CLEANTECH AND TRANSITIONING CAREERS IN OIL & GAS
Career opportunities across Alberta's oil & gas innovation ecosystem

INTRODUCTION

To address climate change and improve environmental performance across a variety of industries requires innovation and new technologies to be developed quickly. In this environment there is great opportunity for Alberta's workforce including experienced workers, students and new graduates, career counselors and human resource professionals, training and education institutes, innovators, entrepreneurs and employers and their hiring managers.

There is growing demand for all levels of skills and experience in innovation, technology and 'cleantech' development, as well as for the many supporting or related roles that will help apply these new solutions across many industries.

This document, and seven others in the *Cleantech and Transitioning Careers in Oil and Gas* series, is a guide to developing or adapting skills and experience for meaningful work and careers with direct impact on the environment and the economy, even as our province's resource industries transition to help meet climate challenges.

This series uses examples from Alberta's oil and gas industry. However, cleantech skills and roles are also in demand among agriculture, forestry, manufacturing, transportation and other sectors that are vital to the sustainability of our province.

What is the Digital Oil and Gas Industry?

Digitization offers the oil and gas industry a critical pathway to sustainability. Greater computing power, advances in data science and increased connectivity are transforming the way oil and gas is produced, transported and consumed, creating a positive impact on the industry's environmental footprint and bottom line.

NEW CAREER AREA IN DIGITIZING THE OIL & GAS INDUSTRY AS A PATH TO COST AND CARBON COMPETITIVENESS

Data is at the heart of digital solutions, but it is how data is used that is helping drive Canada towards a sustainable energy future. More sophisticated levels of data analytics rely on the availability of quality data and lead to greater value. Data analytics involved in the oil and gas industry include:

- Descriptive Analytics: Uses data to describe what happened in a company, operation or situation, providing insight into historical performance and may help identify opportunities for improvements.

- Diagnostic Analytics: Uses data to understand why situations occurred as they did and to diagnose problems.

- Predictive Analytics: Uses historical data to make predictions about situations or performance.

- Prescriptive Analytics: Uses data to prescribe decisions and actions and to proactively enhance performance and decrease unintentional disruptions to operations.

**Digitization of the oil and gas industry enhances environmental performance by:**

- Improving response times to unintended operational changes, thereby reducing potential impacts.
- Reducing unplanned operational and environmental events aided by predictive maintenance analysis.
- Reducing energy waste through technologies that increase efficiency.
- Using automated process control, production optimization and remote operations to decrease the potential for human error and allow workers to focus on higher value activities.
- Improving early leak detection of methane, GHG and liquids, etc.
- Using 3D digital twins, or digital replicas of real-world assets and processes, enabling companies to plan, coordinate and execute activities remotely. This reduces costs, increases efficiency and safety, and reduces travel-related emissions.
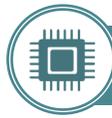
CAREER PATHWAYS FOR DIGITAL OIL & GAS

Universal Attributes Required

Alongside technical skill requirements, workers in cleantech careers (in any industry) require important universal attributes. These are also known as soft skills, attitudes or behaviours.

AGILITY
Adapt to changes, feedback and iterations

SYSTEMS THINKING
Ask right questions, visualize work and accommodate ongoing feedback

STRATEGIC FOCUS
For commercial deployment and monetization of ideas

EMOTIONAL INTELLIGENCE
Work well with others in a changing environment

BUSINESS ACUMEN
Create value for the business and customers

RELATIONSHIP BUILDING
Mutual respect and trust amongst team members and customers

PERSEVERANCE & CONTINUOUS IMPROVEMENT
Incorporate ongoing learning and achieve technical excellence

TRUST & COLLABORATION
Work collectively on problems

COMMITMENT & PASSION
Improving the future through "out of the box" and visionary thinking

COMMUNICATIONS SKILLS
Share important stories of successes and failures and inspire involvement

WORKING IN DIGITAL OIL & GAS

There are three key phases involved in gathering, managing and analyzing data for insights that lead to smarter decisions and improved operational, environmental and social performance in the oil and gas industry:

- Design & build involves installing, integrating and maintaining the mechanical equipment and digital technology required to acquire data.

- Digitize & visualize includes learning from the data by conducting descriptive, diagnostic and predictive analysis to draw insights and conclusions about operations and performance.

- Automate, operate & maintain the digital systems to enhance decision-making and performance by optimizing operations and decreasing unintentional disruptions.

Want more details on activities within the Digital Oil and Gas sector?

Find Digital Oil and Gas Key Activities on the Clean Resource Innovation Network (CRIN) website:

WWW.CLEANRESOURCEINNOVATION.COM

FUNDED BY:

Canada Alberta

POWERED BY:

CRiN
Clean Resource Innovation Network
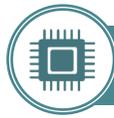
KEY SKILLS AND OCCUPATIONS TABLES

The following table sets out the full lifecycle of digital oil & gas and the skills, knowledge, and occupations required to progress the industry's path to sustainability.

	DESIGN & BUILD *Acquiring data*	DIGITIZE & VISUALIZE *Learning from data*	AUTOMATE, OPERATE & MAINTAIN *Enhanced decision-making and optimizing operations*
KEY SKILLS AND KNOWLEDGE	• Research, evaluate, and recommend systems, equipment and technologies based on operational needs • Perform calibrations, loop checking, troubleshooting, repair, and start-up on field devices • Develop and conduct testing plans and procedures • Apply engineering and mathematical concepts to problems to find an appropriate solution • Understand the intersection of IT (information technology) and OT (operations technology) • Bridge gaps between new and legacy technologies • Visualize complex processes • Understand cloud computing and the use of a network of remote servers hosted on the internet to store, manage, and process data • Design and implement cyber security technologies, processes, and practices to protect networks, devices, programs, and data from attack, damage, or unauthorized access • Interface and architectural design • Post-installation and integration support	• Software design and development, writing code and programming • Data modelling, data mining techniques and statistical analysis such as regression, clustering, and outlier detection • Use of data products, tools and software to optimize collaboration (DevOps, DataOps and/or MLOps) • Understand Clean Development Mechanism (CDM) and requirements for Certified Emission Reduction (CER) credits • Experience in streaming ingestion and real-time data processing • Data warehouse design: data vault modeling and metadata management • Explore and implement enhancements through experiment, prototypes and fast feedback • Utilize SCRUM and Agile methodologies • Experience with wired and wireless communication protocols • UI/UX design and development: ability to translate customer/user requirements into visuals and deliver an effective user experience	• Write code and programs to simulate human intelligence in machines and mimic human actions, learning and problem-solving (Artificial Intelligence (AI)) • Develop algorithms that allow computers to learn automatically without human intervention and adjust actions accordingly (Machine Learning (ML)) • Ongoing optimization of operations data products, pipelines and tools • Ongoing operations optimization using automated control systems • Analyze data for use in decision making • Recognize out-of-the-ordinary conditions and implement corrective action • Actively look for hazards or unsafe conditions • VR/AR application and content development • Program robots to carry out repetitive and dangerous tasks, make inspections, capture data, etc. • Manage multiple and changing priorities in a fast-paced environment with strong decision-making skills
KEY OCCUPATIONS	• Engineers: chemical, process, mechanical, electrical, automation, control systems, computer network, systems integration, data, DataOps, platform • Electricians • Technicians: instrumentation, automated systems, telecommunications, computer network • Cybersecurity specialists • Cloud technology specialists • Business development/sales/marketing professionals	• Engineers: automation, DevOps, DataOps, platform • Technicians: automated systems, mobile application • Change management specialists • Data scientists • Data analysts • Database administrators • Agile project managers/ScrumMasters • Software developers • Software programmers • Machine learning/AI specialists • Cloud computing specialists • Cybersecurity specialists • UI/UX designers • Full stack designers • Business development/sales/marketing professionals	**Optimize:** • Engineers: automation, electrical, DevOps, DataOps, • Technicians: automated systems, instrumentation, mobile applications • Change management specialists • Agile project managers/ScrumMasters • Software developers • Software programmers • Machine learning/AI specialists **Use/Implement:** • Rig managers and crews • Drone operators • Production technicians • Process/Panel/Control room operators • Predictive maintenance planners and schedulers • Business development/sales/marketing professionals