

A WORKFORCE IN TRANSITION:
OIL AND GAS
SKILLS OF THE FUTURE





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FOREWORD

It has been three years since PetroLMI released its study *Shifting Priorities and a Shifting Workforce*,¹ a close look at the impact industry-wide trends were having on the makeup of Canada's oil and gas industry workforce.

Since then, the industry has undergone one of the most difficult downturns in its history, experiencing a restructuring that saw a 25% reduction of the workforce. In addition, many of the occupations and skills previously required to support the exploration, development and production of Canada's oil and gas resources have changed or have been eliminated.

In *Shifting Priorities and a Shifting Workforce* PetroLMI examined three trends: new technologies that were unlocking hard-to-reach, technically complex

unconventional resources; the focus on cost-management strategies to improve financial returns and productivity; and, the need to diversify into new and expanded markets. Fast forward to today and these trends have not only intensified, but add to those new government regulations, a rush towards adoption of automation and data analytics technologies and the standardization and advancement of manufacturing processes in the development of the nation's resources. The result is a change of pace unlike the industry has seen before.

¹ https://careers-oil-gas.s3.amazonaws.com/publications/8/en/shifting_workforce_report.pdf

In the following report, *A Workforce in Transition: Oil and Gas Skills of the Future* we look at these three significant developments that will shift skills and occupations.

Following the election in 2015, the federal government began the process of renewing the regulatory framework which governs how major resource projects are approved in order to balance economic growth with environmental sustainability. The new framework gives the general public greater say in how the country's resources are developed. Indigenous communities also have more involvement at the planning stage of a project, and an opportunity for more economic benefits from the full life cycle of a project.

With all of this additional change comes challenges and opportunities for Canadians working in the oil and gas industry and for those who are looking to become part of it.

The federal and most provincial and territorial governments also agreed on the Pan-Canadian Framework on Clean Growth and Climate Change² designed to reduce carbon dioxide and methane emissions. A number of provinces, including Alberta, have instituted a carbon tax regime as part of that effort.

Secondly, with digital technologies such as automation and data analytics evolving and proving out in other sectors of the economy, Canada's oil and gas industry is quickly adopting these technologies to improve productivity, safety and profitability.

Lastly, oil and gas producers and operators are also importing best-in-class processes from the manufacturing industry in an effort to standardize and streamline production, to further reduce costs and increase profitability.

With all of this additional change comes challenges and opportunities for Canadians working in the oil and gas industry and for those who are looking to become part of it. This report examines just that – where the opportunities lie for the creation of new and interesting careers and those occupations that will be on the decline, if not eliminated.

We believe many of the new or emerging job opportunities will be appealing to workers who are seeking challenging, technology-driven occupations, such as directing automated rig equipment, mapping paths for autonomous trucks or managing large amounts of technical data. More workers will be required to support energy diversification and efficiencies, designing and building wind or solar installations. Meanwhile, strong communications and stakeholder relations skills will be essential whether consulting with the public or working with Indigenous partners to create economic development plans.

The result of all of these changes is the oil and gas industry will need to not only adapt the way it conducts its business, but also who it employs.

Carol Howes

Vice President, Communications and PetroLMI ,
Energy Safety Canada

² <https://www.canada.ca/content/dam/themes/environment/documents/weather1/20170125-en.pdf>



INTRODUCTION

This report examines the impact of key trends on Canada's oil and gas industry and provides an in-depth analysis of how these trends will affect the industry's workforce.

The following three trends were identified as those impacting shifts in workforce requirements, occupations and skills over the next three to five years:

- **Regulatory changes driven by the federal and provincial governments**
- **Implementation of automation and data analytics technologies**
- **Application of manufacturing processes on the development of resources**

The insights provided in this report result from interviews with 16 industry leaders from private companies and

trade associations representing the exploration and production (E&P)², oil sands, oil and gas services, pipeline and midstream sectors. These insights are backed by extensive secondary research on key proposed and enacted federal and provincial legislation, automation and data analytics in the Canadian labour market in general and specifically in the oil and gas sector, and adoption of new operating standards in the industry.

The research gathered will inform workforce planning, career decisions and education and training requirements. In addition, this research will be used in the development of upcoming PetrolMI labour market forecasting and the development of career planning tools and information.

² Exploration and production of oil and gas for onshore and offshore conventional and unconventional reserves except oil sands.

CHANGING REGULATIONS

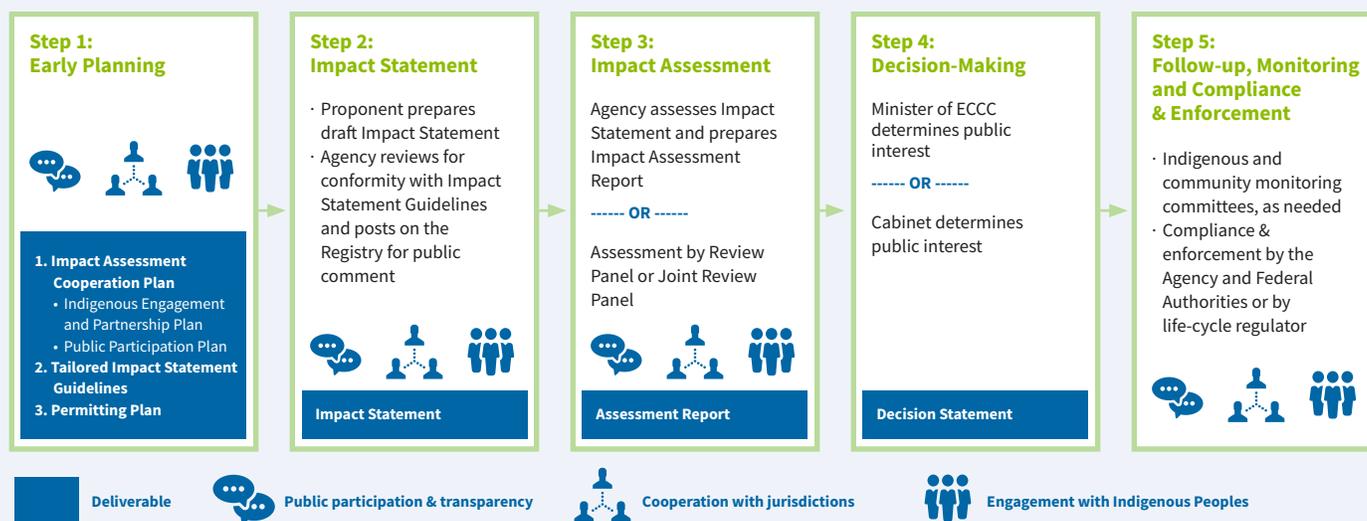
Canada’s oil and gas industry is adapting to a number of regulatory changes proposed in the last three years as governments respond to public concerns about the environmental and social impacts of resource development.

- The federal government launched a restructuring of the regulatory framework³ governing major project approvals and in February 2018 introduced the Impact Assessment Act (IAA)⁴ and the proposed Impact Assessment Agency of Canada to conduct and co-ordinate impact assessments for designated projects.⁵ This process includes a new, early planning phase with expanded Indigenous and public input on the project and the impact assessment. It requires a review not only of environmental impacts but potential changes in health, social and economic conditions should the project proceed.
- As part of a new Climate Strategy, the federal government and almost all of the provincial and territorial governments agreed to the Pan-Canadian Framework on Clean Growth and Climate Change to address issues surrounding climate change, including a tax regime on carbon dioxide emissions through the 2018-2023 time period.
- Methane emission reductions were also targeted by new federal and provincial regulations, with a goal of reaching a 45% reduction in emissions by 2025.

The following outlines the impacts of these regulatory changes on the workforce in Canada’s oil and gas industry and more specifically its sub-sectors.

How does the new review process work?

*Regional and strategic assessments would be proactively conducted outside of individual project reviews. This will help inform project assessments, manage cumulative impacts and support decision-making.



SOURCE: GOVERNMENT OF CANADA

³ <https://www.canada.ca/content/dam/themes/environment/conservation/environmental-reviews/ia-handbook-e.pdf>

⁴ <https://www.canada.ca/en/services/environment/conservation/assessments/environmental-reviews/environmental-assessment-processes.html>

⁵ Major projects that have potential for significant adverse environmental effects in areas of federal jurisdiction are called designated projects and require federal review.

Impacts of the IAA

The implementation of the IAA will have an effect on the skills required and the roles created in all sub-sectors of Canada's oil and gas industry.

Increased need for public and Indigenous consultation in the project planning stage is expected to generate much more demand for communication skills and the ability to curate large amounts of information gathered during the consultation process.

The new review process also has a requirement to include Indigenous traditional knowledge early in project planning, so that will require those with expertise in traditional land use practices, decision-making processes and areas of cultural significance.

Requirements to assess and mitigate the health and socio-economic impacts of proposed projects, along with environmental impacts, will also generate a number of new or expanded roles, including public health specialists, economic development specialists, sociologists, biologists and other natural science professionals.

“With these new regulations and the need for compliance, we’re going to need expertise on water technology, wildlife like caribou, and on entire ecosystems.”

**Gary Leach,
President, Explorers & Producers
Association of Canada**



Pipeline and midstream

With pipelines often covering hundreds and even thousands of kilometres across the country, broader consultation with the

public and Indigenous communities will greatly increase the need for workers with strong communication and data gathering skills, as well as the ability to identify and address key issues.

Identifying and addressing any health and socio-economic issues along pipeline routes will require experts in economic development to help communities build capacity in order to take part in business and work opportunities; social scientists to identify and mitigate any negative community impacts; and, public health professionals.

More effective emergency response planning and spill response and remediation will result in an additional need for biologists and natural science professionals to help develop plans for ecosystems along these pipeline routes.



Exploration and production and oil sands

While E&P and oil sands companies tend to operate more locally than the national reach of pipelines,

the implementation of the IAA will have similar impacts on this sub-sector, increasing demand for communication skills as the public consultation process is expanded, and for those who can identify and address Indigenous rights issues, along with socio-economic and environmental impacts.



Oil and gas services

Oil and gas service companies don't generally own production, processing or distribution assets, so the implementation of the

IAA will have a limited impact on this sub-sector's workforce, with two significant exceptions. Because service companies tend to do the fieldwork in the oil and gas industry, regulations requiring greater Indigenous participation will create additional occupations and potentially entire company departments dedicated to ensuring that participation. Occupations to enforce compliance and contracted obligations for more public participation in these projects will also arise.

Impacts of the new Climate Strategy

The new Climate Strategy's focus on a carbon tax regime and methane emission reduction goals of 45% by 2025 is also expected to create demand for broader skills and new occupations.



Exploration and production

Most large E&P companies already have the structures in place to measure and monitor carbon emissions. But, efforts to eliminate

emissions where it is financially advantageous to do so will increase and with them new opportunities for engineers and technologists to implement emission reduction technologies.

Likewise, the new methane emissions rules will create new roles and expanded skill requirements for measurement, mitigation and reporting.



Oil sands

In the oil sands sub-sector companies expect to see an increase in requirement for expertise and knowledge of how to navigate compliance standards.

Oil sands operators will also be looking for engineered solutions to reduce and eliminate emissions, creating new opportunities for engineers with the right skills.



Oil and gas services

For oil and gas service companies, methane emission reduction regulations will create new opportunities in measuring,

mitigating and monitoring these emissions. Methane leak detection will become a new occupation.

With more electrification of the oil and gas industry expected and service companies diversifying into the power market, this will require additional skills in battery technology, or jobs designing and building wind or solar installations.



Pipeline and midstream

New occupations in leak detection, methane monitoring and mitigation, and regulatory compliance are all expected to be added in the pipeline

sector. Pipeline operators may also look to replace natural gas power at facilities such as compressor stations with sources of renewable energy such as wind or solar. This will create new opportunities to install and maintain the new sources of energy.

New regulations could create workforce challenges

A combination of these new regulations and government policy changes have the potential to create uncertainty among investors and may impact capital investment in Canada's oil and gas industry, resulting in a reduction in a range of roles particularly those in engineering, procurement, fabrication and construction. Many highly skilled professionals, including engineers and technical specialists, such as fabricators, (where there is high international demand for their services) could be at risk of leaving the Canadian workforce to seek employment elsewhere.

Likewise, the new climate change framework and efforts to reduce carbon dioxide and methane emissions are expected to impact the existing labour force as cash flows traditionally spent on capital projects are diverted to emissions management.

In summary, however, the new regulations will bring a growing demand for broader skills and new occupations that address and measure emissions, apply technologies to help reduce emissions, monitor emissions and help to prove compliance to regulators.

Where do methane emissions come from in the natural gas supply chain?

Natural gas production & processing

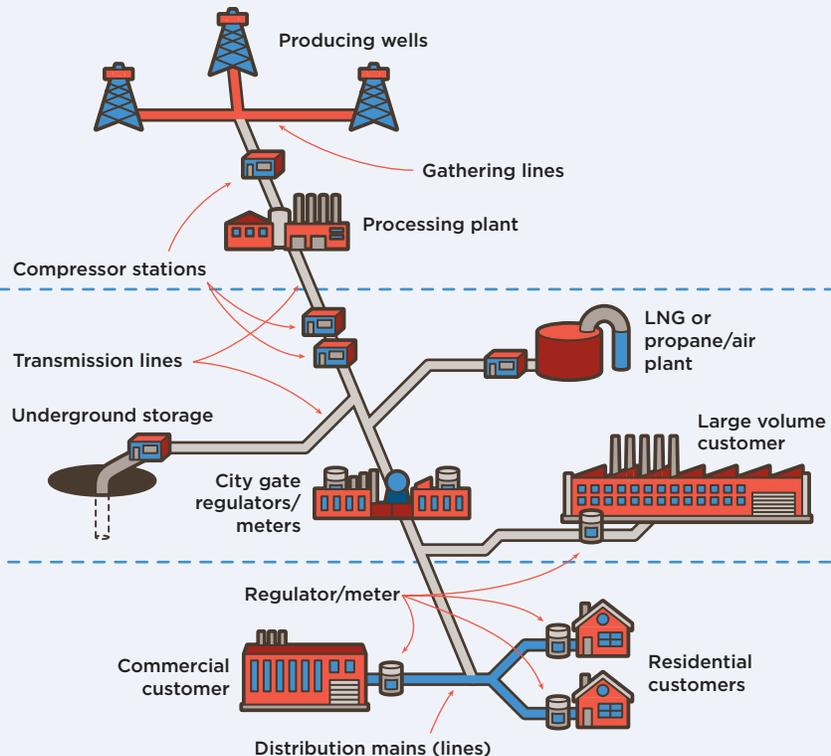
- Well completions, blowdowns and workovers
- Reciprocating compressor rod packing
- Processing plant leaks
- Gas-driven pneumatic devices
- Venting from glycol reboilers on dehydrators

Gas transmission

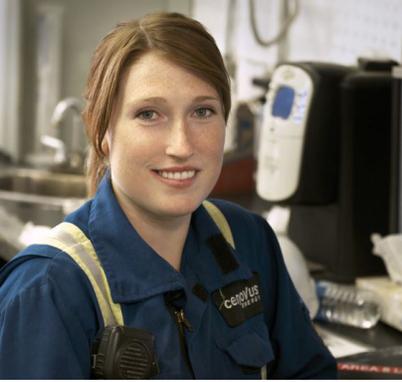
- Venting of gas for maintenance or repair of pipelines or compressors
- Centrifugal compressor seal oil degassing
- Leaks from pipelines, compressor stations

Gas distribution

- Leaks from unprotected steel mains and service lines
- Leaks at metering and regulating stations
- Pipeline blowdowns



SOURCE: ICF INTERNATIONAL



IAA

Impacts of the new regulations on occupations and skills:

- Increased need for stakeholder communications, consultation and data collection.
- Expertise in Indigenous traditional ecology, such as land and resource use, political process and heritage sites.
- Expertise in helping Indigenous communities create economic development plans and building business and workforce skills.
- Increased need for natural science professionals such as biologists and related technologists.
- Expertise in managing safety systems, safety communications and emergency response.
- Expertise in compliance and regulations.
- New and expanded measurement, mitigation and reporting occupations.
- Skills required for renewable energy installation and operations.
- Knowledge of electrical regulations and power grid expertise.
- Skills related to carbon and methane mitigation.

New Climate Strategy

Alberta government programs to spur activity

Alberta government programs will create demand for workers over the next three to five years. The Alberta Energy Diversification Act (EDA)⁶ is providing up to \$2 billion in tax credits to encourage construction of new petrochemical facilities and facilities to capture natural gas liquids, for the manufacturing of petrochemical feedstock, such as ethane, methane and butane.

While the implementation of the EDA will not require any new skills or occupations, the legislation is expected to support an estimated 8,000 construction jobs and hundreds of jobs in operations.

The Alberta government is also loaning the Orphan Well Association⁷ \$235 million to speed up the abandonment and reclamation of the province's orphan wells and sites, those that are left with no one to pay for clean-up, often due to bankruptcy.

This effort will increase demand for service rig personnel, well cementing and environmental services.

⁶ <https://www.alberta.ca/energy-diversification-act.aspx>

⁷ <http://www.orphanwell.ca/>

AUTOMATION AND DATA ANALYTICS

Similar to many other industries facing intense competition in the global market, Canada's oil and gas industry is looking to automation and the use of data analytics to improve operations and decision-making and to increase its productivity and profitability.

The use of automation technologies is already widespread. It touches all sub-sectors of the industry.

To date, automation efforts have largely supported workers to be safer and more efficient rather than eliminating jobs. It's expected this trend will only continue as more mundane, repetitive tasks are automated, freeing up workers to focus on higher value tasks.

As a greater number of tasks are automated across the industry, Canada's oil and gas workforce will need to be digitally literate along with having the more traditional mechanical aptitude expected in the industry. It will also need to be more innovative, creative and willing to look for potential productivity improvements as automation takes over these tasks.

As more and more equipment becomes connected, security concerns will also increase, creating demand for digital security specialists to protect data and processes. Meanwhile, the digitization of oil and gas field equipment will increase demand for information technology and instrumentation technologists to install, maintain and upgrade systems in the field.

The greatest gains in productivity for Canada's oil and gas industry will come from using data analytics to sort the massive amounts of information from connected field and office systems and identify opportunities for improvements. IT technologists and technicians will be required to inspect, clean and transform data. There will be skills in demand to model data along with industry knowledge to apply what is learned.

While data scientists are not new to the oil and gas industry, their role will increase considerably in the next three to five years as analytics are applied to a greater variety of data streams to improve the industry's productivity.

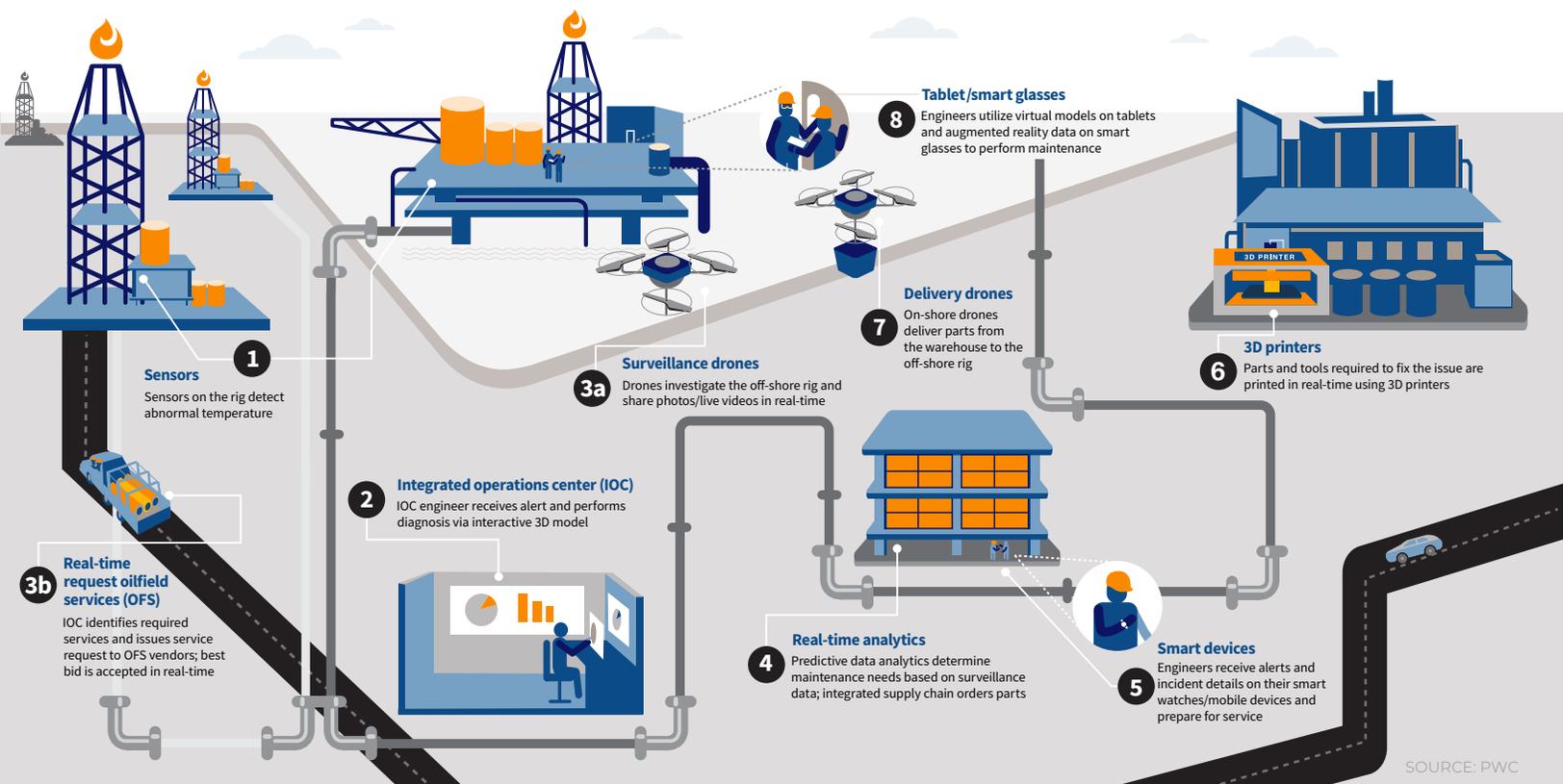
That said, not all oil and gas companies will be impacted the same way by the adoption of automation and data analytics. The low commodity price environment of the last few years stressed the financial ability of many companies to invest in digital technologies. Companies also require a certain scale to benefit from the use of automation and data analytics.

The digitization of the oilfield is having a significant impact on the oil and gas industry. Directional drilling and downhole measurements are being automated, reducing workers during drilling operations.

Data analytics are already being used to inform decision-making on the placement of wells and completions strategies. As sensors become attached to more and more equipment, data will be applied to more processes in finer detail with further improvements in productivity of machinery and equipment.

Over the next three to five years, artificial intelligence and machine learning technology will likely be applied to data analytics to replace specific industry knowledge possessed by individuals in sophisticated occupations. Rather than aiding in decision-making, increasingly machines will make their own decisions based on a huge number of data points.

Digitizing the future oil field



How does the oil and gas industry use automation and data analytics?

1

Remote Asset Monitoring

Collecting and analyzing sensor data related to flow, temperature, vibration and integrity to improve operational safety and performance-related decisions (e.g., downhole drilling sensors).

2

Remote Asset Operations

Developing systems to operate plants and facilities from a remote location. The intent is to reduce the on-site complement of staff, thereby increasing operating efficiency and personnel safety (e.g., off site plant control centres).

3

Predictive Maintenance

Utilizing predictive data analytics and condition-based maintenance approaches to improve asset availability and reliability (e.g., predictive maintenance of electric submersible pumps, mining truck tire failure).

4

Production Asset Optimization

Utilizing specialized sensors to monitor and data analytics to identify improvements in complex operations (e.g., Steam-assisted Gravity Drainage or SAGD steam/production optimization, optimization of field operations activity).

5

Remote Asset Inspection

Employing remotely controlled devices that use imaging (video, Infrared or IR, X-ray) and other sensors to complete inspection and detection tasks more efficiently and safely (e.g., pipeline inspection drones).

6

Automated Production Asset Operations

Installing robots or other automated equipment to perform operating, assembly and maintenance tasks in 24/7 continuous and safety-critical operating environments. Machine intelligence allows the equipment to sense conditions in their local environment, recognize and solve basic problems (e.g., self-driving mining trucks).

7

Fleet Management

Obtaining real-time data—through the use of wireless networks, sensors and video analytics—from on board sensors to improve asset identification, tracking, utilization and logistics operations (e.g., vehicle telematics, Global Positioning System or GPS tracking).

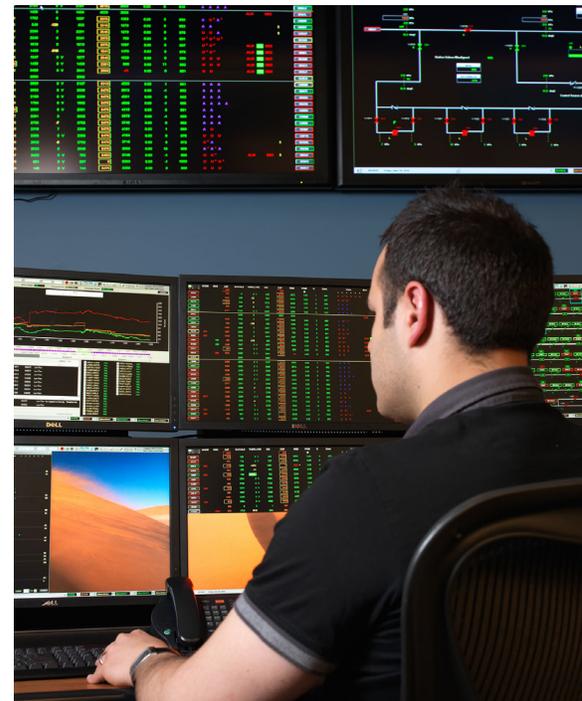
8

Field Productivity

Maximizing worker efficiency by providing wireless mobility that enables on-demand access to field data, engineering drawings and inventory and communication with centralized operations experts (e.g., field tablets).

“The expertise that will be required will predominately come from science or engineering trained individuals with excellent computer and analytic skills. These individuals will be required to analyze large amounts of raw data using specialized software that transforms, organizes and models the data in order to draw conclusions and support decision-making.”

David Humphreys,
Vice President of Operations,
Birchcliff Energy





Exploration and production

In the E&P sub-sector automation of repetitive manual tasks is expected to only increase along with automation of low-level cognitive tasks. While

automation is still largely seen as a way to support workers in this sub-sector do their jobs better more low-level administrative jobs could be completely automated within the next five years.

Data analytics are expected to have the greatest potential to cut costs and improve a company's profitability. Companies are expected to increase their workforce of data scientists as analytics are applied to more areas of their operations. The role of technologists who manage the data will also increase.



Oil sands

Mining operations in the oil sands is one area where automation will reduce the workforce. Driverless automated heavy haulers are now

in operation at Suncor⁸ and are expected to be rolled out to other operations over the next three to five years. The rollout could result in thousands of job losses among heavy equipment operators. Automation will create more demand for heavy equipment operators trained with graders or instrumentation technicians, as driverless vehicles need to be maintained, repaired and updated on a regular basis.



Oil and gas services

The automation of oil and gas services processes and the introduction of data analytics are in early stages of adoption in the oil and gas services sector.

However, it is already rapidly increasing productivity in this sub-sector, allowing more work to be accomplished

with less equipment and fewer workers. For example, the number of active rigs has declined in recent years with the drop in oil prices by about one-third, but production has continued to increase.

Increasing use of automation means workers will continue to need mechanical skills to install or operate equipment, but they will also need to understand and be able to operate the newer electronic systems that are part of the machinery and equipment.

New occupations focused on installing, servicing and updating automated systems on mobile machinery such as drilling rigs and hydraulic fracturing equipment are already emerging as these systems come into wider use.

Skills in interpreting data and using the information to improve oil and gas service processes will be needed as more data analytics delivers actionable information back from the field.



Pipeline and midstream

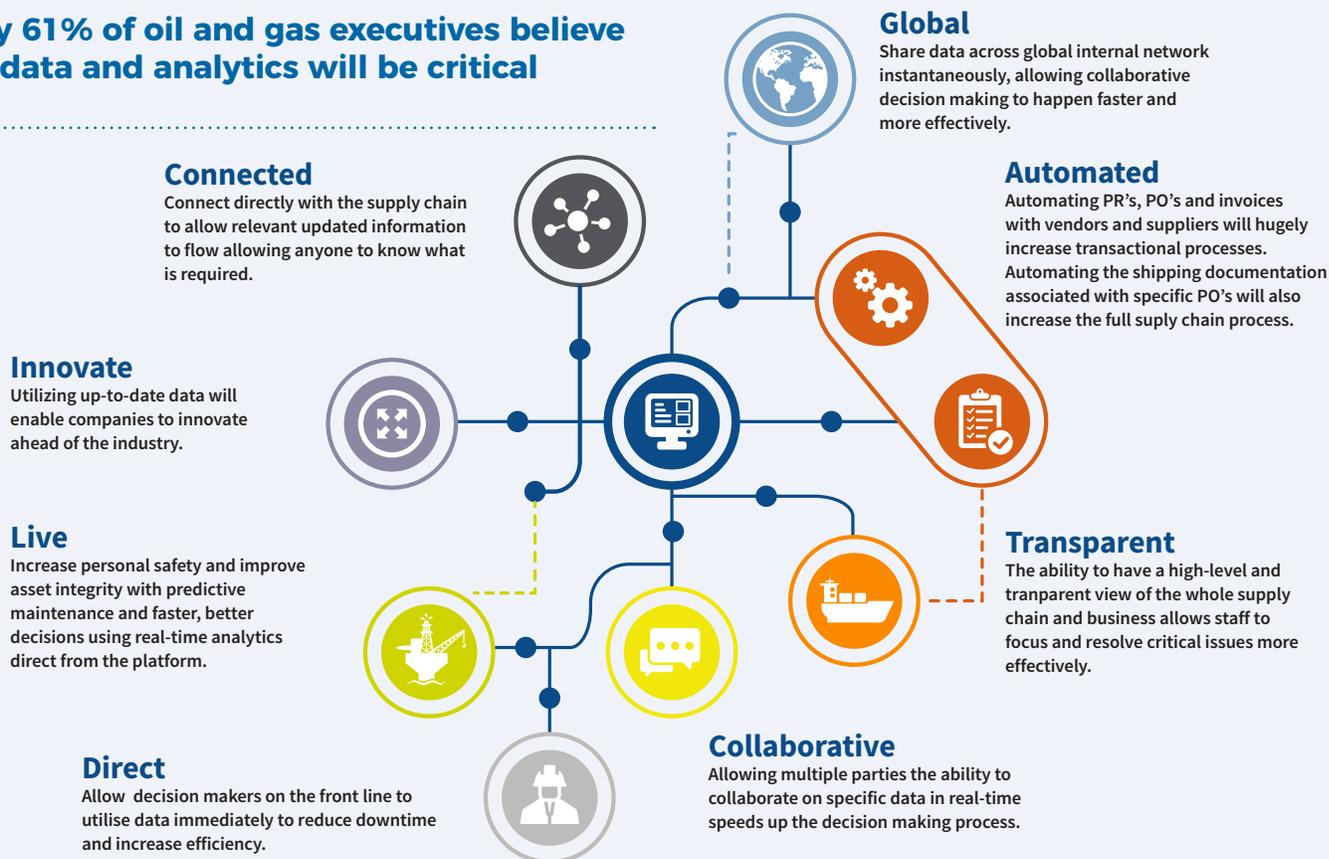
The pipeline and midstream sub-sectors have been early adopters of automation technologies to improve both the safety and efficiency of their operations.

Additional skills in processing data and interpreting data being generated by the technologies will be needed, as will IT and instrumentation technologists to install and maintain the expanding array of sensors and other equipment.

New technologies including in-line pipeline inspection already generate large amounts of data for companies, providing more detailed and more fundamental information on the condition of pipelines. More data scientists will be needed to create systems to interpret this data, which in turn is used for better maintenance and operations and to ensure pipeline integrity.

⁸ <http://www.suncor.com/newsroom/news-releases/2173961>

Why 61% of oil and gas executives believe big data and analytics will be critical



SOURCE: LLOYDS Q&C TECH REPORT 2015

Impacts of automation and data analytics on occupations and skills

- Increased need to collect and analyze data and to build and maintain databases.
- Increased need for software engineers, data management and analytics specialists to measure operations in real-time.
- Increased need for instrumentation technologists as sensors are applied to more field equipment and machinery.
- Technological literacy skills for field workers in a digital environment.
- Increased need for technology-based competencies, creative problem-solving, and the ability to manage change to analyze data in real-time in the field, conduct course corrections and innovate.
- Increased need for IT support roles to support and maintain automated equipment.

APPLICATION OF THE MANUFACTURING PROCESS

As development of Canada's oil and natural gas resources mature, the oil and gas industry is applying manufacturing processes such as standardization and replication to create additional efficiencies, cut costs and improve productivity.

The supply chain of goods and services to support production and development from multiple wells from one well pad at many operations are being re-organized as part of this manufacturing model to streamline procurement and improve logistics. The goal for producers and service companies is to equip, drill and complete identical or similar multi-well pads repeatedly and implement improvements into future development.

A number of technologies have emerged, enabling the implementation of this manufacturing process. These include new generation drilling rigs that are capable of drilling extended reach horizontal wells. These new rigs are also highly automated, with automatic pipe handling systems and the capability to walk from well to well without having to be torn down, making the drilling of multi-well pads economic.

Improved directional drilling technologies allow for better placement of horizontal laterals, enabling multiple wells to better target resources.

Improved well completions technologies, meanwhile, allow for more stages of fracturing and greater fracturing intensity.

Oil and gas operators are also creating centralized water sourcing, recycling and disposal facilities.

The application of all of these technologies, combined with manufacturing processes, are having multiple effects on the skills required.

Increased efficiency and productivity from oil and gas wells means fewer wells are needed to maintain or grow production, but there are more services required at each individual well. Demand for workers in traditional services such as oilfield construction, rig moving, water hauling and well site maintenance is declining.

But with the increasing numbers of wells on one well pad construction planning expertise is needed to ensure there is optimal subsurface drainage and the correct siting and sequencing of surface operations.

Meanwhile, more expertise in logistics is required to ensure materials arrive at the correct time so operations are not delayed, or if materials need to be stored.

Logistical and project management skills will be in greater demand as multiple drilling, completions and facility construction occurs simultaneously on these well pads.



Exploration and production

As E&P companies bring more manufacturing processes into their developments, there will be further

standardization and replication of processes and equipment, reducing the amount of custom engineering and fabrication required.

Oil and gas operators are also increasingly assuming responsibility for procurement of services and materials as they standardize their operations. The role of the procurement specialist therefore, is becoming more sophisticated as E&P companies move from project-based procurement to creating supply chains covering multiple projects over a longer timeframe.



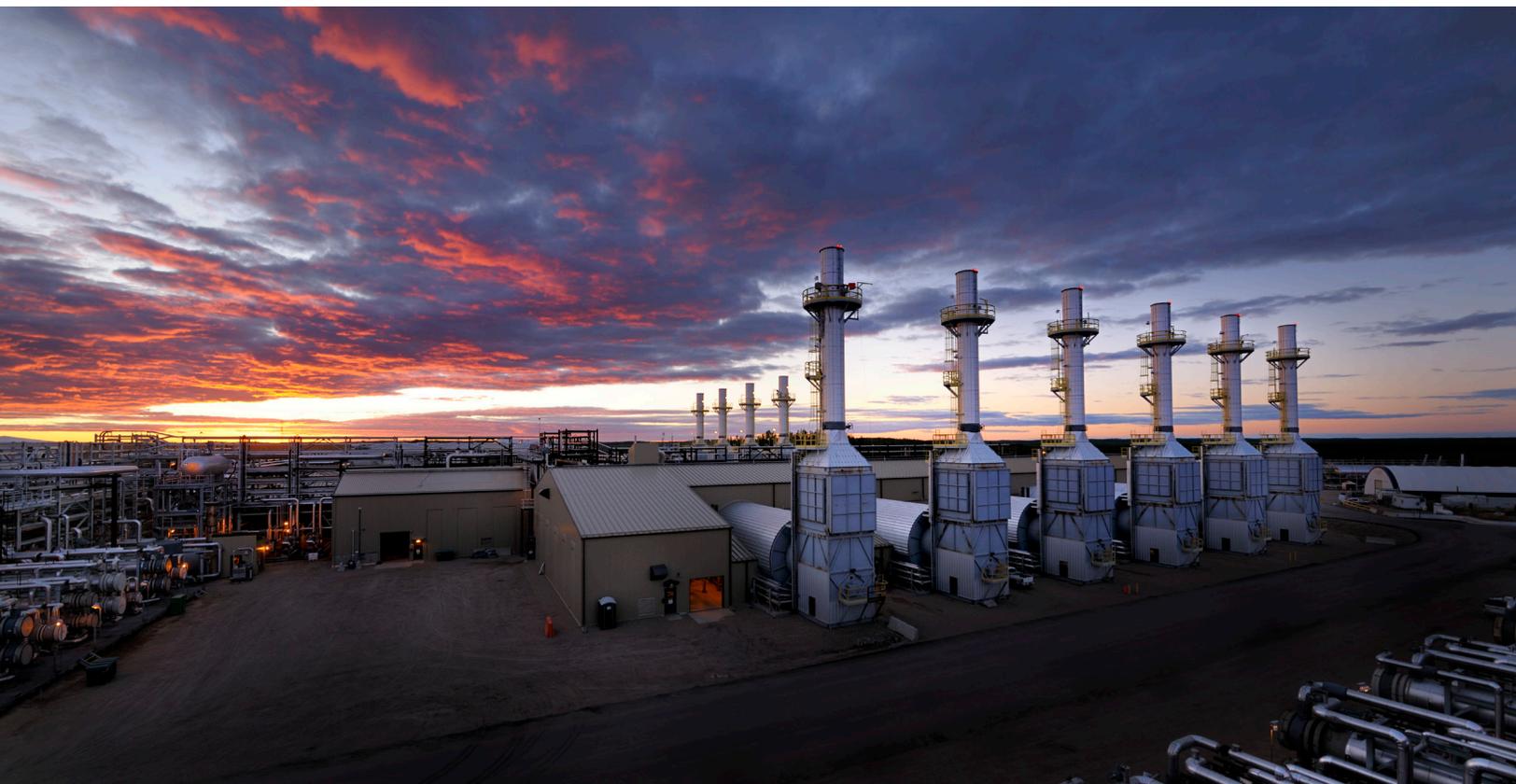
Oil and gas services

The implementation of the manufacturing process, along with the technological improvements

enabling it, are already shifting job skills and creating new occupational opportunities in the services sub-sector.

Work on construction access roads and well pads is declining as a multi-well pad with horizontal wells drains as much reservoir as 70 single vertical well pads would have done in the past.

Innovations such as walking rigs are limiting occupations supporting rig-moving activities. In the place of these traditional oil and gas services occupations, expanded skill sets are required in well construction planning, site planning, procurement and supply chain management.





Oil sands

Applying manufacturing processes to the construction of in situ oil sands facilities in Northern Alberta - whether to help sustain or increase production - is also already underway. These include standardizing designs, modularizing fabrication and replicating designs across multiple well pads, in an effort to cut capital costs.

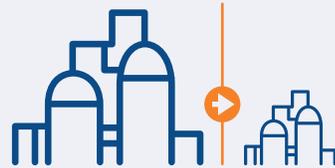
Modularization requires moving much of the construction of facilities from the field to offsite fabrication yards. While this is not new, a greater volume of equipment and technologies are being attached at the fabrication yard.

As fabrication moves offsite, the focus of workforce planning declines and is replaced by a need for more complex logistical and project management skills to ensure modules arrive in sequence onsite and on time.

Like other industry sub-sectors, the application of manufacturing processes to in situ oil sands development reduces demand for engineering services, custom fabrication services and onsite construction services.

Meanwhile, the role of procurement and supply chain management personnel is changing as oil sands operators move from sourcing services and materials on a project basis to longer-term relationships over multiple projects.

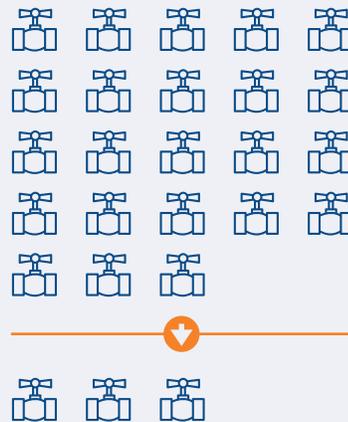
Potential benefits of using the next generation of in situ oil sands technologies



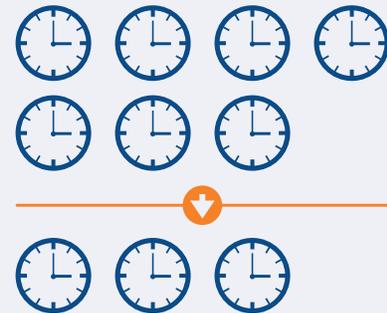
The facility footprint is about 45% smaller than existing thermal oil facilities.



About 15% less equipment is needed.



The number of valves on a well pad is cut to 30 from 230.



Construction would shrink from 7,000 to 3,000 hours.

SOURCE: SUNCOR ENERGY



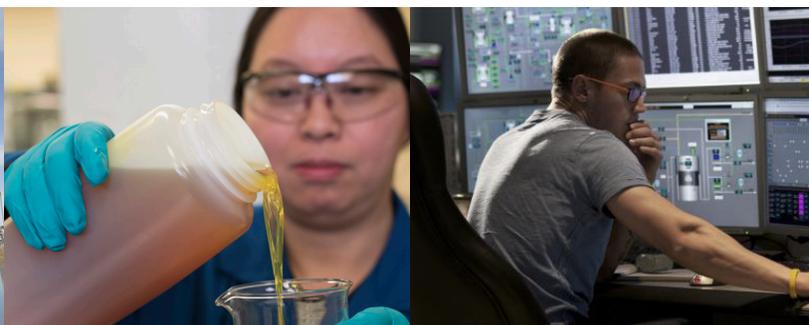
Pipeline and midstream

As oil and gas production increases, both the pipeline and midstream sub-sectors of the industry can expect increasing need for new transportation and processing infrastructure, creating demand for engineering construction and operational personnel. With a focus to bring expansion on in phases, it means the construction workers going forward can remain working continuously at the same site.

Midstream operators meanwhile are moving into more petrochemical feedstock production and into more export markets such as those based on propane. This is already generating a number of newly required skills and occupations in the marketing and sales of petrochemical products.

Impacts of the manufacturing process on occupations and skills

- Increased need for geotechnical, engineering and supply chain expertise.
- Expertise in well pad planning, operations sequencing, construction, materials handling and logistics to support more wells and equipment on well pads.
- Management and multitasking skills for drilling and completion engineers and other specialists to work on multiple projects concurrently, from a central location.
- Expertise in building water hubs with pipelines to well pads, water treatment and recycling facilities.
- Decreased need for engineers as facilities are replicated in multiple locations.
- With increased modularization, shifting work for electrical and instrumentation installations from remote areas into lower cost urban environments.
- Increased required skills in project management to manage the growing complexity of these projects.
- More negotiating skills for salespeople in the services sub-sector to match their customers' newer and more sophisticated supply chain and procurement systems.
- Increased need for service technicians, mechanics and other maintenance personnel to keep equipment functioning.



ON THE HORIZON

While this report focuses on three significant trends there are other emerging trends that may increase demand for specific skills and occupations in the industry. These include:

- **The global shift towards using natural gas for industrial and power applications**
- **Increasing global demand for feedstock for petrochemical production**
- **Developing technologies to decarbonize oil and gas production and processing**

A global shift towards using natural gas for industrial and power applications is expected to increase natural gas demand, creating a window of opportunity for LNG exports for Canada. Should a major project proceed in the next three to five years, constructing an LNG export facility and new pipelines to supply the facility will create opportunities for the engineering, procurement and construction workforce. One large two-train facility will create 5,240 construction jobs and a supply pipeline will create an additional 4,260 jobs.⁹ Requiring about three billion cubic feet of gas per day, a large export facility would also have a positive impact on the overall E&P and natural gas processing workforce.

With growing global demand for petrochemical feedstock opportunities on the horizon, increased production of natural gas liquids to feed the petrochemical industry or to export will also create more occupations in the sales and marketing of petrochemical products, chemical

intermediaries and natural gas liquids to export. Expertise in international business, currency trading, transportation and foreign languages would be required as exports increase.

An opportunity also looms for the decarbonizing of oil and gas production and processing. There are a number of emerging and start-up companies across Canada developing technologies to capture carbon dioxide and turn it into products such as fuels, chemicals and cement additives. Canada's oil and gas industry is already investing significant funds to move these projects forward. The global market for these carbon-based products is estimated to reach \$750 billion in the next decade and with that a number of new employment opportunities are likely to arise. As many of these new technologies become commercial, it will create work for the traditional engineering and construction sectors and new opportunities to sell, market and install these technologies in Canada and abroad. Similarly, expertise in areas such as international business, currency trading, transportation and foreign languages will be required.

“The driller of tomorrow will have tremendous leadership capabilities, and will be able to mentor, coach and motivate his crew.”

**Mark Scholz, President,
Canadian Association of Oilwell Drilling
Contractors**

⁹ https://careers-oil-gas.s3.amazonaws.com/publications/4/en/lng_report_final_online.pdf



CONCLUSION

Efforts to make Canada's oil and gas industry more environmentally sustainable and socially responsible, while remaining globally competitive, are changing skills and occupations across all of its sub-sectors.

Balancing economic growth with environmental sustainability is broadening the need for skills and occupations not traditionally considered oil and gas jobs. Increasing numbers of professionals in natural sciences and environmental services will find themselves working at production and pipeline companies as they answer environmental challenges. Indigenous knowledge is already being incorporated into environmental studies, creating a new specialty.

Enhanced communications skills will be required in earning and maintaining public support for energy projects. Those who can answer the social, economic and health concerns in communities affected by development, will find career opportunities particularly those with skills and experience working with Indigenous communities.

The push to lower costs and increase productivity is driving automation, data analytics and manufacturing

processes throughout the oil and gas industry, building on current occupational requirements and creating new ones. Field workers will be expected to have both mechanical and digital skills. They will be expected to use data analytics to improve their decision-making and work with data scientists to create solutions.

By combining a manufacturing model for oil and gas development with automation, demand for traditional skills is on the decline for Canada's oil and gas field workers and is being replaced by a need for expertise in areas such as in supply chain management, logistics and project management.

The potential exists for some occupations to disappear as a result of pending regulatory and technological changes to the oil and gas industry. However, oil and gas jobs of the future include many of the skills that are required in other Canadian industries today.

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Overview

The Petroleum Labour Market Information (PetroLMI) is a leading resource for labour market information and trends regarding Canada's oil and gas industry. PetroLMI specializes in providing petroleum labour market data, analysis and insights, as well as occupation profiles and other resources.

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