibly. I know at LNG Canada we're always looking for ways to lower our greenhouse gas emissions and this is factored into our designs.

I look to Australia as an example of where we can be as a country. Australia has a similar economy and regulatory framework and has successfully moved LNG projects forward. We are just dipping our toes in the water here with respect to LNG. It's a new industry and people need to get used to it and see how successful it can be.

***Q. What are your longer term career aspirations?***

**A.** I feel like I've signed up for the long haul with LNG Canada. Since I am currently working on expansion, I'd for sure like to be here until expansion reaches the operations phase, which is several years out. I really like working on big projects and the many work and learning opportunities they provide.

***Q. Are there any courses or further training you're considering?***

**A.** As a civil engineer, I know a lot about structures but not as much about actual LNG production and petrochemical processing. I help build these plants, now how does it all work? I'd like to learn about that a little more.

# OCCUPATION PROFILES

The following occupation profiles describe potential in-demand roles found in the LNG sector. Each profile provides a job description and information on typical job duties, type of work environment, education and requirements and related industries that employ similar occupations. The occupations are grouped into three categories: business and operations support, engineering and trades.

Source: TC Energy

## Business and operations support

### Quality Control and Inspection Professional

| Job category | Job description |
|---|---|
| Business and Operations Support | Inspect, review, evaluate and analyze work environments, products or procedures – ensuring safety, quality and best practices standards are met. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors | • Review engineering packages for material selection, weld-procedure acceptance and specification, and regulatory compliance.<br>• Examine permits, licences, applications and records to ensure compliance with licensing requirements.<br>• Develop, maintain and control quality records (e.g., engineering packages, inspection reports, integrity assessments, non-conformance reports and other required documentation) for pressure equipment.<br>• Investigate incidents, events and complaints to ensure public safety, environmental protection and resource conservation.<br>• Conduct inspections to assess compliance with the applicable regulations, codes and standards. |
| **Education level** | |
| Post-secondary degree or diploma | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Utilities | |

## Supply Chain Analyst

| Job category | Job description |
|---|---|
| Business and Operations Support | Source the materials and equipment that energy companies need to get their work done – from procurement to awarding supplier contracts to post-contract award management. |
| **Environment** | **Key job activities** |
| Office only | • Identify efficiencies or recommend changes by analyzing supplier capabilities, service levels, product delivery, supply chain processes, spending and trends.<br>• Research industry trends, analyze organizational processes and workflows to identify gaps, make recommendations for improvement, and ensure compliance with organizational governance requirements.<br>• Contribute to supply chain policy development, maintenance and optimization.<br>• Interact with internal staff and external clients and suppliers involved in the purchasing and movement of goods and services.<br>• Contribute to the development of requests for information (RFIs), requests for proposals (RFPs) and all elements of contracts from creation to execution and renewal. |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Construction<br>• Health care and social assistance<br>• Manufacturing<br>• Public administration<br>• Transportation and warehousing<br>• Utilities<br>• Wholesale trade | |

## Purchasing Manager

| Job category | Job description |
|---|---|
| Business and Operations Support | Oversee, plan, direct, control and evaluate the activities of a purchasing department and develop the company's purchasing policies and strategies for sourcing; and negotiate new supplier relationships. Manage budgets potentially in the millions or even billions of dollars, and usually work closely with other departments such as finance and engineering. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors | • Analyze inventories to determine how to increase inventory turns, reduce waste and optimize customer service.<br>• Develop and maintain relationships with suppliers to understand key aspects of their competitive position and financial strength.<br>• Select transportation routes to maximize economy by combining shipments or consolidating warehousing and distribution.<br>• Assess appropriate material handling equipment needs and staffing levels to load, unload, move or store materials.<br>• Appraise vendor manufacturing ability through on-site visits and measurements. |
| **Education level** | |
| Post-secondary degree or diploma | |
| **Related industries** | |
| • Agriculture, forestry, fishing and hunting<br>• Construction<br>• Finance and insurance<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Transportation and warehousing<br>• Utilities | |

## Facility and Operations Maintenance Manager

| Job category | Job description |
|---|---|
| Business and Operations Support | Plan, organize, direct, control and evaluate the day-to-day operations of a facility – and ensure proper equipment is available and reliable, appropriate operations and maintenance (O&M) resources are available to support the facility, personnel are properly trained, and roles and responsibilities have been clearly communicated. The development of – and ensuring compliance to – health and safety protocols is critical. |
| **Environment** | **Key job activities** |
| Outdoors primarily, with some indoors | • Manage and coordinate the plant's efficient and safe daily operation.<br>• Develop and implement schedules and procedures for safety inspections and preventive maintenance programs.<br>• Implement plant-wide operations hazard awareness programs.<br>• Implement the maintenance strategy.<br>• Direct facility machinery, equipment and electrical and mechanical system installation, maintenance and repair.<br>• Prepare, plan and manage facility operations and maintain reports and budgets.<br>• Prepare monthly expenditure forecasts for the plant manager.<br>• Interact with plant personnel, external suppliers and corporate management. |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Transportation and warehousing<br>• Utilities | |

## Environmental Advisor

| Job category | Job description |
|---|---|
| Business and Operations Support | Assist in development, administration and promotion of Environmental, Health and Safety policies and programs. Broad technical experience in environmental issues, planning, fisheries and regulatory compliance is required. Conducting research, preparing reports and providing advice for meeting regulatory requirements and standards are key elements of the job. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors | **Entry level**<br>• Conduct field work, data analysis and document results ranging from noise monitoring, soil, groundwater, storm water, spill prevention, waste management and wildlife system inspections.<br>• Ensure adequate records are maintained to meet statutory and company requirements.<br>• Review and implement environmental technical standards, guidelines, policies and formal regulations to ensure compliance with all appropriate requirements.<br>**More advanced**<br>• Coach and assist others to interpret and apply related policies, procedures and regulations.<br>• Provide advice and guidance on job site arrangements for environmental management. |
| **Education level** | |
| Post-secondary degree or diploma | |
| **Related industries** | |
| • Agriculture, forestry, fishing and hunting<br>• Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Transportation and warehousing<br>• Utilities | |

## Health and Safety Professional

| Job category | Job description |
|---|---|
| Business and Operations Support | Review, evaluate and analyze work environments and design programs and procedures to control, eliminate and prevent disease or injury caused by chemical, physical and biological agents or ergonomic factors. |

| Environment | Key job activities |
|---|---|
| Indoors primarily, with occasional outdoors | **Entry level**<br>• Analyze HSE procedures and programs.<br>• Provide initial care for sick and injured patients and basic life support to trauma patients.<br>• Advocate for participation in occupational health and safety programs.<br>• Recommend HSE procedures and programs.<br>• Maintain corporate, business unit or department emergency response plans.<br>**More advanced**<br>• Ensure safety training courses are developed, reviewed and delivered to the workforce on a particular site, in a timely and efficient manner.<br>• Participate in design reviews, hazard assessment reviews, incident investigations and audits.<br>• Provide guidance to others to ensure adherence to all regulatory standards, company policies and procedures.<br>• Provide consultation to develop emergency response processes. |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Agriculture, forestry, fishing and hunting<br>• Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Utilities | |

## Operations and Production Accounting Professional

| Job category | Job description |
|---|---|
| Business and Operations Support | Ensure that information as it relates to the quantities, costs and revenues associated with oil and gas activities are properly accounted for and reported to stakeholders so that good decisions about planning or operating a facility or project can be made. |

| Environment | Key job activities |
|---|---|
| Office only | **Entry level**<br>• Establish tables of accounts and assign entries to proper accounts.<br>• Ensure contracts are accurately represented in financial results.<br>**More advanced**<br>• Analyze (or prepare) accounting records, financial statements and other financial reports to assess accuracy, completeness and conformance to reporting and procedural standards.<br>• Assist cross-functional teams to review and recommend appropriate accounting treatments and related business processes for new approaches and practices that evolve from the business.<br>• Provide technical accounting support for federal and provincial tax submissions. |
| **Education level** | |
| Post-secondary degree or diploma | |
| **Related industries** | |
| • Agriculture, forestry, fishing and hunting<br>• Finance and insurance<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Utilities | |

### Warehouse Technician

| Job category | Job description |
|---|---|
| Business and Operations Support | Responsible for products within a warehouse environment. Specifically, to receive, store and issue materials, equipment and other items from the stockroom, warehouse or storage yards. May also connect hoses or pipes and operate equipment to load and unload liquid petroleum, chemical or other products into or from tank cars, tank trucks or storage tanks. Also keep records and compile stock reports and may process orders from supplier company facilities/plants or external customers. |
| **Environment** | **Key job activities** |
| Office only | • Maintain a clean and safe working environment, using safe handling techniques.<br>• Receive materials from external vendors, and requisition supplies and materials.<br>• Operate material handling equipment (e.g., dollies, hand trucks, pallet jacks, forklifts, cranes, conveyers).<br>• Operate equipment to load and unload liquid petroleum, chemical or other products into or from tank cars, tank trucks or storage tanks.<br>• Process orders, customer product returns and product returns to suppliers. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Agriculture, forestry, fishing and hunting<br>• Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Transportation and warehousing<br>• Utilities | |

## Engineers

### Automation Engineer

| Job category | Job description |
|---|---|
| Engineer | Analyze the automated control requirements of process, electrical, instrument and mechanical equipment to design these systems. Choose the appropriate technology and suppliers to engineer and manage the system's installation through to completion. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors | **Entry level**<br>• Research, select or apply sensors, communication technologies or control devices.<br>• Design systems for automating industrial tasks.<br>• Design electronic control systems for mechanical systems.<br>**More advanced**<br>• Oversee the work of contractors in accordance with project requirements.<br>• Design advanced electronic control systems for mechanical systems.<br>• Provide training on topics such as mechatronics or automated control. |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Utilities | |

## Chemical Process Engineer

| Job category | Job description |
|---|---|
| Engineer | Research, design and develop chemical processes and equipment to expand operations, improve efficiencies, reduce emissions and resolve issues in the oil and gas industry. Also oversee the operation, performance, optimization and maintenance of petroleum production, processing, upgrading, liquefaction and refining. |
| **Environment** | **Key job activities** |
| Office only | • Monitor process performance throughout production stages.<br>• Perform tests on processes throughout all production stages.<br>• Troubleshoot problems with chemical manufacturing processes.<br>• Establish quality control programs, operating procedures and control strategies to ensure consistency and adherence to standards for raw materials, products and waste products or emissions.<br>• Provide guidance and expert advice to management or other groups on technical, systems or process-related topics. |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Manufacturing<br>• Construction<br>• Professional, scientific and technical services<br>• Public administration<br>• Utilities | |

## Computer Engineer

| Job category | Job description |
|---|---|
| Engineer | Research, plan, design, develop, modify, evaluate and integrate computer and information and communication system networks, such as mainframe systems, local and wide area networks, fiber-optic networks, wireless communication networks and other data communications systems. Develop complex production and processing systems, surface wellhead systems, high pressure fluid control equipment and marine loading systems specific to the oil and gas industry. |
| **Environment** | **Key job activities** |
| Office only | • Monitor equipment and make the necessary modifications to ensure the system operates within specifications.<br>• Test and verify hardware and support peripherals to meet specifications and requirements.<br>• Store, retrieve and manipulate data for capability and requirement system analysis.<br>• Interact with technicians, designers and end users through training and project implementation and maintenance phases. |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Public administration<br>• Finance and insurance<br>• Agriculture, forestry, fishing and hunting<br>• Construction<br>• Mining and quarrying<br>• Manufacturing<br>• Professional, scientific and technical services | |

## Electrical and Instrumentation Engineer

| Job category | Job description |
|---|---|
| Engineer | Research, design, develop, test and supervise electrical equipment manufacturing and installation, instrumentation, controls, components and systems, and ensure they run smoothly, safely, and to exact measurements. |
| **Environment** | **Key job activities** |
| Office only<br><br>**Education level**<br>Post-secondary degree<br><br>**Related industries**<br>• Manufacturing<br>• Mining and quarrying<br>• Utilities | • Perform detailed calculations to establish manufacturing, construction or installation standards and specifications.<br>• Define and inspect performance measures for control and instrumentation systems to ensure compliance for plant, pipeline and other system performance.<br>• Prepare technical drawings, electrical system specifications, or topographical maps to ensure installation and operations conform to standards and customer requirements.<br>• Design, implement, maintain and improve electrical instruments, equipment, facilities, components, products and systems.<br>• Supervise staff, if required. |

## Environmental Engineer

| Job category | Job description |
|---|---|
| Engineer | Plan, design and supervise a variety of industrial activities and processes in oil and gas to prevent, control or remediate potential environmental impacts. May specialize in a specific area such as air, water or waste management. Key activities in this role include: environmental auditing, testing and regulatory compliance/ reporting. Liaise regularly with regulatory agents, contractors and internal staff to ensure activities meet environmental objectives or requirements. |
| **Environment** | **Key job activities** |
| Indoors, with occasional outdoors<br><br>**Education level**<br>Post-secondary degree<br><br>**Related industries**<br>• Agriculture, forestry, fishing and hunting<br>• Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Utilities | **Entry level**<br>• Collect field samples (e.g., air, water, soil) and analyze them.<br>• Monitor sites and procedures to confirm that private and public operations follow environmental regulations.<br>**More advanced**<br>• Evaluate current system performance and incorporate innovations or develop new technologies to enhance environmental protection.<br>• Provide technical problem-solving support and assistance to internal departments on mitigation practices to prevent or minimize impacts to natural resources and local communities and businesses in accordance with regulations. |

## Mechanical Engineer

| Job category | Job description |
|---|---|
| Engineer | Provide technical support and quality management in oil and gas facility design, evaluation, procurement, modification and installation of mechanical equipment and systems that support the reliable, efficient and safe operations. |

| Environment | Key job activities |
|---|---|
| Office only | **Entry level**<br>• Conduct research that tests or analyzes equipment, component and system feasibility, design, operation or performance.<br>• Provide technical support for production equipment and processes.<br>• Generate engineering drawings, process flow diagrams and other documentation.<br>• Provide feedback to design engineers on customer problems or needs.<br>• Research and design mechanical products, equipment, systems and processes to meet requirements.<br>**More advanced**<br>• Mentor and coach junior members.<br>• Lead or participate in the conceptual and detailed mechanical equipment design for capital projects.<br>• Develop, coordinate or monitor all aspects of production (e.g., selecting manufacturing methods). |
| **Education level** | |
| Post-secondary degree | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Utilities | |

## Civil Engineering Technologist

| Job category | Job description |
|---|---|
| Technicians and Technologists | Assist engineers in planning, designing, constructing and maintaining a wide variety of oil and gas facilities. These facilities may include production plants, pumping and compressor stations, pipelines, storage facilities, tanks and reservoirs, oil and gas well sites, offshore drilling and production rigs and oil sands surface mining sites. |

| Environment | Key job activities |
|---|---|
| Office only | **Entry level**<br>• Conduct materials sampling and laboratory testing, including solids, soil compaction, asphalt, concrete, rock and aggregate.<br>• Undertake geotechnical field work including test pit and borehole site investigations.<br>• Review survey returns for completeness and accuracy.<br>• Perform calculations in accordance with applicable design codes and engineering practices.<br>**More advanced**<br>• Support project management activities related to construction, commissioning, operations and process optimization.<br>• Coordinate all services required for fully functioning project sites, field facilities and camp facilities.<br>• Complete computer-assisted designed and drafted (CADD) plans or maps for land acquisition, third-party approvals or as-built records.<br>• Inspect completed work, constructions sites and materials to ensure quality is maintained in accordance with contract specifications and relevant safety codes. |
| **Education level** | |
| Post-secondary diploma | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Utilities<br>• Waste management and remediation services | |

### Instrumentation Engineering Technologist

| Job category | Job description |
|---|---|
| Technicians and Technologists | Design, adapt, install, maintain and repair electrical control and instrumentation systems. Operate and maintain electrical and electronic equipment and systems. Work with engineers and others to design, specify, size and select measurement and control systems. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors | • Provide expertise in the evaluation, selection and installation of new instrumentation and analytical equipment.<br>• Recommend and implement modifications to improve measurement and control systems.<br>• Perform or arrange for the required maintenance, calibration and repair of analytical equipment, instrumentation, controls and their associated systems.<br>• Manage preventative maintenance and calibration programs.<br>• Repair or replace defective or worn electrical, electronic or instrument parts.<br>• Design, develop and test power equipment and systems, industrial process control systems, telecommunication, broadcast, recording and audiovisual systems, micro-electronic systems and circuits, computers, computer systems and networks and computer software. |
| **Education level** | |
| Post-secondary diploma | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Utilities<br>• Transportation and warehousing | |

## Operators/Trades

### Control Centre Operator

| Job category | Job description |
|---|---|
| Operators | Responsible for the safe and reliable operation of oil and gas processing plants and pipelines—this includes monitoring and controlling pipeline unit operation and processing remotely from within the plant or from a centralized control room. |
| **Environment** | **Key job activities** |
| Office only | • Use a highly computerized supervisory control and data acquisition (SCADA) system to control and monitor pipeline flow rates, system pressures, temperatures, product quality deviations, pressure loses, product blending and batch logistics.<br>• Respond to alarm conditions as they arise, including initiating frontline emergency response measures.<br>• Provide system-wide requirement daily forecasts and adjust to differences between forecasted and actual product volumes.<br>• Remotely operate the mainline and booster pumping stations along the pipeline.<br>• Communicate with pipeline field operations personnel to ensure safe and efficient operations.<br>• Signal other workers by telephone or radio to operate pumps, open and close valves and check temperatures. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Manufacturing<br>• Mining and quarrying<br>• Public administration<br>• Utilities | |

## Power Engineering Technologist and Stationary Steam Engineer

| Job category | Job description |
|---|---|
| Trades | Operate and maintain reactors, steam and gas turbines, boilers, generators, stationary gas and diesel internal combustion engines, and auxiliary equipment or controls to generate electrical power. The oil and gas industry runs on power, and power engineers (also known as stationary engineers or steam engineers) know how to create energy by harnessing steam created from operations. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors<br><br>**Education level**<br><br>High school<br><br>**Related industries**<br><br>• Manufacturing<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Utilities | • Understand the safety, environmental and regulatory responsibilities that go along with the job, such as hazard identification, equipment lock out and emergency response procedures.<br>• Monitor the levels of boiler water, chemicals and fuel, and make adjustments to maintain the required levels.<br>• Analyze problems and take the appropriate action to ensure the continuous and reliable operation of equipment and systems.<br>• Operate stationary engines, boilers and auxiliary equipment, such as pumps and compressors, to supply and maintain steam or heat for buildings, marine vessels or pneumatic tools.<br>• Test or coordinate boiler water quality testing and take necessary corrective action, such as adding chemicals to prevent corrosion and harmful deposits. |

## Boilermaker

| Job category | Job description |
|---|---|
| Trades | Construct, assemble, test, maintain and repair boilers, tanks, LNG processing trains and other large containers that hold liquids and gases. |
| **Environment** | **Key job activities** |
| Outdoors only<br><br>**Education level**<br><br>High school<br><br>**Related industries**<br><br>• Manufacturing<br>• Construction | • Examine boilers, pressure vessels, tanks or vats to locate defects, such as leaks, weak spots or defective sections so that they can be repaired.<br>• Install manholes, handholes, taps, tubes, valves gauges or feedwater connections in drums of water tube boilers.<br>• Bolt or arc welding pressure vessel structures and parts together using wrenches or welding equipment.<br>• Position, align and secure structural parts or related assemblies to boiler frames, tanks or vats of pressure vessels following blueprints.<br>• Shape or fabricate parts, such as stacks, uptakes or chutes, to adapt pressure vessels, heat exchangers or piping to premises using heavy-metalworking machines such as brakes, rolls or drill presses.<br>• Repair or replace defective vessel parts, such as safety valves or regulators, using torches, jacks, caulking hammers, power saws, threading dies, welding equipment or metalworking machinery. |

## Industrial Electrician

| Job category | Job description |
|---|---|
| Trades | Install, maintain, test, troubleshoot and repair industrial electrical devices and equipment in a variety of operations and facilities. Also plan and lay out electrical systems based on technical specifications and drawings and interact with equipment operators to detect faulty equipment issues and with clients to plan electrical layout systems. |
| **Environment** | **Key job activities** |
| Indoors primarily, with occasional outdoors | • Apply safe electrical practices.<br>• Inspect industrial equipment components for accurate assembly and installation or for defects, such as loose connections or frayed wires.<br>• Maintain, repair and install switchgear, transformers, switchboard meters, regulators and reactors, motor starters, contactors and other electrical components.<br>• Repair or adjust equipment, machines or defective components and replace worn parts, such as gaskets or seals in watertight electrical equipment.<br>• Examine, replace or repair electrical wiring, receptacles, switch boxes, conduits, feeders, fiber-optic and coaxial cable assemblies, lighting fixtures and other electrical components.<br>• Consult with customers, supervisors or engineers to plan the layout of equipment or to resolve problems in system operation or maintenance. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Agriculture, forestry, fishing and hunting<br>• Construction<br>• Mining and quarrying<br>• Professional, scientific and technical services<br>• Public administration<br>• Transportation and warehousing | |

## Ironworker

| Job category | Job description |
|---|---|
| Trades | **Generalist ironworkers** live on the edge, working at the highest points of structural ironwork. They hoist, bolt, fasten, cut, bend, weld and erect components for giant storage tanks, towers and other oil and gas structures.<br><br>**Reinforcing ironworkers** reinforce the structural integrity at the very foundation of a building or plant. They cut, bend, lay out, install and weld rebar and wire fabric to increase the tension of structures. |
| **Environment** | **Key job activities** |
| Outdoors only | • Examine structures and equipment for deterioration, defects and non-compliance with specifications.<br>• Hoist steel beams, girders and columns into place using cranes or signal hoisting equipment operators to lift and position structural steel members.<br>• Cut, bend and weld steel pieces using metal shears, torches and welding equipment.<br>• Erect metal and precast concrete components for structures, such as buildings, bridges, dams, towers, storage tanks, fences and highway guard rails.<br>• Schedule work and activities. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Construction | |

## Millwright and Industrial Mechanic

| Job category | Job description |
|---|---|
| Trades | Install, maintain, troubleshoot, overhaul and repair stationary industrial machinery and mechanical equipment. Work on new or maintenance projects at manufacturing, processing and production facilities or on construction sites and have a mindset for troubleshooting and repair to keep facilities and equipment running. |
| **Environment** | **Key job activities** |
| Outdoors only | • Examine parts for defects, such as breakage or excessive wear.<br>• Assemble and install equipment using hand tools and power tools.<br>• Reassemble equipment after inspection, testing and repair completion.<br>• Cut and weld metal to repair broken metal parts, fabricate new parts and assemble new equipment.<br>• Repair or maintain the operating condition of industrial production and processing machinery or equipment. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Utilities | |

## Steamfitter, Pipefitter and Sprinkler System Installer

| Job category | Job description |
|---|---|
| Trades | Maintain and repair storage vessels, pipes and spools for piping or sprinkler systems and build and maintain piping systems used to produce or transport oil and gas. This includes piping system layout, assembly, fabrication, maintenance and repair. |
| **Environment** | **Key job activities** |
| Indoors with occasional outdoors | • Read and interpret drawings, blueprints and specifications to plan the layout requirements and cut openings for pipes in walls, floors and ceilings using power tools or machines.<br>• Select the correct pipe sizes and types required to shape, weld, braze, cement, solder and thread joints to join pipes and fabricate sections of piping systems.<br>• Cut, thread and hammer pipes to specifications using tools such as saws, cutting torches, pipe threaders or pipe benders.<br>• Assemble and secure pipes, tubes, fittings or related equipment according to specifications by welding, brazing, cementing, soldering or threading joints.<br>• Inspect, examine and test installed systems or pipelines using pressure gauges, hydrostatic testing, observation or other methods. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Construction | |

## Welder

| Job category | Job description |
|---|---|
| Trades | Work with tools such as blow torches and hand-welding and flame-cutting equipment to fuse metal parts together or fill holes, indentations or seams of fabricated metal products – a vital function when it comes to oil and gas-related construction, operations or maintenance projects. Use advanced digital tools for high precision work. |
| **Environment** | **Key job activities** |
| Outdoors only | • Analyze engineering drawings, blueprints, specifications, sketches, work orders and material safety data sheets to plan layout, assembly and welding operations.<br>• Operate manual or semi-automatic flame-cutting equipment, brazing and soldering equipment.<br>• Operate metal shaping, straightening and bending machines, such as brakes and shears.<br>• Select and install torches, torch tips filler rods and flux, according to welding chart specifications or types and thicknesses of metals.<br>• Set up and operate hand and power tools common to the welding trade, such as shielded metal arc and gas metal arc welding equipment.<br>• Ensure compliance to established safety protocols – safety is a significant part of the job, as working with heat and open flames can present hazards. |
| **Education level** | |
| High school | |
| **Related industries** | |
| • Construction<br>• Manufacturing<br>• Mining and quarrying<br>• Utilities | |

# RESOURCES FOR MORE INFORMATION

Looking for more information on the LNG industry in Canada, the opportunities available, education and training requirements, or more information about the oil and gas industry in general? These resources can help.

**For information on LNG projects in Canada, including job openings:**

- Kitimat LNG (British Columbia)
- LNG Canada (British Columbia)
- Woodfibre LNG (British Columbia)
- Énergie Saguenay LNG (Quebec)
- Goldboro LNG (Nova Scotia)

**For information on occupations, or to take a self-assessment:**

- Careers in Oil + Gas – Career Explorer

**For general industry information:**

- BC LNG Alliance
- Canada Energy Regulator
- Canadian Association of Geophysical Contractors
- Canadian Association of Oilwell Drilling Contractors
- Canadian Association of Petroleum Producers
- Canadian Energy Pipeline Association
- Canadian Energy Research Institute
- Canadian Society for Unconventional Resources
- Explorers and Producers Association of Canada
- Natural Resources Canada
- PetroLMI
- Resource Works

**For social sharing and engagement:**

- @CanadaAction
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- @Energy_Citizens
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## Disclaimer



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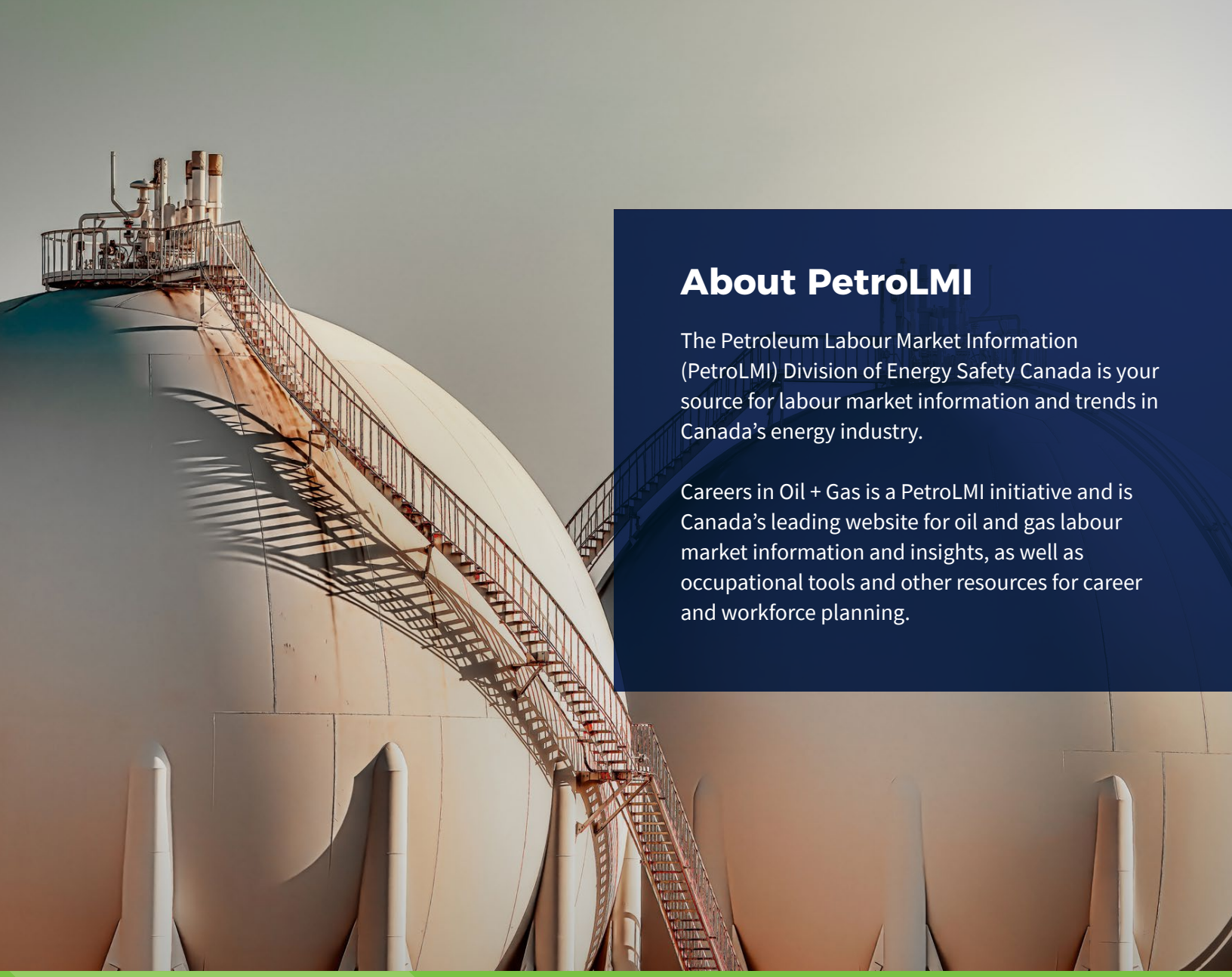

## About PetroLMI

The Petroleum Labour Market Information (PetroLMI) Division of Energy Safety Canada is your source for labour market information and trends in Canada's energy industry.

Careers in Oil + Gas is a PetroLMI initiative and is Canada's leading website for oil and gas labour market information and insights, as well as occupational tools and other resources for career and workforce planning.

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