



B.C. HYDROGEN WORKFORCE CAPACITY-BUILDING STRATEGY AND ACTION PLAN



PRESENTED FOR:



PRESENTED BY:





ACKNOWLEDGEMENTS

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B.C. HYDROGEN WORKFORCE CAPACITY-BUILDING STRATEGY AND ACTION PLAN



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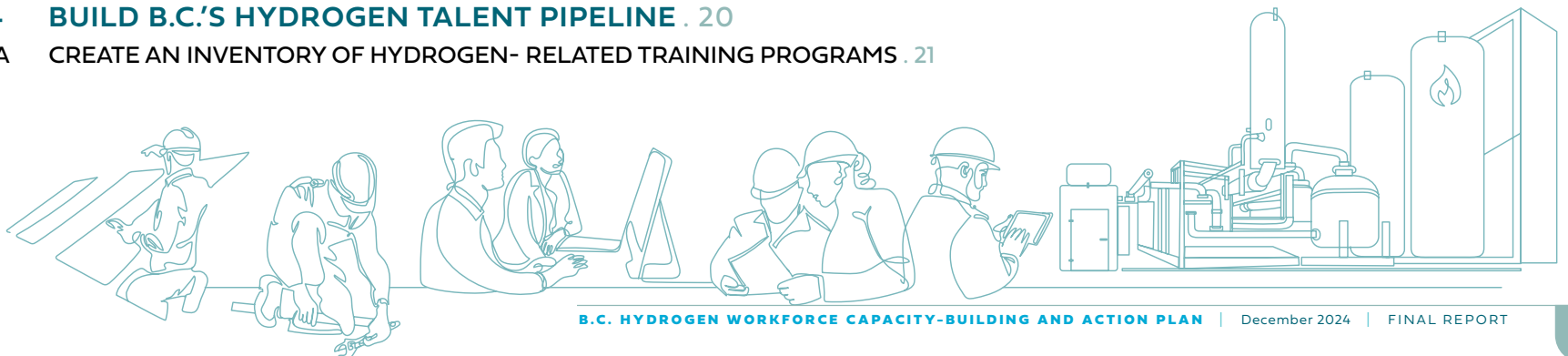
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The *British Columbia (B.C.) Hydrogen Strategy* outlines the Province’s ambitions to build a leading hydrogen economy to help achieve net-zero by 2050. Recognizing that a highly skilled workforce is required, the B.C. Ministry of Energy and Climate Solutions (ECS) commissioned this *B.C. Hydrogen Workforce Capacity-building Strategy and Action Plan* (the “Strategy and Action Plan”) to address labour market, and education and training gaps identified in a previous report, the *B.C. Hydrogen Labour Market and Skills Analysis* (the “Analysis”).

The Strategy and Action Plan reflects the Province’s commitment to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), Truth and Reconciliation efforts, and environmental, social, and governance (ESG) goals.

Strategy and Action Plan Informed by Research

The Analysis outlines both the labour market opportunities and education and training strengths that B.C. can build upon to prepare a skilled workforce for the hydrogen industry, including:

- The opportunity to leverage skills and expertise that already exist in B.C.’s labour market.
- Post-secondary institutions already offer the foundational qualifications the hydrogen industry requires, including degrees, diplomas, and trade certifications.
- Industry and academia have a significant interest in developing a hydrogen workforce for B.C.
- Effective approaches to workforce upskilling and reskilling, including micro-credentials and work-integrated learning, are already embedded in the Province’s post-secondary education system.
- The opportunity to promote hydrogen careers to advance climate solutions.

The research also highlights key labour market risks and education and training gaps:

- Labour shortages exist for several of B.C. hydrogen industry’s core occupations.
- There is a lack of awareness of hydrogen careers and associated career pathways.
- Systemic barriers impede equitable access to hydrogen-related career opportunities for under-represented talent groups.
- There is a lack of hydrogen-specific training programs to augment the foundational qualifications already in the labour market.
- A siloed approach to curriculum development and training at the post-secondary institute level is not cost- or time-efficient.
- There is a potential shortage of qualified instructors to teach hydrogen-specific training programs.

Effective Capacity-building Involves More than Skills Training

This Strategy and Action Plan recognizes the necessity of developing both workforce skills and the mindset and attitudes essential for success in a transitioning economy characterized by uncertainty. It recommends that implementation be guided by core operating principles and overseen by a committee made up of a cross-sector of partners.

Core Operating Principles

The following core operating principles are provided to guide decision-making related to the Strategy and Action Plan implementation:

1. Collaboration among government, industry, academia, and First Nations is paramount.
2. Focus on developing micro-credential training programs and work-integrated learning that can be scaled and embedded in foundational qualification programs.
3. Build on existing work, including promising practices from within the province, other parts of Canada, and international jurisdictions.



4. Develop education and training programs for the hydrogen industry that are also relevant for the broader clean energy economy to help mitigate the uncertainty regarding the timing of hydrogen jobs.
5. Respect the principle of “nothing about us without us” by ensuring the participation of under-represented groups, including members of Indigenous communities, when developing and implementing capacity-building activities that involve them.
6. Leverage cross-sectoral opportunities to advance equity access to education and employment of under-represented groups.
7. Incorporate the latest learning technology and practices and increase flexibility and accessibility for the learner in terms of scheduling, location and structure.
8. Use a pilot approach to build a diverse, inclusive, and equitable workforce for the hydrogen industry.

Strategy and Action Plan: Initiation and Oversight

A foundational step in initiating the Strategy and Action Plan is to share the key findings of the Analysis. This will help establish a common understanding of the opportunities and challenges associated with developing B.C.’s hydrogen workforce and create buy-in and interest in leading or partnering on the solutions recommended in this Strategy and Action Plan.

Funding

Funding is also needed to support the Strategy and Action Plan implementation. One consideration is to establish an innovation fund to provide seed money to carry out the actions, to which other entities can contribute resources. Such a fund can emphasize collaboration, partnerships, and cost-sharing to de-risk the implementation of the actions outlined in this Strategy and Action Plan.

A Roadmap for Capacity-Building and a Diverse and Inclusive Hydrogen Workforce

Advancing B.C.’s hydrogen industry and generating high-quality, well-paying career opportunities requires proactive action and collaboration among governments, industry, academia, and First Nations.

This Strategy and Action Plan offers a comprehensive and achievable roadmap for addressing labour shortages, developing hydrogen-specific skills, and fostering inclusive employment growth. It recommends that actions be taken to ensure equitable access to careers in B.C.’s hydrogen industry in the short term, as addressing complex barriers to the participation of underrepresented groups in the labour force requires time. Equally important is initiating the co-creation of a workforce development framework with Indigenous organization(s) to ensure the transition to a cleaner energy economy, including hydrogen, is part of a pathway to reconciliation.

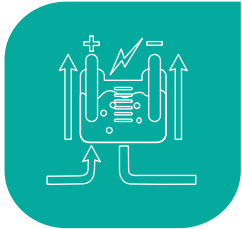
The seven capacity-building requirements and 16 actions summarized on the following page call on government, industry, academia and First Nations to actively engage in workforce development initiatives. The Strategy and Action Plan suggests the following timeframe for implementation:

- Immediate actions: early wins and low-hanging fruit opportunities; initiate in 2025.
- Short-term actions: initiate by the end of 2026.
- Medium-term actions: initiate by 2030.
- Long-term actions: initiate by 2035.



Workforce capacity-building is a process of developing and strengthening the skills, knowledge, processes, and resources needed to adapt and thrive in a changing world.

STRATEGIC REQUIREMENT	ACTION	TIMEFRAME
1. Enhance Public Awareness of Hydrogen's Potential as a Climate Solution	Develop and implement a public education campaign to build awareness about hydrogen safety and its potential as a climate solution.	Short-term (2026)
2. Increase Awareness of B.C.'s Hydrogen Industry and its Careers	Develop and implement an outreach plan to share the key findings of the Analysis, and Strategy and Action Plan.	Immediate (2025)
	Develop and promote profiles and pathways for hydrogen careers to increase awareness of opportunities.	Short-term (2026)
	Foster early interest in the B.C.'s clean energy economy and hydrogen industry by strengthening K-12 education programs.	Long-term (2035)
3. Strategic Foresighting of B.C.'s Clean Energy Workforce Requirements including Hydrogen	Use strategic foresighting to identify workforce and skill requirements for the transition to a low-carbon economy, that includes hydrogen.	Immediate for some regions due to disruptions to industries and plant closures. Short-term (2026)
4. Build B.C.'s Hydrogen Talent Pipeline	Create an inventory of hydrogen-related training programs.	Short-term (2026)
	Develop a suite of hydrogen micro-credentials to address hydrogen skill and knowledge requirements that are common across hydrogen occupations.	Short-term (2026)
	Develop and implement a professional development program to train and support instructors delivering hydrogen-related courses and micro-credentials.	Short-term (2026)
	Develop a micro-credential on business topics related to hydrogen.	Medium-term (2030)
	Develop hydrogen-specific micro-credentials for engineers and engineering-related occupations.	Medium-term (2030)
	Develop micro-credentials to upskill existing trades to work in the hydrogen industry.	Medium-term (2030)
	Develop hydrogen-specific micro-credentials to upskill plant operators.	Medium-term (2030)
	Develop a training program designed to increase the workforce qualified to work as a hydrogen plant operator.	Medium-term (2030)
5. Ensure Equitable Access to Careers in B.C.'s Hydrogen Industry	Develop a multi-sector, multi-disciplinary program to enhance inclusion of under-represented groups in the occupations required by the hydrogen industry.	Immediate (2025)
6. Employment in B.C.'s Clean Energy Economy as a Pathway to Reconciliation	Co-create a capacity-building framework with Indigenous organization(s) to leverage the development of clean energy, including hydrogen, to enhance community workforce development and employment opportunities as a path towards reconciliation.	Immediate (2025)
7. Customize Capacity-Building Strategies and Activities for B.C. Hydrogen Hubs	Develop a toolkit and process to facilitate the customization of a capacity-building strategy and action plan for B.C. regional hydrogen hubs.	Immediate (2025)



**This Strategy
and Action
Plan sets out
an ambitious
but achievable
roadmap to
advance British
Columbia's
hydrogen
workforce.**

INTRODUCTION

The British Columbia (B.C.) Hydrogen Strategy¹ outlines the Province's ambitions to build a leading hydrogen economy and to achieve net-zero by 2050. Recognizing that an appropriately skilled and knowledgeable workforce is required to advance B.C.'s hydrogen economy, a labour market study and education and training analysis was undertaken. The resulting report, *B.C. Hydrogen Labour Market and Training Analysis* ("Analysis") and supporting *B.C. Hydrogen Value Chain and Workforce Map* ("Workforce Map") identified 154 core occupations across 15 job families required by B.C.'s hydrogen industry.

The research for the Analysis informed the development of this Strategy and Action Plan. It identified both labour market opportunities and education and training strengths, that B.C. can build upon to prepare a skilled workforce for the hydrogen industry including:

- The opportunity to leverage skills and expertise that already exist in B.C.'s labour market.
- Post-secondary institutions already deliver most core or foundational qualifications required by the hydrogen industry including degrees, diplomas, and trades certifications.
- Significant interest from both industry and academia to develop a hydrogen workforce for B.C.
- Effective approaches to workforce upskilling and reskilling, including micro-credentials and work-integrated learning, are already embedded in the post-secondary education systems.
- The opportunity to promote a career in hydrogen as advancing provincial, national, and global climate solutions.

The research also highlights key labour market risks and education and training gaps:

- Labour shortages already exist for several of the hydrogen industry's core occupations including engineers, truck drivers, manufacturing production technicians, plant operators with power engineering certification, and in industrial trades such as industrial electricians, instrumentation technicians, refrigeration mechanics, construction mechanics, and heavy-duty equipment technicians.
- There is a lack of awareness of hydrogen careers and associated career pathways.
- Systemic barriers impede equitable access to hydrogen-related career opportunities for under-represented talent groups.
- There is a lack of hydrogen-specific training programs needed to augment the foundational qualification found in the labour market.
- A siloed approach to training at the post-secondary institute level is not cost or time-efficient.
- There is a potential shortage of qualified instructors.

B.C. has commitments to the United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), Truth and Reconciliation efforts, and environmental, social, and governance (ESG) goals. As such, particular effort was made to understand how to enhance equitable access to hydrogen employment opportunities and how to leverage the development of the clean energy economy, including hydrogen, as a pathway to Indigenous reconciliation.



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Uncertainty May Be the B.C. Hydrogen Industry's Greatest Talent Risk

One of the greatest potential risks to developing a workforce for the hydrogen industry is uncertainty. There are many unknowns regarding the timing of projects and industry expansion, and the size and stability of employment opportunities that the industry will generate.

Students and job seekers are hesitant to invest time and funds into training for a career that may not come to fruition. According to research conducted by the Labour Market Information Council (LMIC), future employment opportunities are the second most important determinant of the career decision-making process. Personal interest is the most important factor.²

Post-secondary institutions and other training providers, especially at technical institutions and apprenticeship levels, have reported that they need to be confident that labour market demand will exist before allocating resources to courses focused on hydrogen-specific occupations and skills. Given their role in funding workforce development, the provincial government also faces challenges of balancing demand across multiple sectors and making decisions regarding funding priorities.

This level of uncertainty is not unique to B.C. Other jurisdictions are also grappling with the need to prepare the workforce for the energy transition and net-zero goals by 2050, without certainty about which occupations or how many workers will be required. The recommendations presented in this Strategy and Action Plan are focused on actions that form a solid foundation for capacity-building, and that can be ramped up as the future of the hydrogen industry in B.C. becomes more certain.

1.1 CAPACITY-BUILDING NEEDED TO READY A SKILLED WORKFORCE FOR THE HYDROGEN INDUSTRY

Workforce capacity-building is the process of developing and strengthening the skills, knowledge, processes, and resources needed to adapt and thrive in a changing world. In reference to Sustainable Development Goal 17: Revitalizing the Global Partnership for Sustainability Development, the United Nations (U.N.) identifies the need for capacity-building to go beyond performing tasks to also changing mindsets and attitudes.³

In keeping with the U.N.'s definition of capacity-building, this Strategy and Action Plan for building B.C.'s hydrogen workforce recognizes the need to address both workforce development and the mindset and attitudes required to succeed in a transitioning economy characterized by uncertainty. With this in mind, the Strategy and Action Plan recommends an implementation approach that includes core operating principles, a collaborative committee to oversee implementation, and a potential funding model.

1.2 RECOMMENDED CAPACITY-BUILDING MODEL AND OPERATING PRINCIPLES

There is a need for a capacity-building model that is accessible, cost-effective, agile, and able to address workforce development and the mindset and attitudes required of a transitioning economy characterized by uncertainty.



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In addition, the following operating principles are offered to help guide the approach and decisions made about how to implement the Strategy and Action Plan:

1. Collaboration is paramount for cost-effective and timely solutions:
 - Among government, industry, academia, and First Nations.
 - Build standardized training in the absence of industry-wide codes and standards.
2. Focus on developing short-term micro-credential training programs and work-integrated learning that can be scaled and embedded in foundational qualification programs, including degrees, diplomas, and apprenticeships. This will help to:
 - Leverage transferable skills from existing labour market and related industries.
 - Deploy rapid workforce transition from adjacent industries experiencing layoffs.
3. Build on existing work, including promising practices⁴ from within the province, other parts of Canada, and international jurisdictions.
4. Mitigate the uncertainty regarding the timing of employment growth in the hydrogen industry by developing education and training that does not rely solely on the success of hydrogen. Two examples of this are:
 - Northern Alberta Institute of Technology's (NAIT) Clean Energy Professional Program which provides experienced professionals with the skills and knowledge to effectively transition into clean energy sectors (without being exclusive to hydrogen).
 - College of North Atlantic's (CNA) Hydrogen Technology Program that provides trainees with hydrogen-specific skills as well as foundational 4th class power engineering certification which qualifies them to work across several industries.
5. Respect the principle of "nothing about us without us"⁵ by ensuring the participation of under-represented groups, including members of Indigenous communities, when developing and implementing capacity-building activities that involve them.
 - Co-create programming with those with lived experience will result in a more effective program.
6. Leverage cross-sectoral opportunities to progress equity access to education and employment of under-represented groups.
 - Address systemic barriers for under-represented groups is beyond what the nascent hydrogen industry can tackle on its own.
 - Collaboration is required to address barriers on multiple levels: structural, organizational, interpersonal, and individual.
 - Facilitate connections between talent from under-represented groups with industry employers.
 - Increase participation in foundational occupations hired by the hydrogen industry and others.
7. Incorporate the latest learning technology and practices and increase flexibility and accessibility for the learner in terms of scheduling, location, and structure.
8. Use a pilot/demonstration approach to building a diverse, inclusive, and equitable workforce for the hydrogen industry.
 - Research suggests that pilots that occur over two-to-three-years provide the greatest opportunity to develop interventions that are effective.
 - Multiple pilots of the same initiative can also provide learnings across a variety of environments and accelerate learnings.
 - Scale the most impactful initiatives.

1.3 RECOMMENDED APPROACH TO INITIATION AND OVERSIGHT

A foundational step to initiating the Strategy and Action Plan is to share the key findings of the Analysis. This will help establish a common understanding of the opportunities and challenges associated with developing B.C.'s hydrogen workforce and create buy-in and interest in leading and partnering on solutions.

After sharing the Analysis' key findings, this Strategy and Action Plan recommends establishing a collaborative Hydrogen Workforce Development Committee to oversee implementation and ensure alignment with the operating principles. Interest in joining the committee is likely to arise during the sharing of the key findings. The committee should include a cross-section of workforce development and hydrogen industry partners such as hydrogen companies, hydrogen hub partners, provincial, municipal, and First Nation governments, Indigenous communities, industry associations, post-secondary institutions and trainers, and unions and trade associations.

One example of a framework that stimulates collaboration is the Hydrogen Education for a Decarbonized Global Economy (H₂EDGE) initiative in the United States (U.S.). H₂EDGE was established by the Electric Power Research Institute (EPRI), with funding from the federal government, to bring together industry, post-secondary, and government representatives to develop professional development courses and post-secondary programs required to prepare the hydrogen workforce.⁶ H₂EDGE focuses on workforce training and initiatives that are common and beneficial to the national hydrogen industry as a whole while respecting regions' need to address unique workforce challenges. This is similar for B.C. as there are workforce development issues common across the province, and some that are unique concerns for individual regions and hydrogen hubs that need tailored solutions.

Funding to support the implementation of the Strategy and Action Plan is also needed. One recommendation is to establish a Workplace Innovation Fund⁷ similar to that created to support B.C.'s construction industry adopt new technology and processes to address labour shortages. An innovation fund can provide seed funding to which other entities can contribute resources. Such a fund can emphasize collaboration, partnerships, and cost-sharing and de-risk the implementation of the actions outlined in this Strategy and Action Plan.

For example, the Workplace Innovation Fund for B.C.'s construction industry prioritized projects that:

- Had a high level of readiness to implement.
- Involved collaboration and the potential to benefit the whole construction industry.
- Supported industry to adopt new technologies and improve productivity.
- Improved workplace culture and human resource practices to attract and retain workers.
- Developed and support innovative training practices.
- Elevated the prestige and awareness of the industry and careers.
- Streamlined career pathways for under-represented talent groups.

Case for National Collaboration on Hydrogen Workforce Development

Collaboration to develop a hydrogen workforce can be extended beyond B.C. to include other Canadian provinces and territories. While each provincial hydrogen strategy is built around provincial strengths and decarbonization priorities, the skills and knowledge needed to advance the hydrogen industry across Canada are similar. Other benefits include:

- Collaboration is more efficient and cost-effective.
- There is an opportunity to leverage the work each province has done.
- Establishing standardized training programs and nationally recognized certifications will help to create consistency and quality across the industry.

B.C. has agreements to work with other provinces to develop the hydrogen industry. For example, B.C. and Newfoundland and Labrador have agreed to share information on the development of clean energy, including low-carbon hydrogen development, given that both provinces have deep seaports and access to international markets.⁸ B.C. hydrogen companies are also establishing cross-border collaborations to advance the industry and have expressed interest in doing the same to expedite workforce development. Examples include Velocity Truck Centres opening hydrogen truck service bays in B.C. and Alberta.^{9 10} HTEC has secured investment for hydrogen refuelling stations across B.C. and Alberta.¹¹

2. CAPACITY-BUILDING STRATEGIC REQUIREMENTS AND RECOMMENDED ACTIONS

This section presents a comprehensive capacity-building strategy and action plan to address the labour market risks, and education and training gaps identified in the Analysis. The strategic requirements of the Strategy and Action Plan outline goals needed to prepare a skilled, diverse, and inclusive hydrogen workforce, which are:

- Enhance public awareness of hydrogen's potential as a climate solution, and the ability to produce and use it safely.
- Increase awareness of B.C.'s hydrogen industry, potential careers and career pathways to attract British Columbians to obtain foundational qualifications including degrees, diplomas, and trades hired by hydrogen employers.
- Engage in strategic foresighting to identify workforce and skill requirements for the transition to a low-carbon economy, that includes hydrogen.
- Build B.C.'s hydrogen talent pipeline by providing hydrogen-specific training to those who already have foundational qualifications.
- Ensure equitable access to careers in B.C.'s hydrogen industry.
- Leverage the development of clean energy, including hydrogen, as a pathway to reconciliation and enhancing Indigenous Peoples' participation in employment and economic benefits.
- Customize capacity-building strategies and actions to address the unique needs of B.C.'s hydrogen hubs.

B.C. hydrogen companies are also establishing cross-border collaborations to advance the industry and have expressed interest in doing the same to expedite workforce development.

2.1
ENHANCE PUBLIC
AWARENESS OF
HYDROGEN'S
POTENTIAL AS A
CLIMATE SOLUTION

2.2
INCREASE
AWARENESS OF B.C.'S
HYDROGEN
INDUSTRY AND ITS
CAREERS

2.3
STRATEGIC
FORESIGHTING OF B.C.'S
CLEAN ENERGY WORK-
FORCE REQUIREMENTS
INCLUDING HYDROGEN

2.4
BUILD B.C.'S
HYDROGEN TALENT
PIPELINE

2.5
ENSURE EQUITABLE
ACCESS TO
CAREERS IN B.C.'S
HYDROGEN
INDUSTRY

2.6
EMPLOYMENT IN
B.C.'S CLEAN
ENERGY ECONOMY
AS A PATHWAY TO
RECONCILIATION

2.7
CUSTOMIZE
CAPACITY-BUILDING
STRATEGIES AND
ACTIVITIES FOR B.C.
HYDROGEN HUBS

The plan provides a description of activities associated with each recommended action, identifies potential partners to involve, and suggests a timeframe for implementation.

As some actions set the foundation for others, the timing of the implementation of actions is an important consideration.

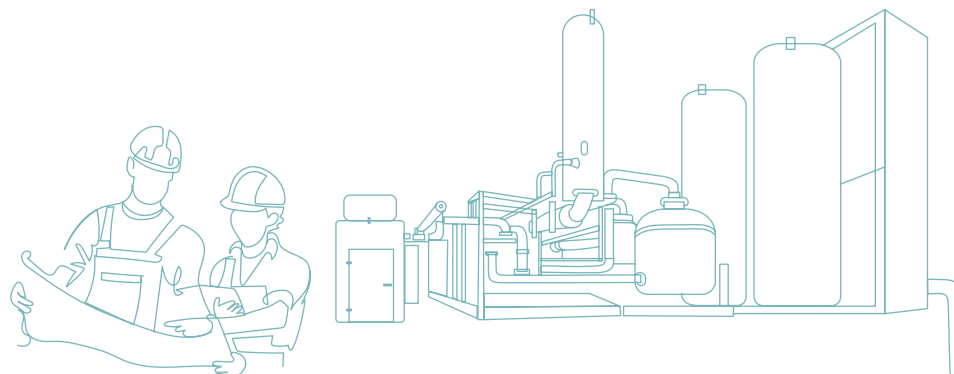
This action plan recommends the following timeframes for the sequencing of actions:

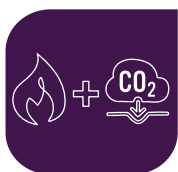
- Immediate actions: early wins and low-hanging fruit opportunities; initiate in 2025.
- Short-term actions: initiate by end of 2026.
- Medium-term actions: initiate by 2030.
- Long-term actions: initiate by 2035.

The plan also offers promising practices, and tools and resources that can be leveraged to facilitate implementation of the Strategy and Action Plan. Not all practices, tools and resources listed are directly related to hydrogen. Some offer a structure, framework, or approach designed to address capacity gaps in industries similar to hydrogen and they may be relevant for more than one of the recommended actions.



SEARCH TIP: Use the buttons in this sidebar to navigate between the strategic requirements of the Strategy and Action Plan.





2.1 ENHANCE PUBLIC AWARENESS OF HYDROGEN'S POTENTIAL AS A CLIMATE SOLUTION

Like any emerging industry, hydrogen faces adoption challenges, partly due to a lack of public awareness of its potential as a decarbonization pathway and concerns about its safe production, transportation, and use. This lack of adoption affects the pace and timing of potential jobs the hydrogen industry will create.

Enhancing British Columbians' understanding of hydrogen's potential as a climate solution and its ability to be safely produced, transported, and used can contribute to the social acceptance of hydrogen projects. Social acceptance is one factor that can increase the certainty of projects moving forward and generate employment opportunities associated with the construction and operation of the hydrogen value chain.

ACTION 2.1A

Develop and implement a public education campaign to build awareness about hydrogen safety and its potential as a climate solution.



DESCRIPTION

An awareness and education campaign designed to enhance hydrogen knowledge.

- Co-create with diverse stakeholders to ensure messaging resonates with diverse population.
- Develop toolkit and resources for public hydrogen education.

Leverage the Southern Alberta Institute of Technology's (SAIT) *Low-Carbon Hydrogen: What Canadians Need to Know*.

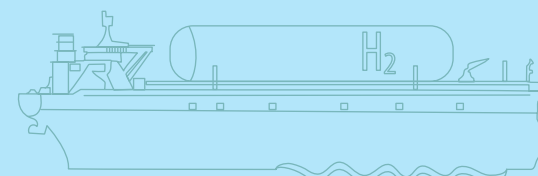
- Available for free and for audiences over 18 years of age.
- Explore partnership with SAIT to review and update their course to ensure it provides up-to-date information about the development of B.C.'s hydrogen industry.

TIMEFRAME

> Short-term (2026)

PARTNERS TO INVOLVE

Economic Development Organizations
Hydrogen employers
Hydrogen hub partners
Government of B.C.
Indigenous organizations
Industry associations
Municipal governments
Post-secondary institutions and trainers
Unions and trade associations



PROMISING PRACTICES

Harnessing Hydrogen and Community Benefits Public Forums

Offers materials to support hosting deliberative and structured public conversation about emerging hydrogen technologies with complex business, environmental and social implications including:

- Harnessing Hydrogen: An interactive activity to build hydrogen-based supply chains to teach participants about hydrogen and foster discussion about the economic, social and environmental implications associated with different ways of producing, transporting, and using hydrogen.
- Exploring Benefits: An interactive workshop to explore benefits for a hypothetical community that has been approached about hosting a hydrogen fuel cell trucking project.

TOOLS & RESOURCES

A Resource for Building Stronger Community Engagement in Hydrogen Hubs (Energy Futures Initiative (EFI) Foundation)

Low-Carbon Hydrogen: What Canadians Need to Know

BC First Nations Hydrogen Initiative – Hydrogen 101 Workshop (2023)



2.2 INCREASE AWARENESS OF B.C.'S HYDROGEN INDUSTRY AND ITS CAREERS

Talent shortages are a risk for the hydrogen industry as some of its core occupations are already facing labour shortages including engineers, truck drivers, manufacturing production technicians, plant operators with power engineering certification, and industrial trades such as industrial electricians, instrumentation technicians, refrigeration mechanics, construction mechanics, and heavy-duty equipment technicians.

Talent constraints in these occupations are Canada-wide¹² and shortages are the result of a combination of factors. The actions associated with this strategic requirement are designed to address to two key causes of talent shortages:

- Not enough workers entering the occupation to replace retiring workers.
- Lack of career awareness and the negative perception associated with some types of jobs impact attraction to some occupations.

To increase attraction into the hydrogen industry's core occupations there is a need to:

- Enhance awareness of the career opportunities and pathways available in the hydrogen industry.
- Increase participation in foundational degree, diploma, and trades training required by the hydrogen industry.
- Promote the opportunity to build a resilient career in B.C.'s energy industry while contributing to provincial and global climate targets.

ACTION 2.2A

Develop and implement an outreach plan to share the Analysis, and Strategy and Action Plan.

DESCRIPTION

Share key findings for developing an equitable, inclusive, and diverse workforce for the hydrogen industry.

- Use partners' and the Province's networks and communications channels to distribute the findings.
- Interactive presentations offer an opportunity to validate key findings and recommendations for capacity-building.
- Create interest and buy-in for taking action among partners involved.

Customize information and messaging for each audience.

- Create support materials such as: presentations, information sheets, etc.

Partner with organizations representing target audiences to assist with outreach.

Multi-pronged approach: written communication, virtual and in-person presentations.

Could be stand-alone presentations or leverage existing events (e.g., BC Natural Resources Forum, Union of B.C. Municipalities [UBCM], regional events such as the Future Fuels Forum in Prince George, etc.).

- Opportunity to gauge interest in participation in collaborative efforts to develop the workforce for the hydrogen industry including being part of the Hydrogen Workforce Development Committee.

TIMEFRAME

> Immediate (2025)

PARTNERS TO INVOLVE

- Career/employment agencies
- Local businesses and Chambers of Commerce
- Economic Development Organizations
- Government of B.C.
- Hydrogen employers
- Hydrogen hub partners
- Indigenous communities
- Industry associations
- Municipal governments
- Post-secondary institutions and trainers
- Unions and trade associations

PROMISING PRACTICES

Hydrogen Education for a Decarbonized Global Economy (H2EDGE)

H2EDGE, an EPRI initiative, is supported by the U.S. Department of Energy as a program to develop and train the emerging hydrogen industry workforce through professional development activities and targeted instruction at the post-secondary level.

EPRI is an entity of 20 university partners and 20 industry partners that collaborate to accelerate workforce development through two main streams:

1. Assessing academic and professional workforce needs; and
2. Developing short courses for professionals and curricula for universities.

Collaboration and technology transfer are emphasized here and enable diverse representation in the emerging workforce, with a strong focus on Historically Black Colleges and Universities (HBCU).¹³

EPRI has developed a series of professional development courses required across a number of hydrogen-related occupations (i.e.: micro-credentials), including:

- Basics of Hydrogen Science
- Trends in Electrolyser Technology
- Hydrogen Applications in a Low-carbon Economy
- Hydrogen Storage and Delivery
- Hydrogen in Power Generation

H2EDGE has established a Hydrogen Safety Panel to develop a safety module to be added to other courses.



ACTION 2.2B
Develop and promote profiles and pathways for hydrogen careers to increase awareness of opportunities.



DESCRIPTION

Demonstrate the foundational qualifications required (degrees, diploma, and apprenticeship) and potential pathways into the hydrogen industry.

- Target audiences: high school students, post-secondary students, and workers exploring a career transition.

Hydrogen website being developed by Canadian Hydrogen Association (CHA) maybe appropriate place for hydrogen career information.

Once profiles and pathways are complete, develop, and implement a marketing plan.

- Promote working in the hydrogen sector as an opportunity to be part of the climate solution for B.C., Canada, and the world.

TIMEFRAME

> Short-term (2026)

PARTNERS TO INVOLVE

Hydrogen employers
 Government of B.C.
 Industry associations
 Career/employment agencies



PROMISING PRACTICES

The following are examples of websites that promote careers in hydrogen:

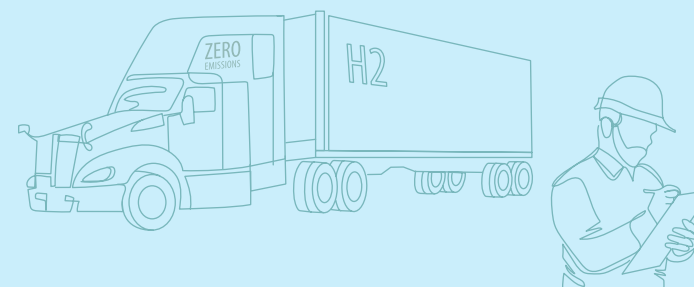
- [Careers in Energy – Career Pathways](#)
- [Careers in Energy – Hydrogen Explainer Video](#)
- [Fuel 4 the Future](#)
- [Hydrogen and Fuel Cells Career Map](#)



TOOLS & RESOURCES

[B.C. Hydrogen Value Chain and Workforce Map](#)
 (To be posted on Canadian Hydrogen Association's website)

[Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)



ACTION 2.2C

Foster early interest in B.C.'s clean energy economy and hydrogen industry by strengthening K-12 education programs.



DESCRIPTION

Establish an entity, or work with an existing one, to engage k-12 students, teachers, and parents in learning more about clean energy, including hydrogen.

- Classroom activities, site tours, interactive activities, conferences, and digital experiences can engage younger generations and the broader public in hydrogen technologies.

Promote the career opportunities in clean energy including hydrogen.

Note: this action aligns with the recommendation in the [Industry Strategy: B.C.'s Workforce Readiness for A Clean Economy Future](#) to "Address youth readiness for clean economy occupations, with a focus on developing the skills and competencies needed for success in the clean economy".

TIMEFRAME

> Long-term (2030)

PARTNERS TO INVOLVE

Hydrogen employers
Government of B.C.
Industry associations
K-12 education system
Organizations already offering career information for K-12 system

PROMISING PRACTICES, TOOLS & RESOURCES

Inside Education

Bringing environmental and natural resource education to life for students and teachers.

This website provides information on:

- Learning Resources
- Teacher Professional Development
- Grants, which are available to make students' energy education ideas come to life.
- Classroom & Field Trips Ideas
- Youth Summits

Horizon Educational

- Design, produce, and distribute science, technology, engineering, and math (STEM) education kits and teaching materials to enable k-12 students to develop renewable energy technology skills through hands-on learning.
- Classroom equipment includes hydrogen fuel cell model cars, wind/hydrogen conversion kits, solar energy demonstration kits, and complete full cell stacks. Products come with lesson plans, quizzes, and instructional videos.
- Used by teachers to help students understand the key scientific processes behind the renewable energy technologies including solar energy, wind energy, and thermal power to super capacitors, hydrogen fuel cells, electrolysers, and bioenergy.

Ten Peaks Innovation

- Engages, educates, and inspires learners through high-quality learning opportunities.
- Conferences, webinars, and communities of practice designed to create a deeper understanding of the relationships between energy, environment, and climate.
- For teachers: monthly webinar series and communities of practice to support integration of high-quality energy, environmental and climate education into curriculum.
- For students: camps and case competitions where participants work together to solve a business problem and present their solution to a panel of judges.
- Annual conference: a free day-long exchange for students to help them understand the vital role they can play in Alberta's and Canada's future. Brings together industry experts, academia, innovators, Indigenous leaders, entrepreneurs, students, and teachers for a hybrid (in-person and virtual) conference.
- Ten Peaks [Shared Resources](#)





2.1
ENHANCE PUBLIC
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HYDROGEN'S
POTENTIAL AS A
CLIMATE SOLUTION

2.2
INCREASE
AWARENESS OF B.C.'S
HYDROGEN
INDUSTRY AND ITS
CAREERS

2.3
STRATEGIC
FORESIGHTING OF B.C.'S
CLEAN ENERGY WORK-
FORCE REQUIREMENTS
INCLUDING HYDROGEN

2.4
BUILD B.C.'S
HYDROGEN TALENT
PIPELINE

2.5
ENSURE EQUITABLE
ACCESS TO
CAREERS IN B.C.'S
HYDROGEN
INDUSTRY

2.6
EMPLOYMENT IN
B.C.'S CLEAN
ENERGY ECONOMY
AS A PATHWAY TO
RECONCILIATION

2.7
CUSTOMIZE
CAPACITY-BUILDING
STRATEGIES AND
ACTIVITIES FOR B.C.
HYDROGEN HUBS

2.3 STRATEGIC FORESIGHTING OF B.C.'S CLEAN ENERGY WORKFORCE REQUIREMENTS INCLUDING HYDROGEN

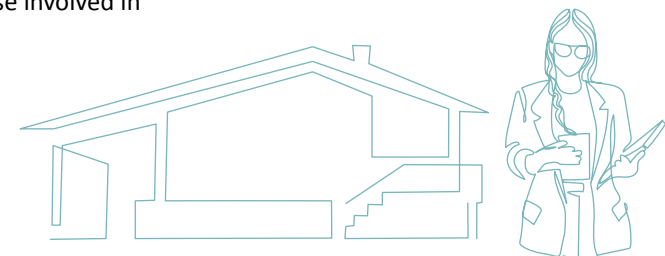
Uncertainty poses a significant risk to the hydrogen industry. There are many unknowns about project timelines and industry expansion that affect the size and stability of employment opportunities. Career decision-makers, including students and those transitioning into new careers, are hesitant to put time and funds into training for a career that may not come to fruition. Increase awareness post-secondary institutions and trainers want to ensure they are offering courses that deliver in-demand occupations and skills before they allocate resources to course development. Governments also face challenges balancing demands across multiple sectors and making decisions regarding funding priorities.

However, the hydrogen industry, post-secondary institutions, other training organizations, and governments acknowledge that delaying actions to prepare a hydrogen workforce increases the risk of talent shortages. The lack of qualified workers often leads to schedule and cost overruns because the skills needed to complete work on time are not available, and wages escalate due to increased competition for workers.

Foresighting, when applied to workforce analysis, can help develop a resilient workforce amid uncertainty. Foresighting is a strategic planning approach that aids in navigating uncertainty across economies, industries, and businesses. Rooted in systems thinking, it explores possible futures by understanding various indicators, signals, and trends that affect a system as a whole rather than focusing on specific components. This Strategy and Action Plan recommends conducting a foresighting exercise to examine workforce and capacity-building needs related to B.C.'s evolving clean energy system, including hydrogen, but not exclusively. The goal of this strategic approach is to prepare the hydrogen workforce by identifying opportunities to enhance the skills of the labour force that are also relevant and in-demand across other industries in the clean energy system.

For B.C., foresighting at both the provincial and regional levels can provide insights into occupation and skill requirements for the hydrogen sector by examining the economy and cross-sector trends to find similar occupations and transferable skills. These insights can serve as a basis for developing training programs that are inclusive of hydrogen industry needs, without being solely reliant on the expansion of hydrogen employment.

The timeframe for this action is more urgent in certain regions. The Cariboo and Northeast regions have recently experienced closures of wood manufacturing plants. The employment impacts associated with these closures do not only affect the workers at the facilities; they also impact the entire supply chain, including those involved in harvesting the wood and transporting wood products to customers.



ACTION 2.3A

Use strategic foresighting to identify workforce and skill requirements for the transition to a low-carbon economy, that includes hydrogen.



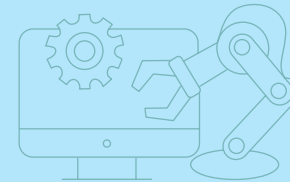
DESCRIPTION

Identify opportunities to initiate workforce development that do not rely solely on the deployment of hydrogen, focusing on:

- A multi-discipline/multi-sector approach.
- Previous work completed to understand the readiness of the B.C. clean economy workforce and how this is complementary to foresighting workforce requirements.

Regional/hub-specific approach to understand the impact of local labour market and economy dynamics on workforce requirements.

- Consider the expansion and contraction of industries at a regional level.



TIMEFRAME

Immediate (2025) for some regions due to disruptions to industries and plant closures.
Short-term (2026)

PARTNERS TO INVOLVE

Chambers of Commerce
Economic Development Organizations
Hydrogen employers
Hydrogen hub partners
Government of B.C.
Indigenous communities
Industry associations
Municipal governments
Post-secondary institutions and trainers
Unions and trade associations

PROMISING PRACTICES

Jobs and Skills in the Transition to a Net-Zero Economy: A Foresight Exercise

Canadian study that found that the skills expected to lose jobs due to transition to a net-zero economy are the same as the top skills expected to grow. This means that workers that may be negatively impacted by transition are likely to have skills transferable in a decarbonized future. For example, the study found:

- The skills profiles for jobs that will emerge in alternative fuel sectors are similar to those of current occupations within the industrial gas manufacturing industries and chemical manufacturing sectors.
- Those employed in equipment manufacturing will still need skills like quality control, systems analysis, programming, and operation and control even though the industry will increase its use of low-carbon inputs and incorporate circular economy practices.

TOOLS & RESOURCES

[Training in Uncertainty: Skills Foresight for a Just Green Hydrogen Transition \(2024\)](#)

[Skills Foresight: Making Sense of Emerging Labour Market Trends](#)

[Developing Skills Foresights, Scenarios and Forecasts: Guide to Anticipating and Matching Skills and Jobs Volume 2](#)

[B.C. Hydrogen Hub Assessment Reports by Foresight Canada](#)

- [Envisioning a Hydrogen Hub in the Lower Mainland \(July 2024\)](#)
- Other reports forthcoming

[Industry Strategy: British Columbia's Workforce Readiness for a Clean Economy Future](#)

[BC Clean Economy Workforce Readiness Project: Phase 2 Labour Market Information Research: SUMMARY REPORT](#)



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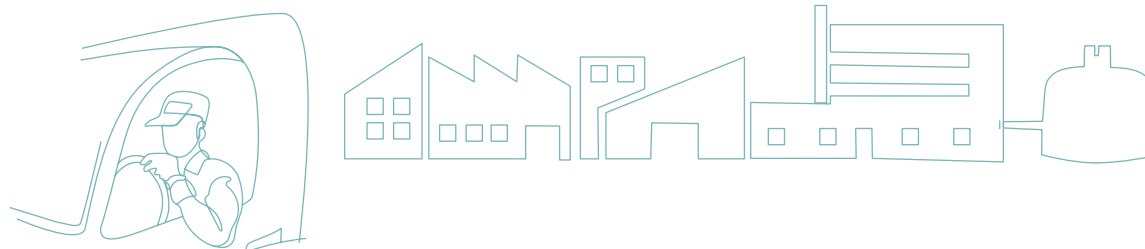
2.4 BUILD B.C.'S HYDROGEN TALENT PIPELINE

The foundational qualifications required by the hydrogen industry, including degrees, diplomas, and trades certifications, are already delivered by B.C. post-secondary and training institutions.¹⁴ This means there is opportunity to leverage existing expertise found in B.C.'s natural gas, pulp and paper, power generation, petrochemical, refineries, aviation/aeronautics, liquified natural gas (LNG), and mining industries to advance the hydrogen industry.

While the actions included in section 2.2 “Enhance Awareness of B.C.’s Hydrogen Industry and its Careers” are designed to attract British Columbians into the foundational qualification training required by the hydrogen industry, the actions included in this section focus on providing hydrogen-specific training to those that already have the foundational qualifications. This will help develop a group of qualified candidates who are ready with hydrogen-specific skills and knowledge, as well as transferable industrial experience, to fill hydrogen employment opportunities as they become available.

Short-term training, such as micro-credential programs, will support the transition of workers between those industries mentioned above and the hydrogen industry. There is, however, a gap in the availability of hydrogen-specific micro-credentials in B.C.’s post-secondary and training systems. This gap needs to be filled to help prepare B.C.’s labour market for employment in the hydrogen industry.

As the hydrogen industry expands and the demand for hydrogen-specific skills increases, micro-credential programs can be embedded in foundational qualification programs. Collaboration between industry, post-secondary training, and unions and trade associations for course development is key to establish standardized training programs that ensure consistency and quality while hydrogen-specific codes and standards are still being developed.¹⁵



ACTION 2.4A

Create an inventory of hydrogen-related training programs.

DESCRIPTION

Enhance awareness of existing hydrogen-related training programs by creating a centralized, online catalogue.

- This resource could be searchable by geographic locations learners may be most interested in accessing training from such as specific provinces, Canada, or North America.

Develop a mechanism to ensure inventory can be consistently updated.

Hydrogen website being developed by CHA maybe appropriate place for inventory.

TIMEFRAME

> Short-term (2025)

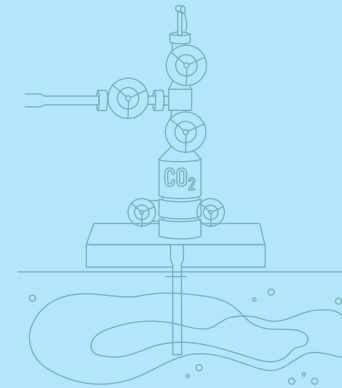
PARTNERS TO INVOLVE

Hydrogen employers

Industry associations

Post-secondary institutions and trainers

Unions and trade associations



PROMISING PRACTICES

TradeUpBC website highlights a diverse array of short courses offered across B.C. that are specifically designed to upskill trades people to better and focus on areas of demand:

- Adapt to Changes in Technology and Digitization
- Address the Impact of Climate Change
- Develop Business, Managerial and Leadership Skills
- Build Leadership Skills for Effective Apprenticeship Guidance
- Promote Inclusive Workplaces and Reconciliation
- Identify and Support Pathways to Become Educators
- Ensure the Health and Safety of the Workplace

European Hydrogen Observatory

An inventory of hydrogen-related courses or programmes in European countries. Features include:

- A map displays training programmes based on location and allows filtering by type of training, focus of the training, and language of instruction.
- Programs listed as part of the inventory are compiled by having training institute share standard information about the course using a questionnaire. To be listed, a minimum set of information and references are required.

TOOLS & RESOURCES

International Hydrogen Training Programs:

Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap (2022) (Australia)

- Appendix A-J lists several international hydrogen training programs



ACTION 2.4B

Develop a suite of hydrogen micro-credentials to address hydrogen skill and knowledge requirements that are common across hydrogen occupations.

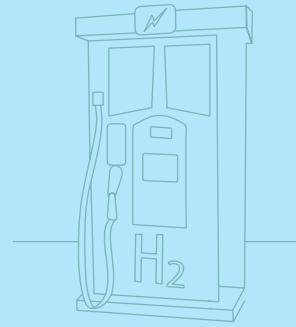


DESCRIPTION

Develop a series of online hydrogen courses focused on fundamental hydrogen knowledge required by the industry's core occupations.

Online courses covering topics such as:

- Hydrogen fundamentals.
- Hydrogen safety.
- Low-carbon hydrogen production pathways and technologies.
- Hydrogen storage and distribution.
- Hydrogen end-uses: industrial processes, transportation, heating/power, export.



TIMEFRAME

> Short-term (2026)

PARTNERS TO INVOLVE

Hydrogen employers
Industry associations
Post-secondary institutions and trainers
Unions and trade associations



PROMISING PRACTICES

European Hydrogen Skills Alliance

Members of the Alliance have worked collaboratively to develop and offer the following free training modules:

- Hydrogen Fundamentals
- Hydrogen Production
- Hydrogen Storage and Distribution
- Hydrogen Energy Use: Domestic and Industrial
- Hydrogen Energy Use: Feedstock
- Hydrogen Energy Use: Transport

H2EDGE has developed short courses based on assessment of common skill and knowledge requirements required across a number of hydrogen occupations:

- Hydrogen Applications in a Low-Carbon Economy
- Hydrogen Delivery and Storage
- Trends in Electrolyzer Technology
- An Introduction to the Basics of Hydrogen Science
- Hydrogen in Power Generation
- Hydrogen Final Energy: Sources and End Uses
- Hydrogen Safety (under-development)

TOOLS & RESOURCES

Gain insights into hydrogen skills and knowledge required by the majority of core hydrogen occupations from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\)](#) (Australia)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)
- [Identification of Skills Needed for Hydrogen Economy \(2024\)](#) (South Africa)

International Hydrogen Training Programs:

[Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap \(2022\)](#) (Australia)

- Appendix A-J lists several international hydrogen training programs

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework and Micro-credential Toolkit](#)

ACTION 2.4C

Develop and implement a professional development program to train and support instructors delivering hydrogen-related courses and micro-credentials.

DESCRIPTION

As hydrogen micro-credentials are developed, there is a need to ensure instructors have the skills and knowledge to deliver them.

- Some instructors will be involved in the development of the hydrogen micro-credentials.

Engage professors and instructors with expertise, as well as industry, to deliver professional development workshops to instructors and enhance comfort in delivering courses.

- Consider site tours to university hydrogen hubs, hydrogen production sites, hydrogen refuelling stations, etc.

TIMEFRAME

> Short-term (2026)

PARTNERS TO INVOLVE

Hydrogen employers
Industry associations

Post-secondary institutions and trainers

Unions and trade associations



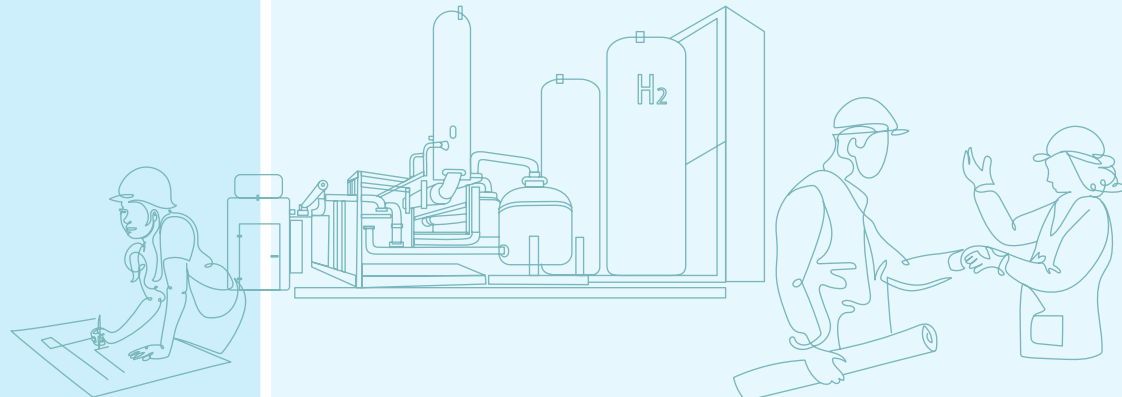
PROMISING PRACTICES

H2EDGE Hydrogen Curriculum Workshop: basic hydrogen science course to university and industry affiliates.

TOOLS & RESOURCES

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework and Micro-credential Toolkit](#)



ACTION 2.4D Develop a micro-credential on business topics related to hydrogen.



DESCRIPTION

Designed to build the skills and knowledge needed by those working to establish a business ecosystem that supports the adoption of hydrogen.

- Business and commercial development, regulatory, sustainability and ESG professionals.

Topics may include:

- Benefits and risks associated with hydrogen.
- Feasibility of hydrogen projects and technologies.
- Key business, sustainability, and ESG drivers.
- Regulations, and economic and policy frameworks related to hydrogen.



TIMEFRAME

> Medium-term (2030)

PARTNERS TO INVOLVE

Hydrogen employers
Industry associations
Post-secondary institutions and trainers
Unions and trade associations

PROMISING PRACTICES

The Business of Hydrogen (H2EDGE Common Course)

A credit course offered through C.T. Bauer College of Business, University of Houston that covers all the business, policy and regulatory aspects of a low carbon hydrogen industry. Topics covered over five modules:

Module 1: Introduction to the Current Global Energy System Drivers

- Challenges of the Current Energy Transition
- Current Global Hydrogen System
- Hydrogen's Role as a Low Carbon Energy Carrier and Fuel

Module 2: Potential Global Low Carbon Hydrogen System - Production

- Potential Global Low Carbon Hydrogen System – Transportation & Storage
- Potential Global Low Carbon Hydrogen System – End Uses

Module 3: Associated Low Carbon Energy Value Chains – Low Carbon Electricity, CCUS, Equipment

- Costs of a Low Carbon Hydrogen Value Chain

Module 4: Markets and Trade in Low Carbon Hydrogen

- Development of Regional Hydrogen Hubs
- Policy Choices – Incentives and Regulations
- New Business Models and Key Players in a Low Carbon Hydrogen Industry

Module 5: Team Presentations – no exam

Credit and grade granted based on a mix of biweekly quizzes, homework, and a team project.

Clean Energy Professional Upskilling (NAIT)

A 16-week program design for professionals with degrees or diplomas and 3+ years of work experience to develop skills for careers in clean energy sectors. Is a combination of online course work and work integrated learning placement. Topics covered include:

- Introduction to clean fuels.
- The hydrogen economy.
- Hydrogen production and storage.
- Hydrogen transportation.
- Introduction to operations management.
- Lifecycle assessment and carbon accounting.
- Feasibility planning for carbon capture, utilization, and sequestration.
- Operation and maintenance of carbon capture facilities and sequestration facilities.
- Cultural intelligence.
- Equity, diversity, and inclusion.
- Biases and microaggressions.

Upon successful completion, participants receive a certificate of achievement and nine micro-credentials.

TOOLS & RESOURCES

Gain insights into hydrogen skills and knowledge required by business and commercial development, regulatory, sustainability and ESG professionals from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\)](#) (Australia)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)
- [Identification of Skills Needed for Hydrogen Economy \(2024\)](#) (South Africa)

International Hydrogen Training Programs:

[Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap \(2022\)](#) (Australia)

- Appendix A-J lists several international hydrogen training programs

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework and Micro-credential Toolkit](#)

ACTION 2.4E

Develop hydrogen specific micro-credentials for engineers and engineering-related occupations.



DESCRIPTION

Designed to upskill engineers and engineering-related occupations, such as technologists, to work in the hydrogen industry.

Potential topic areas include:

- Project management.
- Design of hydrogen infrastructure projects.
- Material integrity.
- Integration of hydrogen into existing systems and processes.
- Risk mitigation strategies.



TIMEFRAME

> Medium-term (2030)

PARTNERS TO INVOLVE

Hydrogen employers
Industry associations
Post-secondary institutions and trainers
Unions and trade associations

PROMISING PRACTICES

Professional Certificate of Competency in Hydrogen Energy – Production, Delivery, Storage, and Use (Australia)

A certificate course designed for engineers and professionals. The 12 modules cover the fundamental principles and concepts used in process design and plant design including:

- Hydrogen production methods, with a specific attention to producing hydrogen from renewable energy using electrolysis.
- Hydrogen storage methods.
- Process of electrical energy generation from hydrogen by using fuel cell technology.
- The hydrogen economy, future trends, and opportunities and challenges.
- Hydrogen properties and safety, including its application to hydrogen production plants and refueling stations.

What Engineers Need to Know About Hydrogen Safety (U.K.)

An introductory course on hydrogen safety designed for engineers, project managers, project engineers, health, safety and environment (HSE) professionals, business development managers, and operations personnel. Course outline includes:

- Physical properties of hydrogen.
- Hazards presented by hydrogen, ammonia, and other energy vectors.
- The life cycle of process safety for hydrogen projects, from concept development to project execution.
- Overview of risk mitigation strategies for hydrogen production, storage, transportation, distribution, and use.
- How to develop an understanding of the hazards and risks associated with the use of hydrogen within the context of a new project design.
- Review of process safety incidents involving hydrogen and the learnings that have been derived from past accidents.

TOOLS & RESOURCES

Gain insights into hydrogen-specific skills required by engineers and engineering-related occupations from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\)](#) (Australia)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)
- [Identification of Skills Needed for Hydrogen Economy \(2024\)](#) (South Africa)

International Hydrogen Training Programs:

[Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap \(2022\)](#) (Australia)

- Appendix A-J lists several international hydrogen training programs

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework and Micro-credential Toolkit](#)

ACTION
2.4F
Develop micro-credentials to upskill existing trades to work in the hydrogen industry.



DESCRIPTION

Develop micro-credentials to augment certified trades and registered apprentices with the skills and knowledge required to work in the industry.

- Electrical/instrumentation, heavy mechanical, industrial construction, and welding.
- Vancouver Community College (VCC) is already working with industry to develop micro-credential for heavy-duty equipment mechanics.

Potential topics to include:

- Electromechanical installations and maintenance.
- Fuel cell installations and maintenance.
- Material science including selection and installation of coatings and sealants appropriate for hydrogen.
- Selection of equipment and systems appropriate for hydrogen.
- Material integrity for hydrogen.
- Integration of hydrogen use into existing industrial equipment and systems.
- Selection and installation of hydrogen detection systems.

Update relevant trades standards/qualifications to include hydrogen skill and knowledge requirements.

Advocate for adoption of use of hydrogen micro-credentials at the Red Seal level.

TIMEFRAME

> Medium-term (2030)

PARTNERS TO INVOLVE

TradeUpBC

Hydrogen employers

Industry associations

Post-secondary institutions and trainers

Unions and trade associations



PROMISING PRACTICES

Zero Emissions Vehicle Service and Technology for Automotive Service Technicians (VCC)

A continuing education course established in partnership with Toyota for certified Automotive Service Technicians and registered 3rd and 4th year apprentices. Training combines online theory and hands-on training on how to safely diagnose and service high voltage electric vehicles and hydrogen fuel cell vehicles. Upon successful completion of this course, students will be able to:

- Apply high voltage safety procedures.
- Distinguish different categories of high voltage vehicles.
- Service high voltage powertrain systems.
- Service high voltage battery charging systems.
- Compare high voltage vehicle drivetrain type.
- Explain hydrogen fuel cell systems.
- Explain hydrogen and air systems.
- Service hydrogen fuel cell vehicles.
- Service high voltage vehicle temperature management systems.
- Describe maintenance procedures for high voltage vehicles.
- Determine causes of common faults in current high voltage vehicles.

TOOLS & RESOURCES

Gain insights into hydrogen-specific skills required by trades occupations from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\)](#) (Australia)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)
- [Identification of Skills Needed for Hydrogen Economy \(2024\)](#) (South Africa)

International Hydrogen Training Programs:

[Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap \(2022\)](#) (Australia)

- Appendix A-J lists several international hydrogen training programs

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework](#) and [Micro-credential Toolkit](#)



ACTION 2.4G
Develop hydrogen-specific micro-credentials to upskill plant operators.



DESCRIPTION

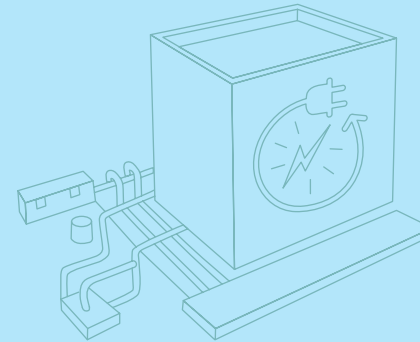
Target audience is experienced power engineers and process operators.
 Provide skills and knowledge for hydrogen-specific production operations and industrial processes.

Topics may include:

- Hydrogen production processes.
- Compression of hydrogen.
- Electrochemistry.
- Handling high pressure hydrogen at very high and very cold temperatures.
- Integration of hydrogen into existing industrial processes and platforms.

Explore partnership/licensing of Mohawk College's courses:

- Hydrogen Awareness and Understanding for Process-Related Occupations.
- Entry-level Technical Applications in Hydrogen for Process Occupations.



TIMEFRAME

> Medium-term (2030)

PARTNERS TO INVOLVE

- Hydrogen employers
- Industry associations
- Post-secondary institutions and trainers
- Unions and trade associations



PROMISING PRACTICE

Hydrogen Awareness and Understanding for Process-Related Occupations

(Mohawk College program currently available through SAIT)

This 24-hour online hydrogen awareness course for mid-career professionals working in process-related occupations across Canadian industries. Designed to provide foundational technical knowledge on the production and uses of hydrogen as well as the economic and safety challenges posed by hydrogen.

Topics of instruction:

- Introduction to Hydrogen
- Integration of Hydrogen in Industrial Processes
- Safety Management for Hydrogen

Students who successfully complete this course with a final grade of B (73%) or higher will earn a micro-credential and receive a shareable digital badge.

Entry-level Technical Applications in Hydrogen for Process Occupations

(Mohawk College program currently available through SAIT)

This 48-hour online hydrogen awareness course for mid-career professionals working in process-related occupations across diverse industries in Canada. Topics of instruction:

- Process Optimization and Efficiency
- Environmental and Sustainable Impacts
- System Integration and Infrastructure Development

Students who successfully complete this course with a final grade of B (73%) or higher will earn a micro-credential and receive a shareable digital badge.

TOOLS & RESOURCES

Gain insights into hydrogen-specific skills required by plant operator occupations from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\)](#) (Australia)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)
- [Identification of Skills Needed for Hydrogen Economy \(2024\)](#) (South Africa)

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework and Micro-credential Toolkit](#)

International Hydrogen Training Programs:

[Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap \(2022\)](#) (Australia)

- Appendix A-J lists several international hydrogen training programs

ACTION

2.4h

Develop a training program designed to increase the workforce qualified to work as a hydrogen plant operator.



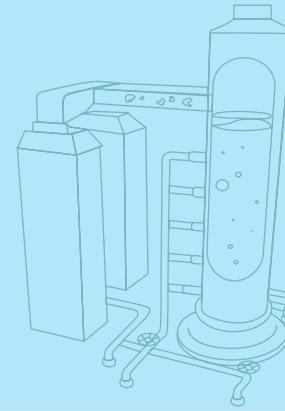
DESCRIPTION

This program expands the talent pool with the foundational qualifications required to work in hydrogen production plants as well as other processing industries.

- Foundational qualification is 4th class power engineer certificate.

Explore partnership/licensing of College of North Atlantic's Hydrogen Technician program.

- Power engineering (4th class) is the foundational training; hydrogen-specific modules added on.



TIMEFRAME

> Medium-term (2030)

PARTNERS TO INVOLVE

Hydrogen employers

Industry associations

Post-secondary institutions and trainers

Unions and trade associations



PROMISING PRACTICES

Hydrogen Technician Program – College of the North Atlantic (CNA)

A 2-year in-person diploma program the CNA's School of Sustainable Development. Upon successful completion, graduates will have the skills and knowledge to:

- Demonstrate the practical skills necessary for a 4th Class Power Engineer. Prepare for a provincial examination in Power Engineering 4th Class part "A" and "B".
- Demonstrate safety procedures required in hydrogen, ammonia, fuel, and steam-based plant environments. Demonstrate problem solving skills and team-based work practices to optimize hydrogen production.
- Utilize essential skill training to enhance career experience and opportunities.
- Utilize control documentation and reporting systems in power engineering and process operation environments.
- Develop and practice mechanical and electrical diagnostics, installation, calibration, repair, and replacement of instruments, controls, output devices, in start-up, idle, shut down, decommissioning, and commissioning within a processing environment.
- Develop and employ standardized operating procedures using technology integrated preventative maintenance procedures for reliability utilizing performance data, monitoring, production indicators, and quality tracking.
- Develop a comprehensive familiarity for safe processing of cryogenic based fuel cells, electrolysers, cooling systems, transportation systems, handling, maintenance, storage, and electrolysis.

TOOLS & RESOURCES

Gain insights into hydrogen-specific skills required by trades occupations from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\)](#) (Australia)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\)](#) (Canada)
- [Identification of Skills Needed for Hydrogen Economy \(2024\)](#) (South Africa)

International Hydrogen Training Programs:

[Swinburne University of Technology, Victorian Hydrogen Hub - Hydrogen Skills Roadmap \(2022\)](#) (Australia)

- [Appendix A-J lists several international hydrogen training programs](#)

B.C. Ministry of Post-Secondary Education and Future Skills:

- [Micro-credential Framework and Micro-credential Toolkit](#)



2.1
ENHANCE PUBLIC
AWARENESS OF
HYDROGEN'S
POTENTIAL AS A
CLIMATE SOLUTION

2.2
INCREASE
AWARENESS OF B.C.'S
HYDROGEN
INDUSTRY AND ITS
CAREERS

2.3
STRATEGIC
FORESIGHTING OF B.C.'S
CLEAN ENERGY WORK-
FORCE REQUIREMENTS
INCLUDING HYDROGEN

2.4
BUILD B.C.'S
HYDROGEN TALENT
PIPELINE

2.5
ENSURE EQUITABLE
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CAREERS IN B.C.'S
HYDROGEN
INDUSTRY

2.6
EMPLOYMENT IN
B.C.'S CLEAN
ENERGY ECONOMY
AS A PATHWAY TO
RECONCILIATION

2.7
CUSTOMIZE
CAPACITY-BUILDING
STRATEGIES AND
ACTIVITIES FOR B.C.
HYDROGEN HUBS

2.5 ENSURE EQUITABLE ACCESS TO CAREERS IN B.C.'S HYDROGEN INDUSTRY

The business case for reducing labour market and education and training barriers for under-represented groups including women, visible minorities, immigrants, and people with disabilities is multifaceted. Increasing the participation of under-represented groups in B.C.'s hydrogen industry will help to address talent shortages, and progress industry and company sustainability and ESG goals. Increasing opportunities for Indigenous Peoples is included in the next capacity-building requirement and actions.

Systemic barriers have prevented the participation of under-represented groups in many of the core occupations needed by the hydrogen industry. Data indicates the groups identified above are under-represented in industrial trades occupations. High-paying occupations such as engineers, and technologists and technicians continue to be male-dominated. Immigrants tend to be trained in professional occupations such as engineers, accountants, and information and communications technology occupations but remain under-represented in industries similar to hydrogen (energy, electricity, and construction). Persons with disabilities make up less than 1% of the workforce in hydrogen-like industries but account for almost 16% of Canadians in the workforce.¹⁶

Addressing the barriers causing under-representation is complex, and ensuring equitable access to employment requires a holistic approach. A socio-ecological approach helps to better understand the complexity of systemic barriers, as it considers the interactions between society, organizations, and people. Equally important, a socio-ecological understanding of barriers provides guidance on the strategies and actions required to address complex barriers.

The four socio-ecological levels of barriers are as follows:

- Structural - structures, systems, and beliefs at a macro-societal level.¹⁷
- Organizational - practices, policies, and culture at an organizational level.
- Interpersonal - attitudes and behaviours of individuals in the workplace.
- Individual - knowledge, skills, beliefs, self-perception, and confidence of the individual in the under-represented group.

Section 7, "Ensuring Equitable Access to Hydrogen Employment Opportunities" in the Analysis outlines the four socio-ecological levels of barriers to education and employment for underrepresented groups, as well as identifies the supports required to improve equitable access. It compiles insights from interviews and research and serves as a resource for implementing this recommended action.

The action under this strategic requirement recommends co-creating programs with representatives of under-represented groups and ensuring the programs are designed to address barriers at multiple levels. Also, given the uncertainty related to the timing and opportunity for hydrogen employment, a multi-sector approach to design and implementation is recommended. This can be accomplished by focusing on developing the skills, knowledge, and certification required for multiple industries rather than specifically focusing on hydrogen.

ACTION 2.5A

Develop a multi-sector, multi-disciplinary program to enhance inclusion of under-represented groups in the occupations required by the hydrogen industry.



DESCRIPTION

Leverage strategic foresighting work to inform sector, occupation and skills focus.

Co-create programs with representation from under-represented groups.

Ensure programs address barriers beyond the individual level to include those at the interpersonal and organizational levels. Some factors to consider:

- Local training.
- Use of role models, mentors and sponsors.
- Wrap around supports to enhance trainees' success including such as childcare, transportation, and mental wellness programs.
- Appropriately fitting equipment and safety gear.
- Work integrated learning with companies that have zero tolerance for harassment and violence, and culture of inclusion.
- Extensive onboarding and site-specific training.
- Employee/trainee codes of conduct indicating commitment to uphold values of respect and inclusivity.

- Cultural awareness and competency training for trainees and employers.

Consider program readiness training to support the development of foundational skills and knowledge to be successful in the pre-employment training program.

- For trades, operators, and other technical roles, this may include written communication, math, and science studies to enhance chance of success.

Explore possibility of expanding existing promising practices designed for the mining and LNG industries to include hydrogen.

- Focus on occupations that overlap across sectors including trades and plant operations.

Pilot the program, evaluate, adjust, and implement improved program.

Document approach and promote through industry associations.

TIMEFRAME

> Short-term (2026)

PARTNERS TO INVOLVE

Hydrogen employers

Hydrogen hub partners

Government of B.C.

Indigenous communities

Industry associations

Municipal governments

Post-secondary institutions and trainers

Unions and trade associations

PROMISING PRACTICES

STEPS4GROWTH Program (addressing individual and organizational barriers)

This is a H2EDGE program led by North Carolina A&T State University, Centre for Energy Research. The program focuses on preparing high school students, displaced workers, and under-represented talent groups into four key sectors: energy efficiency, renewable energy, clean vehicles, and grid and storage.

Key features include:

- Partnership across 16 community colleges to create curriculum, apprenticeship programs, and work-integrated learning opportunities.
- Partnerships with employers as curriculum developers, instructors, and mentors.

Clean Energy Professional Upskilling (NAIT) (addressing individual, interpersonal, and organizational barriers)

A 16-week program design for professionals with degrees or diplomas and 3+ years of work experience to develop skills for careers in clean energy sectors. Is a combination of online course work and work integrated learning placement. Topics covered include:

- Introduction to clean fuels.
- The hydrogen economy.
- Hydrogen production and storage.
- Hydrogen transportation.

- Introduction to operations management.
- Lifecycle assessment and carbon accounting.
- Feasibility planning for carbon capture, utilization, and sequestration.
- Operation and maintenance of carbon capture facilities and sequestration facilities.
- Cultural intelligence.
- Equity, diversity and inclusion.
- Biases and microaggressions.

Upon successful completion, participants receive a certificate of achievement and nine micro-credentials. This program has proven to help bridge individuals with relevant foreign credentials and experience into Canada's labour force. The skills, knowledge, and Canadian work experience gained through this program enable new Canadians to be more competitive when applying for clean energy jobs. Ekona Power and HTEC have hired graduates of this program.

LNG Canada's Your Place Training and Employment Program for Women (addressing individual, interpersonal, and organizational barriers)

Program was a partnership between LNG Canada and its prime contractor, JGC Fluor, designed to attract and train women for employment in construction trades for the LNG Canada project. Key features:

- Four-week workplace readiness training program and employment supports designed to help the women succeed in the skilled trades.
- Training held at Kitimat Valley Institution to increase accessibility for First Nations and women across B.C.

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PROMISING PRACTICES

- Provided first-hand experience with the realities of a rotational work assignment, including living in company-provided workforce lodgings.
- Personal protective equipment was also provided.
- Graduates were offered entry-level positions with the project.

B.C. Centre of Training Excellence in Mining (CTEM's) Underground Mining Training Project

(addressing individual, interpersonal, and organizational barriers)

Program was a collaboration between CTEM, mining companies, and post-secondary institutions to train unemployed or under-employed persons for jobs in underground mines. This training was co-funding from federal and provincial governments. Key features of the program include:

- Indigenous liaison support.
- Wrap-around supports for students.
- Paid work-integrated learning.
- Onboarding by company's HR representatives.
- Cultural activities and cultural awareness training available for all company employees.
- Skills and the certification of recognition students obtained were transferable to other sectors.

Excellence in Manufacturing Consortium (EMC) B.C. Youth in Manufacturing Initiative (addressing individual and organizational barriers)

Program targets youth aged 16 – 24 years and designed to support technical manufacturing and employability training. Features that enhance the success of this training program:

- Skills training is relevant across the manufacturing industry, providing a multitude of opportunities for the participants.
- Includes short-term, paid work placements.
- Employers involved receive mentorship training and a financial subsidy of up to \$3,500 for each youth placed at their company.
- The pilot phase is 3-years long to provide time to go through implementation and adjusting cycle three times and continually improve the program.

SkilledTradesBC: Training Programs for Under-represented Groups

SkilledTradesBC partners with several service providers, training providers, and Indigenous organizations across B.C. to deliver skills development and employment programs. These programs are focused on meeting the needs of under-represented groups in the skilled trades including women, Indigenous peoples, and other under-represented groups.

TOOLS & RESOURCES

[A Framework for a Just Transition in South Africa \(2022\)](#)

[Just Energy Transition Implementation Plan 2023 – 2027 \(2023\)](#)

[The South African Green Hydrogen TVET Ecosystem Just Transition Strategic Framework \(2022\)](#)

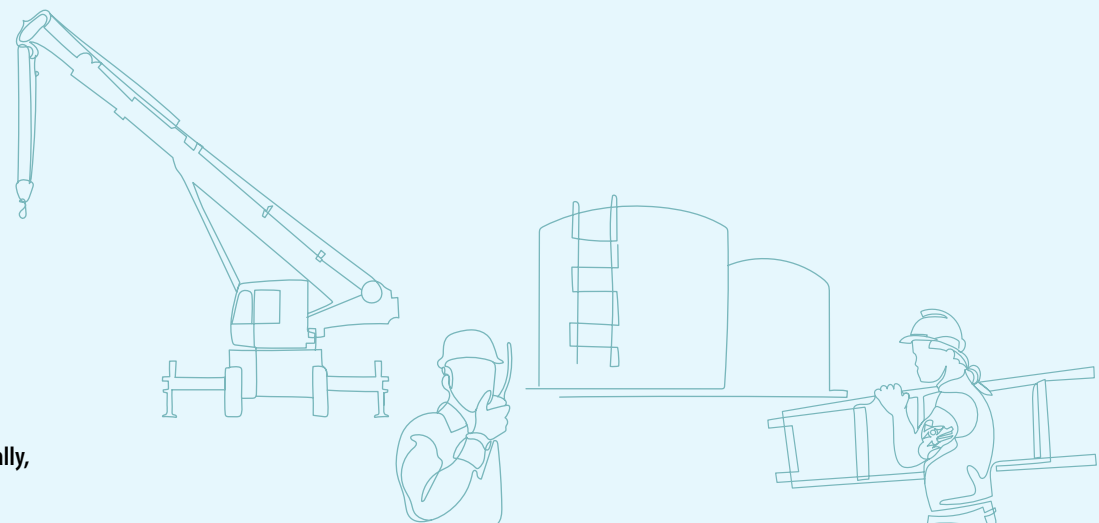
Unlocking Inclusive Pre-Apprenticeship Pathways

- The Diversity and Inclusion Tool helps educators evaluate activities and captures promising practices that make pre-apprenticeship programs more inclusive.

[Engendering Industries: best practices for improving workforce gender equity](#)

[Hire for Talent Toolkit: recruitment, hiring, inclusion and retention of people with disabilities.](#)

[Enserva's Remote Workforce Lodgings Industry – Community Commitment Toolkit: ensuring physically, emotionally, and culturally safe remote workforce lodgings \(camps\).](#)





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2.6 EMPLOYMENT IN B.C.'S CLEAN ENERGY ECONOMY AS A PATHWAY TO RECONCILIATION

Ensuring the inclusion of Indigenous People and communities in B.C.'s emerging clean energy economy is an opportunity to demonstrate industry, government, and academia's commitment to Indigenous reconciliation including alignment with the UNDRIP, the Declaration on the Rights of Indigenous Peoples Act, the Truth and Reconciliation Commission's Calls to Action, and the Final Report of the National Inquiry into Missing and Murdered Indigenous Women and Girls Calls for Justice.

Reconciliation is more than inclusion of Indigenous Peoples in economic activity and employment. It is about addressing the legacy of colonization that has caused Indigenous Peoples to be disadvantaged and excluded from economic benefits. Similar to the socio-ecological approach outlined in section 2.5, Ensure Equitable Access to Hydrogen Career Opportunities, the fundamental structural, organizational, interpersonal, and individual barriers that have disempowered Indigenous People from participating in the labour market need to be addressed.

The four socio-ecological levels of barriers to education and employment, and solutions that need to be developed and implemented to improve Indigenous People's equitable access are:

1. Structural - structures, systems, and beliefs at a macro-societal level.¹⁸
2. Organizational - practices, policies, and culture at an organizational level.
3. Interpersonal - attitudes and behaviours of individuals in the workplace.
4. Individual - knowledge, skills, beliefs, self-perception, and confidence of the individual in the under-represented group.

Section 7, "Ensuring Equitable Access to Hydrogen Employment Opportunities" in the Analysis outlines the four socio-ecological levels of barriers to education and employment for Indigenous Peoples, as well as identifies the supports required to improve reconciliation and equitable access. It compiles insights from interviews and research and serves as a resource for implementing this recommended action.

In addition, each hydrogen project deployed in B.C. will be unique, as will each Indigenous community involved. B.C. First Nations are increasingly involved in evaluating a wide range of clean energy projects, such as solar power, hydroelectric generation, LNG, bioenergy, and geothermal. Indigenous capacity-building for hydrogen, including workforce development and skills training, needs to be considered in the context of other economic activities the community may be involved in and its unique cultural and socio-economic goals.

Using LNG as an example, LNG Canada and Coastal GasLink consulted with 25 First Nation communities, representing 15,000 Indigenous people as part of their commitment to Indigenous reconciliation. Agreements related to capacity-building, workforce training and the procurement of goods and services were negotiated with each of the 25 communities separately.¹⁹

ACTION

2.6A

Co-create a framework for leveraging the development of clean energy, including hydrogen, to enhance community workforce development and employment opportunities as a path towards reconciliation.

DESCRIPTION

Partner with Indigenous organization(s) to co-lead the development of a framework.

Ensure the program addresses barriers beyond the individual level to include those at the interpersonal and organizational levels including education on colonialism and its impact on Indigenous participation in the labour market.

- Local training.
- Use of role models, mentors, and sponsors.
- Wrap around supports to enhance trainees' success including such as childcare, transportation, and mental wellness programs.
- Appropriately fitting equipment and safety gear.
- Work integrated learning with companies that have zero tolerance for harassment and violence and have a culture of inclusion.
- Extensive onboarding and site-specific training.

- Employee/trainee codes of conduct indicating commitment to uphold values of respect and inclusivity.
- Cultural awareness and competency training for those involved in the program including educators and employers.

Consider program readiness training to support the development of foundational skills and knowledge to be successful in the pre-employment training program.

- For trades, operator, and other technical roles this may include written communication, math, and science studies to enhance success.

Pilot implementation of framework with an Indigenous community(ies) involved with a hydrogen project and/or other clean energy projects.

Evaluate, adjust, and implement improved program.

- Document approach and promote through industry and Indigenous associations.

TIMEFRAME

Immediate (2025)

PARTNERS TO INVOLVE

Hydrogen employers
Hydrogen hub partners
Government of B.C.
Indigenous partners
Industry associations
Municipal governments
Post-secondary institutions and trainers
including First Nations
Unions and trade associations

PROMISING PRACTICES

Energy Peers in Indigenous Communities (EPIC) Network (addressing individual, interpersonal, and organizational barriers)

This program, administered by Fraser Basin Council, is designed to enhance readiness of Indigenous communities in B.C. to implement renewable energy projects by:

- Customized training and skill development related to renewable energy.
- Capacity-building funds for Indigenous communities to advance their energy goals related to community renewable energy.
- Peer-to-peer cohort and peer mentorship approach to building and sharing knowledge on renewable energy.
- Cross-community networking and sharing.
- Ensuring equitable, diverse, and inclusive participation by supporting flexibility via part-time or flexible positions.
- Encouraging gender balance and Culturally Relevant Gender Application Protocols (CRGAP), developed by the Native Women's Association of Canada.

LNG Canada's Your Place Training and Employment Program for Women (addressing individual, interpersonal, and organizational barriers)

This program was a partnership between LNG Canada and its prime contractor, JGC Fluor, designed to attract and train women for employment in construction trades for the LNG Canada project.

Key features:

- Four-week workplace readiness training program and employment supports designed to help the women succeed in the skilled trades.

- Training held at Kitimat Valley Institution to increase accessibility for First Nations and women across B.C.
- Provided first-hand experience with the realities of a rotational work assignment, including living in company-provided workforce lodgings.
- Personal protective equipment was also provided.
- Graduates were offered entry-level positions with the project.

B.C. Centre of Training Excellence in Mining (CTEM's) Underground Mining Training Project (addressing individual, interpersonal, and organizational barriers)

Program was a collaboration between CTEM, mining companies, and post-secondary institutions to train unemployed or under-employed persons for jobs in underground mines. This training was co-funding from federal and provincial governments. Key features of the program include:

- Indigenous liaison support.
- Wrap-around supports for students.
- Paid work-integrated learning.
- Onboarding by company's HR representatives.
- Cultural activities and cultural awareness training available for all company employees.
- Skills and the certification of recognition students obtained were transferable to other sectors.

Woodfibre LNG Operator Training Program (addressing individual, interpersonal, and organizational barriers)

A comprehensive two-year operator training program offered by Woodfibre LNG working in collaboration with the Squamish Nation Training and Trades Centre and BCIT. The program is designed to provide hands-on experience, professional development, and a pathway to a fulfilling career.

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PROMISING PRACTICES

Priority given to qualified members of the Squamish Nation, then to members of other Indigenous Nations. Features to enhance success include:

- An Operator Training Readiness program focused on upgrading reading, writing, math, and science skills prior to trainees taking the power engineering certification training.
- Extensive onboarding and site-specific training.
- Upon completion, trainees will obtain a power engineering certification and have the opportunity to join Woodfibre LNG as a process operator.

Inspiring Inclusion: Woodfibre LNG and Gender Safety Advisory Committee (addressing individual, interpersonal, and organizational barriers)

Taking guidance from the Calls for Justice from the National Inquiry into Missing and Murdered Indigenous Women and Girls, and the federal Standing Committee on the Status of Women's *Addressing Violence Against Indigenous Women and Girls in the Context of Resource Development Projects* report, Woodfibre LNG has developed programming to prioritize gender safety and inclusion in the workplace, and in worker accommodations in the community. Program components include:

- Establishing a Gender Safety Advisory Committee made up of Indigenous and non-Indigenous women from the Squamish First Nation community.
- Mandatory, in-person cultural awareness and gender safety training for all Woodfibre LNG staff, contractors, sub-contractors, and suppliers.

TOOLS & RESOURCES

Just Transition Guide: Indigenous-Led Pathways Toward Equitable Climate Solutions and Resiliency in the Climate Crisis

B.C. First Nations Climate Strategy and Action Plan released Spring 2022

Specifies a goal to *Ensure First Nations in BC are empowered and prepared with the capacity and tools needed to effectively lead the response to the climate crisis both now and in the future by:*

- Creating adequate opportunities for climate-related training and skills development for First Nations both on and off reserve that incorporates both Indigenous Knowledge and western science. This involves preparing the future generations through sufficient advocacy and training opportunities and the facilitation of intergenerational knowledge sharing.
- Ensuring inclusive participation and empowerment for First Nations youth, women, and 2SLGBTQIA+ (Two-Spirit, Lesbian, Gay, Bisexual, Transgender, Queer, Questioning, Intersex, Asexual, and others) peoples in climate action.

B.C. Hydrogen Hub Assessment Reports by Foresight Canada

These reports provide insights into hub-specific value chain components and activities.

- **Envisioning a Hydrogen Hub in the Lower Mainland (July 2024)**
- Other reports forthcoming

Realizing UNDRIP Initiative

- Website gathers insights about creating and maintaining the positive Indigenous - non-Indigenous relationships that are essential to making meaningful progress on reconciliation and sustainability.

- A Worker Code of Conduct establishing requirements for respectful behavior and zero-tolerance for bullying, harassment, and discrimination.
- Dedicated positions to champion gender safety and economic inclusion.
- Training in personal safety and risk identification for women and girls in Squamish, with the intent of leaving a legacy of reduced vulnerability to assault and increased personal confidence and security.
- Working with local community organizations to support programming for women, including consent training for youth and high school students in Squamish.
- A four-year statistics research project to collect and assess data and measure effectiveness of the program.

ECO Canada: BEAHR Indigenous Training Program

BEAHR Indigenous training programs offer local customized learning that provide accessible and meaningful career development to First Nation, Métis, and Inuit members to overcome employment barriers and to develop the competencies need to work in the environmental sector in Canada by:

- Providing requisite technical, cultural, safety, and soft-skills required to secure meaningful employment in the environmental sector.
- Blending local and traditional knowledge.
- Providing practical, hands-on field experience.
- Including Elder and/or Traditional Knowledge Holder participation.
- Adapting to local communities nationwide.



BC First Nations Hydrogen Initiative – Hydrogen 101 Workshop (2023)

Native Women's Association of Canada (NWAC) – Culturally Relevant Gender Application Protocol Workbook

Indigenous Gender Based Analysis Plus (IGBA+) Toolkit

- Minister's Advisory Council on Indigenous Women's (MACIW) IGBA+ toolkit created for governments, corporations, Indigenous communities and Indigenous women, girls, two-spirit and gender-diverse individuals to analyze socio-cultural and historical realities on Indigenous Peoples resulting from colonization and systemic racism.

First Nations Major Project Coalition (FNMPCC)

- Offers a variety of reports, and environmental and economic resources to support Indigenous capacity-building.

Enserva's Remote Workforce Lodgings Industry – Community Commitment Toolkit

The Toolkit outlines policies and wise practices the workforce lodgings sectors and those who use workforce accommodations can implement to ensure physically, emotionally, and culturally safe lodgings by:

- Creating workplaces and community environments that are physically, emotionally, and culturally safe for all.
- Conducting authentic community engagement.
- Contributing to the economic security as a foundation to empowerment and safety.



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2.7 CUSTOMIZE CAPACITY-BUILDING STRATEGIES AND ACTIVITIES FOR B.C. HYDROGEN HUBS

A key challenge facing hydrogen development in B.C. is matching supply and demand. Regional hydrogen hubs can overcome this challenge by co-locating hydrogen production and end-use applications while accelerating the growth of the local economy. Hydrogen hubs involve a collaborative effort among First Nations, governments (local, provincial, and federal), industry, academia, regulators, and utilities. The Lower Mainland, Northeast B.C., Interior B.C. (Kootenays and Okanagan), Northern B.C., and Vancouver Island have been identified as key economic regions in which hydrogen projects are developing.

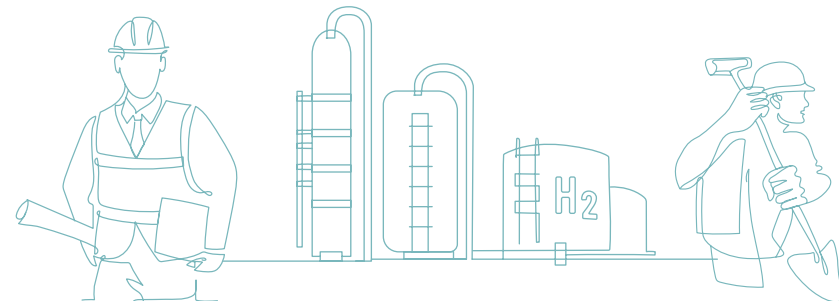
Each hub is unique in that it considers a region's strengths to produce hydrogen, ideally with a low-carbon intensity and at the lowest price possible, and end-uses that address the region's clean fuels needs and emissions reduction targets. As a result, the mixture of occupations and skills is required to advance and deploy hydrogen depends on the hub-specific value chain components.

The make-up of the regional labour force and talent dynamics are also unique, and impact hub-specific capacity-building and training requirements. Creating a customized capacity-building strategy and action plan for the hydrogen hub provides an opportunity for the region to embrace the diversity of clean energy it is considering, and ensure it has the right mix of skills and talent by:

- Conducting a comprehensive analysis of the regional labour market and a region-specific GBA+.
- Increasing awareness of hydrogen and its career opportunities to prepare the regional workforce for hydrogen.
- Optimizing the transferability of existing workforce and expertise.
- Enhancing equitable access to employment opportunities for all under-represented groups.

As hydrogen hubs are already collaborative efforts, working together to develop and implement workforce capacity-building activities is a natural extension of existing partnerships.

The Northern B.C. Hydrogen Hub encompasses the Cariboo, and North Coast and Nechako regions. These regions are currently experiencing an industrial transition as their forestry, pulp and paper, and wood manufacturing industries undergo economic downturns. With this in mind, it is recommended that the pilot project associated with this action take place with the Northern B.C. Hydrogen Hub, which the key partners have agreed upon.



ACTION 2.7A

Develop a toolkit and process to facilitate the customization of a capacity-building strategy and action plan for B.C. regional hydrogen hubs.



DESCRIPTION

Develop a toolkit and process that supports hydrogen workforce planning at a hub level, including:

- Identifying hydrogen occupational and skill requirements based on specific characteristics of the hydrogen hub as well as other emerging clean energy industries in the region.
- Gathering data on the availability of local talent.
- Assessing suitability and transferability between talent supply and future regional demand requirements including hydrogen.
- Conducting a Gender-Based Analysis Plus (GBA+) analysis.
- Determine a capacity-building and training plan to address gaps that:
 - » Optimize the transferability of existing expertise.
 - » Enhance equitable access to employment opportunities.
 - » Prepare the regional workforce for hydrogen but does not solely rely on the success of hydrogen.
 - » Supports the workforce development, attraction and retention needs of small and medium-sized businesses.
- Mapping activities to existing training/micro-credentials, practices, and tools and resources.

Pilot and upgrade the toolkit with lessons learned.

- Consider piloting the toolkit with the Northern BC Hydrogen Hub given current need for workforce transition in the region.

Develop a micro-credential to enhance knowledge and skills required to implement the toolkit.



TIMEFRAME

> Short-term (2026)

REGIONAL PARTNERS TO INVOLVE

Economic Development Organizations

Hydrogen employers

Hydrogen hub partners

Government of B.C.

Indigenous communities

Municipal governments

Post-secondary institutions and trainers

Unions and trade associations

PROMISING PRACTICES

Essentials of Community Energy and Emissions Management (BCIT)

Online micro-credential program made up of six courses designed to provide community development practitioners with the foundational knowledge and skills to address challenges of energy use and emissions in community planning and management. Topics include:

- Energy and Emissions Basics.
- Introduction to Creating a Community Energy and Emissions Plan.
- Introduction to On-site Renewable Energy.
- Introduction to Reducing Energy Demand and Emissions in Buildings.
- Introduction to Reducing Emissions from Transportation.
- Introduction to Project Development and Implementation.

TOOLS & RESOURCES

Gain insights into hydrogen-specific occupations and skills required by the hydrogen chain components from the following resources:

- [Developing Australia's Hydrogen Workforce \(2022\) \(Australia\)](#)
- [Hydrogen Workforce Requirements Assessment Tool \(2022\) \(Canada\)](#)
- [Identification of Skills Needed for Hydrogen Economy \(2024\) \(South Africa\)](#)

[Training in Uncertainty: Skills Foresight for a Just Green Hydrogen Transition \(2024\)](#)

[Skills Foresight: Making Sense of Emerging Labour Market Trends](#)

[Developing Skills Foresights, Scenarios and Forecasts: Guide to anticipating and Matching Skills and Jobs Volume 2](#)

[B.C. Hydrogen Hub Assessment Reports by Foresight Canada](#)

These reports provide insights into hub-specific value chain components and activities:

- [Envisioning a Hydrogen Hub in the Lower Mainland \(July 2024\)](#)
- Other forthcoming

[Native Women's Association of Canada \(NWAC\) – Culturally Relevant Gender Application Protocol Workbook](#)

[Indigenous Gender Based Analysis Plus \(IGBA+\) Toolkit](#)

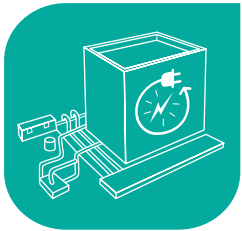
- Minister's Advisory Council on Indigenous Women's (MACIW) IGBA+ toolkit created for governments, corporations, Indigenous communities and Indigenous women, girls, two-spirit and gender-diverse individuals to analyze socio-cultural and historical realities on Indigenous Peoples resulting from colonization and systemic racism.

[Gender-based Analysis Plus \(GBA+\)](#)

- Provides guidance and resources to guide an effective GBA+.

[Industry Strategy: British Columbia's Workforce Readiness for a Clean Economy Future](#)

[BC Clean Economy Workforce Readiness Project: Phase 2 Labour Market Information Research: SUMMARY REPORT](#)



This Strategy and Action Plan offers a coordinated approach to help ensure that B.C. remains at the forefront of clean energy, contributing economic, social, and environmental benefits that extend beyond the hydrogen industry alone.

CONCLUSION

Advancing B.C.'s hydrogen industry will generate high-quality, well-paying career opportunities across several occupations. Having a skilled and qualified workforce ready to deploy hydrogen as a decarbonization strategy will not happen without unprecedented action. There already is a shortage of talent for many of hydrogen's core occupations. Attracting a more diverse workforce to the hydrogen industry is a solution. However, there are multiple levels of barriers preventing under-represented groups from participating in the labour force. Indigenous reconciliation and increasing Indigenous Peoples' inclusion in the labour market cannot be attained without dismantling the colonial approach to economic development. Increasing equitable access to employment will not happen organically.

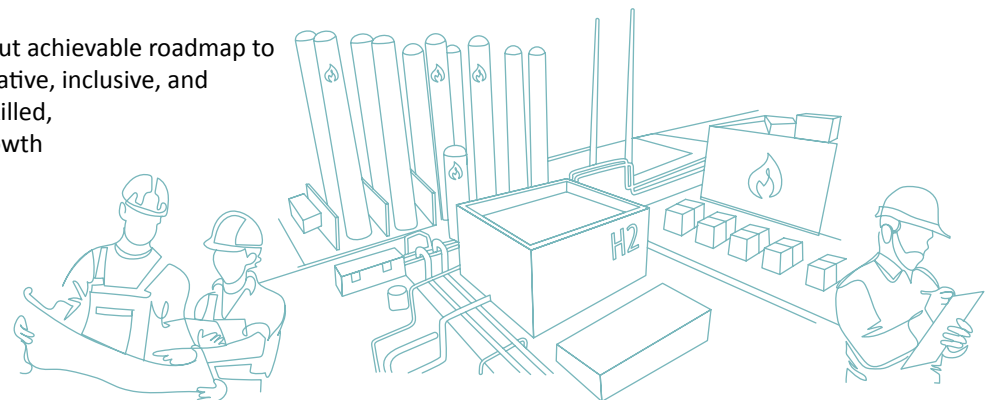
This Strategy and Action Plan offers a coordinated approach to help ensure that B.C. remains at the forefront of clean energy, contributing economic, social, and environmental benefits that extend beyond the hydrogen industry. It recommends initiating the Strategy and Action Plan by sharing the key findings of the Analysis with potential implementation partners including hydrogen companies, hydrogen hub partners, provincial, municipal, and First Nation governments, Indigenous communities, industry associations, post-secondary institutions and trainers, and unions and trade associations. This will help establish a common understanding of the opportunities and challenges associated with developing B.C.'s hydrogen workforce, and create buy-in and interest in leading and partnering on solutions.

A second foundational implementation step is establishing a collaborative Hydrogen Workforce Development Committee. This committee will oversee implementation and ensure alignment with the operating principles. It is anticipated that the process of sharing the Analysis' key findings will help identify potential committee members.

The seven capacity-building requirements and 16 actions call on government, industry, academia, and First Nations to:

- Actively engage in workforce development initiatives.
- Promote awareness of hydrogen careers.
- Address workforce shortages and the lack of hydrogen-specific skills and knowledge in B.C.
- Promoting equitable access and inclusivity in the B.C. clean energy system and workforce including hydrogen.
- Support Indigenous reconciliation through hydrogen career opportunities.
- Customize strategies for collaboration and innovation for a resilient workforce across B.C.'s hydrogen hubs.

This Strategy and Action Plan sets out an ambitious but achievable roadmap to advance B.C.'s hydrogen workforce. Through collaborative, inclusive, and strategic initiatives, the Province can build a highly-skilled, resilient, and diverse workforce that supports the growth of a hydrogen economy and contributes to provincial, national, and global climate goals.



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