

CLEANTECH AND TRANSITIONING CAREERS IN OIL & GAS

Addressing climate change and other environmental challenges creates new career pathways and skill development opportunities for all workers

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.

CLEANTECH
is defined here as: Innovation and commercialization of new technologies, processes, strategies and products to decarbonize, reduce emissions and achieve a sustainable oil & gas industry.

What is the Innovation Ecosystem?

Cleantech is about the innovation (development, deployment and commercialization) of new technologies, processes, strategies and products to improve environmental performance.

These types of technology solutions support improved operational efficiency, safety and environmental performance.

Solutions developed are often easily adapted by other industries. For example, technology to reduce water use can be applied in agriculture, cement, forestry, manufacturing, mining, transportation, oil and gas, and many other sectors.

Many stakeholders including researchers, governments, regulators and investors are necessary to help create innovation in one sector and also introduce it to other sectors. That's the innovation ecosystem!

JOIN THE INNOVATION ECOSYSTEM

A career in cleantech is a way new entrants, experienced professionals, researchers and entrepreneurs can contribute their passion, values and skills to improve the lives of Albertans, Canadians, and people around the globe. There are many ways to participate.

Cleantech applied in the oil and gas industry enables new contributors and cross-industry collaborations to create:

- **Solutions for climate change** by reducing barriers and working across disciplines to increase sustainable energy development.
- **Innovations and skills** that are transferable to other sectors in Canada and around the world.
- **Public and corporate policy** to guide strategic planning processes and practices that implement regulator requirements into operational processes.
- **Growth** in Canada's oil and gas and cleantech sectors which are critical to help Canada maintain a strong economy while achieving climate commitments.

UNIVERSAL ATTRIBUTES

Alongside technical skill requirements, workers in cleantech careers (in any industry) require important universal attributes.

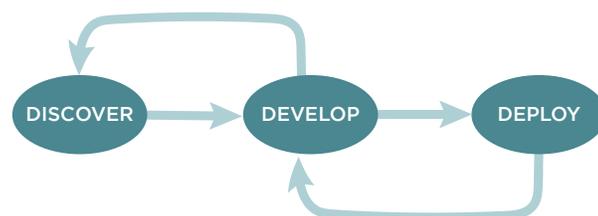
These are also known as soft skills, attitudes or behaviours.



PHASES OF CLEANTECH DEVELOPMENT

The innovation pathway for new technology (and improving existing technology) has a variety of work and career opportunities from the development of new ideas through to the testing, manufacture, marketing and use of cleantech solutions. The following activities provide insight into a variety of skills, knowledge, and occupations related to cleantech.

Once a technology has been developed, feedback from users, performance metrics and new innovations can lead to updates and improvements. This cycle of continuous improvement, illustrated in the diagram below, provides additional work opportunities across the innovation ecosystem.



Key activities for cleantech development across the oil and gas industry occur in **four main phases**:

1	Define concepts and fundamentals including problem definition and collaborative ideation to translate scientific principles into applied research and practical applications, build partnerships and technology development plans, and understand market potential.
2	Determine feasibility and development including experimentation to establish proof of concept; designing, planning and testing in labs and the field; presenting analytical and statistical results; and assessing commercial readiness with potential customers.
3	Piloting and demonstrations including testing in laboratory and operational environments, analyzing and solving challenges, prototype demonstrations, making improvements and developing potential routes to market.
4	Adoption of commercial innovation and technology including field testing and development, using prototypes in operational environments, building partnerships, developing business and marketing plans, attracting investors and implementing regulatory requirements.

KEY SKILLS AND OCCUPATIONS NEEDED IN TECHNOLOGY DEVELOPMENT

The following tables set out the skills, knowledge and occupations relevant to the phases and activities of cleantech development described above. Many industries, including oil and gas as one of the largest investors in cleantech innovation, provide career opportunities in each of these areas.

More work activity details can be found at www.cleanresourceinnovation.network.com

KEY SKILLS & KNOWLEDGE	CONCEPTS AND FUNDAMENTALS	FEASIBILITY AND DEVELOPMENT	PILOTING AND DEMONSTRATIONS	COMMERCIAL INNOVATION AND TECHNOLOGY ADOPTION
	<i>Problem definition Collaborative ideation</i>	<i>Proof of concept Design, plan and test</i>	<i>Test and improve Commercial readiness</i>	<i>Innovation in field Implement</i>
	<ul style="list-style-type: none"> Ability to navigate multiple technologies and digital tools Understand the oil and gas industry and its challenges Understand and apply relevant research methodologies and techniques Critically analyze and evaluate own findings and those of others Generate novel approaches to issues and implement solutions Partnership development and expansion of value chains Commercialization and funding skills Understand risk and ambiguity Ability to ask questions and frame the core problem Understand IP, user rights and patenting 	<ul style="list-style-type: none"> Understand the oil and gas industry and its challenges Technology development planning Data analytics Risk management and mitigation Ability to focus and prioritize solutions Focus on the needs of the industry/create a line of site to end-use of technologies Partnership development and expansion of value chains Commercialization and funding skills Define the potential of commercial products and market scalability Understand IP, user rights, patenting and contracts Understand how public policy affects the business 	<ul style="list-style-type: none"> Data analytics and decision making Understand industry language and have the ability to communicate value propositions Environmental risk assessment experience Understand regulatory requirements and how to align with external affairs and an overall strategy Build partnerships and expand value chains Commercialization skills: <ul style="list-style-type: none"> Strategy and planning Finance and funding Market knowledge Business acumen Indigenous engagement expertise Stakeholder engagement skills 	<ul style="list-style-type: none"> Understand industry language and have the ability to communicate value propositions Data analytics and decision making Understand what it takes to scale Business development and collaboration with investors, customers and partners Have a commercial deployment mind-set and execution skills Have the ability to establish trust and confidence Networking, sales and marketing skills Experience navigating regulations Experience interacting with regulators, stakeholders and other partners and industry

The Cleantech and Transitioning Careers in Oil and Gas Series is the result of a 2021 project funded by the Province of Alberta working in partnership with the Government of Canada, and research conducted by consultants Cheryl Knight and Pat Hufnagel-Smith.

For more information please contact: info@cleanresourceinnovation.com and to view or download documents in the series, visit www.cleanresourceinnovation.com

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KEY OCCUPATIONS	CONCEPTS AND FUNDAMENTALS	FEASIBILITY AND DEVELOPMENT	PILOTING AND DEMONSTRATIONS	COMMERCIAL INNOVATION AND TECHNOLOGY ADOPTION
	<i>Problem definition Collaborative ideation</i>	<i>Proof of concept Design, plan and test</i>	<i>Test and improve Commercial readiness</i>	<i>Innovation in field Implement</i>
	<ul style="list-style-type: none"> • Research scientists • Engineers • Technologists • Data scientists • Business development and marketing professionals • Commercial development specialists • Contracting/licensing professionals • ESG/Sustainability professionals • Diversity and inclusion professionals • Research support professionals • Proposal writers • Investment fund managers 	<ul style="list-style-type: none"> • Research scientists • Engineers • Technologists • Software developers • Data scientists • Technically experienced professionals with varied operations and applied backgrounds • Business development and marketing specialists • Commercial development specialists • Licensing, contracts and patenting specialists • ESG/Sustainability • Professionals • Diversity and inclusion professionals • Stakeholder and government relations professionals • Policy and regulatory analysts • Product managers • Administrative/project • Coordinators 	<ul style="list-style-type: none"> • Research scientists • Engineers • Technologists • IT and OT (operations technology) professionals • Software developers • Data scientists • Technically experienced professionals with varied operations and applied backgrounds • Project managers • Contract managers • Cost management specialists • Regulatory specialists • Health & safety specialists • Environmental specialists • ESG professionals • Diversity and inclusion professionals • Communications and advocacy professionals • Policy and government relations specialists • Stakeholder engagement professionals • Administrative/project • Coordinators 	<ul style="list-style-type: none"> • Technically experienced professionals with varied operations and applied backgrounds • Data scientists • IT and OT (operations technology) specialists • Software developers • Hardware developers • Field experienced engineers, technologists and operators • Environmental specialists • Business development and marketing specialists • Supply chain managers • Health & safety specialists • Environmental specialists • ESG/Sustainability professionals • Diversity and inclusion professionals • Communications, advocacy and policy professionals • Stakeholder engagement professionals • Policy and government relations specialists • Administrative/project • Coordinators

CAREER PATHWAYS

Thanks to the variety of skills and knowledge required to discover, develop, deploy and use new technology to address environmental and economic challenges in the oil and gas sector, there are many ways to be a part of Alberta's oil and gas workforce for many years to come.

The innovation ecosystem includes private, public and not-for-profit organizations and companies that are small, medium and large, coming together to apply their varied expertise to bring sustainably produced energy to the world.

Cleantech careers can be found directly with oil and gas producers, service providers, midstream (refining and transportation) and downstream (including retailers of petroleum products.) Opportunities are also found with technology start-ups or companies specializing in providing solutions to industries like oil and gas. Often, a variety of companies will work collaboratively to bring state of the art, end-to-end technology solutions to life to help the oil and gas industry meet regulatory requirements, improve safety and efficiency, and reduce environmental impacts including greenhouse gas emissions.

Career paths range from research, science, and technology occupations to roles that support the business side of enabling innovation. Operational jobs that implement and use technology "on the ground" are also sustainable career options.

ADDITIONAL INSIGHTS: SEVEN OIL AND GAS TECHNOLOGY THEME AREAS

Additional profiles related to cleantech skills, attributes, behaviours and occupations required by the oil and gas industry to improve environmental performance are available. Check out career pathways information in these seven oil and gas technology theme areas:

Check out job and career information in these seven oil and gas technology theme areas:

- Creating Cleaner Fuels
- Digitizing the Oil and Gas Industry
- Developing Low Emissions Value-Added Products
- Reducing Methane Emissions
- Discovering Innovative Hydrocarbon Extraction and Recovery Techniques
- Enhancing Novel Land and Wellsite Reclamation Performance
- Protecting and Reducing Our Use of Water

CLEANTECH CAREER PATHWAYS IN OIL AND GAS

The following table outlines cleantech career pathways in the oil and gas sector, followed by tips for developing a career path whether you are an experienced worker looking for a change, a recent graduate or considering entering training or education programs.

CAREER PATHWAYS IN CLEANTECH INNOVATION	TECHNICAL	BUSINESS	LEADERSHIP	ENTREPRENEURIAL
	<p><i>Individual contributor involved as a specialist that offers an increasing level of technical expertise</i></p> <ul style="list-style-type: none"> • Engineering • Geoscience • Research • Technologist/ technician • Trades • Plant operations • Field operations • Software development • Data science • Process operations 	<p><i>Individual contributor involved as a specialist that offers an increasing level of expertise in fields integral to the success of the company</i></p> <ul style="list-style-type: none"> • Regulatory • Government relations • Stakeholder engagement • Business development • Legal • Product development • Marketing/sales • Supply chain • ESG/Sustainability • Finance • Human resources 	<p><i>Combines technical or business experience with the skills required to motivate individuals or a team to achieve a common vision/goal</i></p> <ul style="list-style-type: none"> • Project management • Team leader • Department manager • Director • Executive (VP, President) 	<p><i>Business creator able to develop, scale and commercialize clean technology to transform the oil and gas industry</i></p> <ul style="list-style-type: none"> • Contractor • Freelancer • Consultant • Researcher • Fundraiser • Sales • Entrepreneurial pathways for cleantech innovation vary and can start with technical, business or leadership experience. Entrepreneurs leverage their expertise, passions and networks and may be independent or part of a consulting firm, incubator or business start-up.

KNOWLEDGE AND SKILLS LEVELS	<p>ENTRY-LEVEL First time role in a discipline or industry bringing minimal education, training and experience.</p>
	<p>INTERMEDIATE Have gained enough experience and knowledge within a discipline or field to work independently and demonstrate problem-solving, ingenuity and responsibility. May mentor entry-level colleagues.</p>
	<p>ADVANCED Have the ability to apply skills and knowledge to work within increased scope and complexity and demonstrate effective judgment and actions.</p>
	<p>EXPERT Recognized as an organization or industry expert. Involved in and/or leads projects or work that is of critical importance to the organization or industry and may carry substantial success or failure consequences.</p>

TIPS FOR DEVELOPING A CAREER PATH

IF YOU ARE ...	HELPFUL HINTS FOR PURSUING YOUR DESIRED PATHWAY
High school student	<ul style="list-style-type: none"> Identify career options related to your interests, skills and values Pursue continuing education: STEM; Business; Entrepreneurial; Trades Volunteer to gain experience and contacts Explore experiential learning such as job shadowing/mentoring programs
New graduate	<ul style="list-style-type: none"> Research internships Build your network Volunteer to gain experience and contacts Set up informational interviews Find a mentor Join a professional association and attend seminars and workshops Pursue continuous improvement and education to support technical or business career goals Include terminology of the sector you're interested in within your covering letter and resume Look for bootcamps and shorter-term training offered by traditional post-secondary institutions, continuing education departments and private training organizations Join meet-ups, lunch & learns, webinars, free online courses, etc. to learn more and network Building digital skills - practice, practice, practice - access open source data to develop interesting analytics and visuals; build your portfolio
Experienced career transitioner	<ul style="list-style-type: none"> Document and leverage your achievements and skills to start at an intermediate, advanced or expert level Learn the terminology used by the sector you're interested in and incorporate into your covering letter and resume Market your value and fit for employment for a targeted job or sector or consider an entrepreneurial role Explore alternative work options such as gigs and contracts, self-employment, part-time, or remote work Build your network Update your skills through continuous improvement and education Look for bootcamps and shorter-term training offered by traditional post-secondary institutions, continuing education departments and private training organizations Join meet-ups, lunch & learns, webinars, free online courses, etc. to learn more and to network Building digital skills - practice, practice, practice - access open source data to develop interesting analytics and visuals; build your portfolio Volunteer to gain experience and contacts on committees or boards Work with a career development professional Join an incubator to develop an entrepreneurial venture