OPPORTUNITY ASSESSMENT

ENVISIONING A HYDROGEN HUB FOR BC'S SOUTHERN INTERIOR BY 2035

FORESIGHT CANADA

JULY 2025

Acknowledgements

Foresight acknowledges that the lands on which we conducted this work are the traditional, ancestral, and unceded territories of the Syilx Okanagan people.

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About Foresight

Foresight Canada helps the world do more with less, sustainably. As Canada's largest cleantech innovation and adoption accelerator, we de-risk and simplify public and private sector adoption of the world's best clean technologies to improve productivity, profitability, and economic competitiveness, all while addressing urgent climate challenges.

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Glossary

Term	Definition
Ammonia	A colourless, toxic gas with a pungent odour. Chemical formula is NH_3. Ammonia is commonly used in fertilizer production and its applications for use as a clean fuel is currently being explored.
Battery electric vehicle (BEV)	A zero-emissions vehicle that is powered by electricity from a battery.
Blue hydrogen	Common term used to refer to hydrogen produced from methane through reformation processes, paired with carbon capture, utilization, and storage (see definition of CCUS). The fraction of CO_2 that is captured varies depending on the process.
Carbon capture, utilization, and storage (CCUS)	Refers to a suite of technologies that capture carbon dioxide (CO_2) from point sources or directly from the atmosphere, store it in geological formations, or use it in a variety of applications.
Carbon intensity	A measure of total carbon emissions of something per unit of production or economic activity. For example: for hydrogen, carbon intensity is measured as the mass of CO_2 equivalents emitted per kilogram of hydrogen produced (kg CO_2e/kg H2).
Clean energy transition	The global shift away from fossil fuel-based energy systems to renewable energy systems.
Combustion	A chemical reaction that produces heat and light in the form of a flame (e.g., burning).
Cryogenic tanker	A ship designed to store and transport liquefied gases, such as hydrogen, at very low temperatures.
Decarbonization	The process of reducing the levels of carbon emissions associated with a system or process.
Electrolysis	A process by which electric current is passed through a substance to create a chemical change. When referring to production of hydrogen, electric current is passed through water to produce hydrogen and oxygen.

Term	Definition
Energy carrier	An energy carrier is a transmitter of energy. Includes electricity and heat as well as solid, liquid, and gaseous fuels such as hydrogen.
Fuel cell	A power generation device that uses hydrogen and oxygen as fuel to produce electricity, with water and heat as the only by-products.
Fuel cell electric vehicle (FCEV)	A zero-emissions vehicle that runs on a fuel cell powered by hydrogen.
Green hydrogen	Common term used to refer to hydrogen produced by electrolysis (see definition of electrolysis) using electricity generated from renewable energy sources.
Greenhouse gas (GHG)	Any gas in the Earth's atmosphere that absorbs infrared radiation (heat) emitted from the Earth's surface and reradiates it back, creating the greenhouse effect. Include gases such as carbon dioxide (CO_2), methane, and water vapour.
Hydrogen	The chemical element of atomic number 1. A colourless, odourless, highly flammable gas that can be used as a chemical feedstock or energy carrier.
Hydrogen carrier	A carrier is a molecule containing hydrogen (such as ammonia) that can be easily transported and then broken down to isolate hydrogen for use at its destination.
Low-carbon hydrogen	Common term used to refer to hydrogen produced from methods that produce fewer to no carbon emissions. Includes hydrogen produced by electrolysis, methane reforming with CCUS, and methane pyrolysis (green, blue, and turquoise hydrogen). The Government of Canada categorizes low-carbon hydrogen as that which has a carbon intensity that does not exceed 67.8 gCO_2e/MJ.
Methane pyrolysis	A process to produce hydrogen from natural gas/methane that produces solid carbon as a byproduct instead of CO_2.
Methane reforming	Industrial processes used to produce hydrogen from natural gas. Includes methods such as steam methane reforming (SMR) or auto-thermal reforming (ATR). SMR and ATR produce carbon dioxide as well as hydrogen.

Term	Definition
Methanol	A clear, colourless liquid alcohol. Chemical formula is CH_3OH. Methanol is commonly used as an industrial substance and its applications for use as a clean fuel is currently being explored.
Molecule	Two or more atoms bonded together.
Natural gas	A gaseous, naturally occurring hydrocarbon consisting primarily of methane.
Net zero	A stage where economies emit no greenhouse gas emissions or offset any emissions.
Renewable energy	Energy created from natural processes that are replenished at a rate that is equal to or faster than the rate at which they are consumed. Includes energy generated from solar, wind, geothermal, hydropower, and ocean resources, solid biomass, biogas and liquid biofuels, but biomass is considered renewable only if its rate of use does not exceed its rate of regeneration.
Sustainable Aviation Fuel (SAF)	Sustainable aviation fuel (SAF) is a term that refers to fuels derived from non-fossil sources that have the same approximate composition and energy content but significantly lower life-cycle carbon emissions of conventional jet fuel.
Synthetic fuel	A term used to describe any manufactured fuel that has the approximate composition and similar energy content of a fuel derived from crude oil sources.
Turquoise hydrogen	Common term used to refer to hydrogen produced from methane through pyrolysis (see definition of methane pyrolysis).
Technology Readiness Level (TRL)	A measurement of the maturity of a given technology, from conception to proven commercial stbility, on a scale of 1-9.

Introduction

Hydrogen is a versatile energy carrier that, when produced sustainably, could play an important role in reducing British Columbia's (BC's) greenhouse gas (GHG) emissions. It can be utilized in fuel cells to power vehicles, in industrial processes as a heat source, and as a means of storing and transporting energy. However, to realize this potential growth, the sector must overcome a key challenge facing hydrogen development in BC: matching supply and demand.

Released in 2021, the BC Hydrogen Strategy highlights a regional hydrogen hub model as a solution to this challenge. [1] By co-locating hydrogen production and end-use applications, these hubs can ensure a balanced market while accelerating the growth of the local economy. This strategic approach can optimize resource utilization and create synergies among different sectors.

As part of the implementation of the BC Hydrogen Strategy, the BC Clean Energy and Major Projects Office (CEMPO) is working with Foresight to examine the potential for hydrogen hub development in the following regions where project development is underway and potential sources of demand exist: The Lower Mainland, Northeast BC, the Southern Interior (Kootenays and Thompson-Okanagan), and Vancouver Island. Additionally, the City of Prince George and the City of Prince Rupert are exploring the development of a Northern BC hydrogen hub through opportunity assessments in each respective region.

This report focuses on the opportunities and challenges for hydrogen development within the Kootenay and Thompson-Okanagan regions of Interior BC. These regions feature diverse geography, including mountain ranges, valleys, large lakes, and rivers. Major centres include Kelowna, Kamloops, Vernon, Penticton, Cranbrook, Castlegar, and Trail. Local economies have historically relied heavily on natural resource industries such as mining (metallurgical coal, copper, lead-zinc smelting), forestry (logging, sawmills, pulp), and agriculture (ranching, orchards, vineyards), complemented significantly by tourism. Some of these industries represent both potential sources of demand for low-carbon hydrogen and potential contributors to its supply. The region has unique attributes that are advantageous to developing a hydrogen hub, such as:

- **Existing infrastructure:** Regional gas infrastructure can be adapted for hydrogen production, storage, and distribution.
- **Low-carbon electricity:** BC's renewable hydroelectric power provides a low-carbon pathway for hydrogen production.
- **End-use applications:** There are potential demand-side applications for hydrogen use in the region, including trucking, rail, and industrial decarbonization.

- **Proximity to Alberta:** The Kootenays neighbour Alberta hydrogen development zones which is beneficial for potential trade, shared technology development and shared energy resources.

This report is the second in a series of high-level assessments that review regional potential for local supply and demand, and discuss opportunities and challenges associated with hydrogen hub development in the region over the next decade.

The report is divided into three sections:

1. **Supply:** This section reviews potential sources of supply in the region, including feedstocks, production methods and locations, and transportation and storage.

2. **Demand:** This section explores the potential sources of hydrogen demand within the region, cost trends, and forecasts for demand growth.

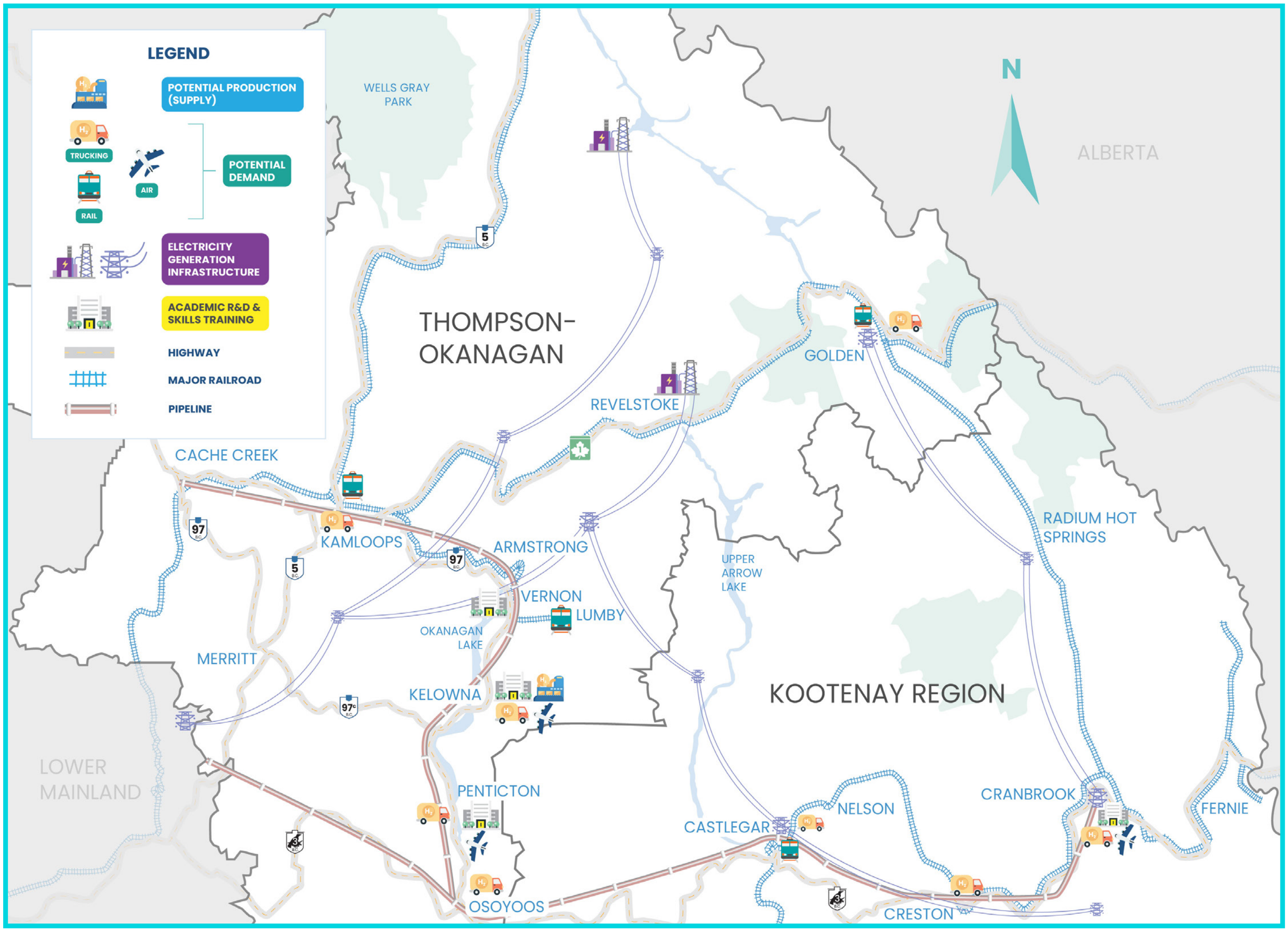
3. **Regional Considerations:** This section assesses the competitive landscape and opportunities for collaboration with neighbouring jurisdictions, as well as workforce considerations.

Each section's insights were collected from a literature review, interviews, and an in-depth workshop that was hosted in Kelowna with key hub partners and experts, including but not limited to local governments, provincial government agencies, industry, and academia. In the case of research or insights that are consistent province-wide, this report includes the same information as our previous reports in this series.

The development of a regional hydrogen hub by 2035 represents an opportunity for the region to fill the emissions reduction gaps that cannot be addressed by direct electrification, thereby accelerating the transition to net zero.

Mapping a 2035 Hydrogen Ecosystem

To provide future decision-makers and project proponents with a visualization of a hydrogen ecosystem in the region, Foresight developed a map marking areas of future supply, demand, and research and development (R&D), as well as key infrastructure.



Supply-Side

Hydrogen production is emerging in the region and many projects are still in the conceptual stage. Key supply-side considerations for the development of a regional hydrogen hub include production methods, locations, and transportation and storage. This section will explore each of these considerations further.

Feedstocks and Production Methods for Low-Carbon Hydrogen

Blue Hydrogen

The production of "blue" hydrogen involves extracting hydrogen from methane (CH_4) molecules and capturing the resulting CO_2 for either sequestration or utilization. There are two prominent technology pathways used to produce hydrogen: steam methane reforming (SMR) and auto thermal reforming (ATR). SMR is commercially proven and is the primary process through which hydrogen is produced globally. It involves a chemical reaction that uses high temperature steam and methane to yield hydrogen and carbon dioxide (CO_2). ATR is a variation of SMR that has a greater thermal efficiency and involves a simpler production stream where CO_2 is more concentrated in the process gas, making capture easier. When equipped with carbon capture utilization and storage (CCUS) technology, hydrogen produced via either one of these processes is labeled "blue". While ATR and SMR with CCUS with high capture rates (above 90 per cent) are considered "low-carbon," they are still at the prototype stage (TRL 5-6) according to the International Energy Agency. [2]

Captured carbon could be utilized in various ways, rather than stored, and contribute to additional economic activity. For example, captured CO2 can be used in the production of chemicals and fuels through processes such as methanation. Captured carbon could also be utilized in the production of building materials, such as concrete, where CO_2 is mineralized to enhance strength and durability while reducing the carbon footprint of construction. Plastics and fertilizer production are examples of other industries that could use captured CO_2 as a feedstock. However, many utilization pathways are not commercial yet and require further testing and research.

The Southern Interior is served by natural gas infrastructure, including FortisBC's distribution network that is connected to Enbridge's Westcoast transmission system (T-South section), which transports gas from the significant reserves in Northeast BC. For blue hydrogen production to be feasible in the region, there would need to be a means for permanent storage of the CO_2. However, the suitability of geological formations for large-scale CO_2 storage within the Kootenay and Thompson-Okanagan regions is unclear. The closest opportunities that have been investigated lie in the southwest of the Nechako Basin (surrounding Prince George and to the northwest of Kamloops). [3] Further research would be needed to explore the potential for CO_2 storage in the Southern Interior, such as injection in saline aquifers or carbon mineralization. [4] Consequently, at this time it appears unlikely that blue hydrogen will be produced in the Southern Interior within the next decade.

Turquoise Hydrogen

A promising method of producing hydrogen using natural gas as a primary feedstock is pyrolysis, known as "turquoise" hydrogen. This pathway is considered more likely to develop in the region by 2035. Pyrolysis technologies—which use high temperatures to break the chemical bonds in methane into hydrogen and solid carbon—have the potential to produce hydrogen with a relatively low-carbon-intensity. They currently range between TRL 4-8, depending on the specific technology (see Table 1). Turquoise hydrogen could offer a viable low-carbon pathway utilizing the Southern Interior's existing gas infrastructure without the challenges associated with CCS. The solid carbon byproduct could then be used as a commodity for industries within or outside of the province (e.g., rubber, construction materials, pigment for inks). [5]

Green Hydrogen

Another technology pathway likely to produce hydrogen within the next decade is electrolysis, which utilizes electricity to split highly purified water into its constituent elements: hydrogen and oxygen. Hydrogen produced in this manner is known colloquially as "green" hydrogen when renewable sources of electricity are used as the feedstock (e.g., wind, solar, or hydro). The freshwater resources within the Kootenay and Thompson-Okanagan regions, including major rivers and lakes, would be an important enabler for green hydrogen production; though, this would need to be reconciled with other major sources of water demand in the region (e.g., agriculture, viniculture). As identified in Table 1, on a provincial scale electrolysis is projected to produce some of the least carbon-intensive hydrogen thanks to the region's predominately hydroelectric grid.

However, it is also important to note that the electricity consumption of electrolysers presents challenges related to grid capacity and connection costs, even with discounts. The significant grid expansion planned by provincial utilities underscores the current limitations and future demands of decarbonization, suggesting that securing sufficient, affordable, and reliably available clean power will be a key factor for large-scale green hydrogen projects anywhere in BC. Off-grid power could be a supporting measure to help with grid capacity challenges.

Byproduct Hydrogen

An existing source of supply in the province is “waste” or “byproduct” hydrogen: hydrogen that is already being commercially produced as a byproduct of chemical processes. Byproduct hydrogen is typically released during industrial activities, such as chlor-alkali production and petrochemical refining, where it is not the primary product. This hydrogen can be captured and utilized, reducing waste and providing a recovered energy resource. Byproduct hydrogen is already playing a role as an early-stage source of supply in the province, and will continue to in the short term. [6] However, based on current public projections, it is not anticipated to be a large source of supply in any region of the province over the long term due to its limited ability to scale. [7]

Biomass Gasification

Biomass-derived hydrogen is another source of supply that could be explored for the region. The Kootenay and Thompson-Okanagan regions have several forest product companies generating large volumes of wood residues (e.g., sawmill waste, logging slash). Agriculture, including livestock farming and orchards, also contribute to regional organic waste streams. This biomass could be used as a feedstock for low-carbon hydrogen through gasification or pyrolysis. Gasification processes convert organic materials, such as agricultural residues, wood waste, or other biomass, into syngas. [7] The syngas can then be processed to separate hydrogen gas from carbon and other components. While it has not yet achieved widespread commercialization, the technology has progressed beyond the prototype stage and ongoing developments continue to advance its readiness and scalability. Biomass gasification with CCUS and biomass pyrolysis are at TRL 5 and 6, respectively, globally, though TRLs can vary depending on specific technologies and their integration levels. [2]

Scaling up to commercial levels requires the establishment of reliable and efficient supply chains for woody biomass, the primary potential feedstock. [7] However, BC’s bioeconomy is currently facing multiple headwinds that may limit the viability of this pathway. Recent research from Foresight uncovered a number of challenges faced by the BC forestry sector, the largest of which is “the declining availability of economically available fibre.” [8] This calls into question the long-term security of biomass supply for investors and value added project proponents (either bioeconomy or clean fuels projects).

Fibre supply has declined in the province due to “mountain pine beetle infestations and forest fires, combined with drivers like conservation and endangered species protection.” [8] This declining supply of logs has downstream consequences, as the flow of forestry residuals such as hog fuel, sawdust, and shavings are constrained when primary industries (e.g., mills) recede. Furthermore, Foresight’s conversations with industry leaders over the past two years have also found that the high transportation costs of recovering BC’s waste wood from logging sites within forested areas remains prohibitive.

An additional barrier to consider is competition from RNG production, which also seeks biomass as a feedstock. Currently, RNG production in the region is limited to landfill capture, such as those in Kelowna and Salmon Arm. [9] However, woody and agricultural biomass can both be used to produce RNG and should that pathway continue to expand in BC, there is reason to expect demand for these feedstocks to be competitive.
Given these considerations, it is not expected that this technology pathway will contribute to hydrogen production in the region by 2035.

Production Pathways Summary

In Table 1, we list the production technologies most likely to scale as part of a hydrogen hub. The table includes each technology's approximate TRL, which measures the maturity of a given technology, from conception to proven commercial stability. It also includes carbon intensity, a measure of the GHG emissions per unit of energy produced, based on analysis from NorthX Climate Tech (formerly known as the B.C. Centre for Innovation and Clean Energy). [10] All the pyrolysis and electrolysis technologies listed in the table have projected carbon intensities below the low-carbon threshold of 36.4 gCO2e/MJ adopted in the BC Hydrogen Strategy; the threshold is meant to be a starting point to define low-carbon production, and represents a 60 per cent reduction "below the intensity of hydrogen produced from natural gas." [11]

Table 1. Emerging low-carbon hydrogen production pathways for BC's Southern Interior (carbon intensities including upstream emissions).

Feedstock	Technology	TRL (1-11)[5]	2030 Carbon Intensity (gCO2e/MJ) in BC [6]
Electricity (On-Grid)	Alkaline electrolyser	9	16.2
	Polymer electrolyte membrane (PEM) electrolyser	9	15.3
	Solid oxide electrolyser	8	11.9
Natural Gas	Pyrolysis, Thermal	3-4	19.6
	Pyrolysis, Plasma	8	18.2
	Pyrolysis, Catalytic	6	19.5

[1] Note that while the carbon intensity figures in this table are among the best publicly-available projections, project proponents cannot rely on them exclusively. Projects intending to secure the federal Clean Hydrogen Investment Tax Credit must use the Government of Canada's Fuel Life Cycle Assessment Model, which has different assumptions from NorthX Climate Tech referenced in Table 1. Further information is available here.

Electricity Supply

In the Kootenay and Thompson-Okanagan regions, both BC Hydro and FortisBC operate significant hydroelectric generation facilities. FortisBC owns four dams on the Kootenay River, supplying approximately 1609 GWh annually. [12] In response to growing demand, FortisBC issued a Request for Expressions of Interest in late 2024, seeking up to 1100 GWh of new power supply for the Southern Interior by 2030. [12]

BC Hydro's 2021 Integrated Resource Plan (IRP), which projects the province's electricity needs over a 20-year planning horizon, has an "accelerated electrification" contingency plan that assumes the province meets its CleanBC emissions targets. [13] The plan lists future gaps between projected supply and demand, and notes that additional resources will need to be procured to meet the needs of the low-carbon transition, including new sources of electricity demand such as hydrogen production. BC Hydro is currently developing its 2025 IRP, which should discuss these opportunities and challenges further. [14] The interim findings from the 2025 IRP's Technical Advisory Committee (TAC) meetings have suggested that utility-scale solar projects based in the Southern Interior are among the lowest cost options to add to the provincial grid (approximately 10,000 GWh available at <$80/MWh province-wide). [15,16]

BC Hydro has announced an expanded 10-Year Capital Plan, committing approximately $6 billion specifically for projects in the Southern Interior over the next decade. [17] Key investments include:

- **Generation Asset Upgrades:** Approximately $1.2 billion for the La Joie dam facility on the Bridge River (addressing aging infrastructure and seismic concerns) and roughly $3.8 billion for dam safety, refurbishments, and improvements at other facilities on the Bridge River and Columbia systems (including Revelstoke, Mica, Kootenay Canal).

- **Transmission Enhancements:** Approximately $450 million allocated for transmission line upgrades. Notable projects include the West Kelowna Transmission and Westbank Upgrade (adding capacity and redundancy), and upgrades to support electrification at the Highland Valley Copper mine.

- **Substation Upgrades:** Approximately $275 million for replacing end-of-life equipment and upgrading aging infrastructure.

As part of BC's Clean Energy Strategy, the province also set a new commitment to conduct competitive calls for power every two years. [18] In April 2024, BC Hydro launched a call for 3000 gigawatt-hours (GWh) of new power, yielding 21 proposals from independent power producers across the province (totaling over 9000 GWh in potential generation), including eight from the Southern Interior. [19,20] Of the 10 finalized electricity purchase agreements province-wide, five are in the Southern Interior at the time of this report's publication (approximately 700MW). [21,22]

The Province followed up with an additional call for power in 2025 targeting up to 5000 GWh per year. [23] Nonetheless, it appears reasonable to question whether on-grid hydrogen production will be competing with other important grid users (electric vehicles, heat pumps, industrial electrification) in the future. Given the requirements of both electrification and hydrogen production technologies, the Province will need to consider how new hydrogen projects will impact the wider goals of economy-wide emissions reductions across all sectors. However, it should be noted that the Clean Energy Strategy, released in 2024, asserts that hydrogen will be a pillar of the clean fuels mix and affirms support for the use of BC's low-carbon electricity in hydrogen production. [18]

It is also important to note that four municipalities in the Southern Interior own and operate their own electric utilities: Nelson, Penticton, Grand Forks and Summerland. These utilities typically purchase power from BC Hydro or FortisBC and then distribute it to local customers. Municipalities directly delivering energy services to their residents through their own local government-owned electricity or district heating utilities are excluded from BC Utilities Commission oversight under the Utilities Commission Act. For instance, rates, operations and service standards are set by city bylaws. This should be considered in the context of hydrogen development and the addition of new energy resources, as municipalities would have more flexibility and potentially a faster pathway to adopt new technologies.

Like the rest of the province, the Southern Interior also faces climate-related constraints that can affect the reliability of future electricity supply for all uses, including hydrogen production. [24] For example:

- **Hydrological Changes:** Climate change will alter precipitation patterns, increase temperatures, and change the timing and volume of spring runoff. These changes can impact hydroelectric power generation, which relies on consistent water flows.

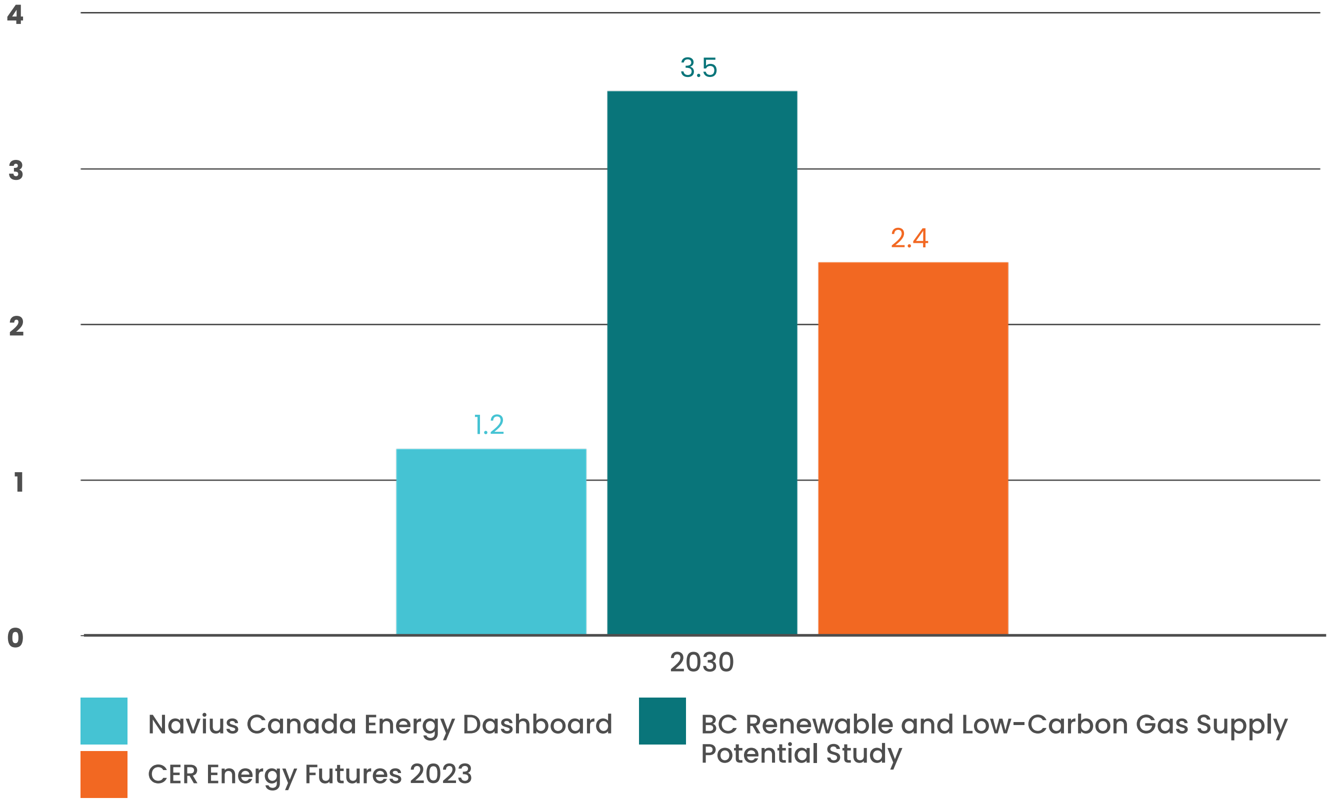
- **Drought Conditions:** Extended periods of dry and warm weather, as experienced in recent years, have led to low water levels in some reservoirs. This affects the ability to generate hydroelectric power consistently. BC has experienced some of its driest and hottest extended periods on record over the last few years, including a record drought in 2023, impacting water availability for power generation. [24]

- **Extreme weather events:** Wildfires, flooding, and droughts can disrupt electricity supply and damage infrastructure.

Modelling Supply

There are differing projections of how much hydrogen will be produced in BC within the next decade and by what means. Using Navius Research's net zero modelling in its Canada Energy Dashboard, we observe a projection of 1.2 PJ (approximately 10,000 tonnes) of BC hydrogen production supply in 2030 and 2.9 PJ (approximately 24,167 tonnes) in 2035. [25] Navius's model projects all of this supply to come from electrolysis technologies. The BC Renewable and Low-Carbon Gas Supply Potential Study differs slightly, with approximately 3.5 PJ projected in 2030 (0.8 PJ from electrolysis, 1.5 PJ from pyrolysis, 0.9 PJ of waste hydrogen, and 0.3 PJ of biomass gasification). [7] In contrast, the Canada Energy Regulator's (CER) net zero modelling projects approximately 2.4 PJ of hydrogen production in 2030 and approximately 12 PJ in 2035; but 100 per cent of this supply is from biomass gasification in 2030, and in 2035 electrolysis technologies account for 20 per cent of provincial supply (~2.4 PJ).

Figure 1. Projected BC hydrogen production in 2030.



Transportation and Storage

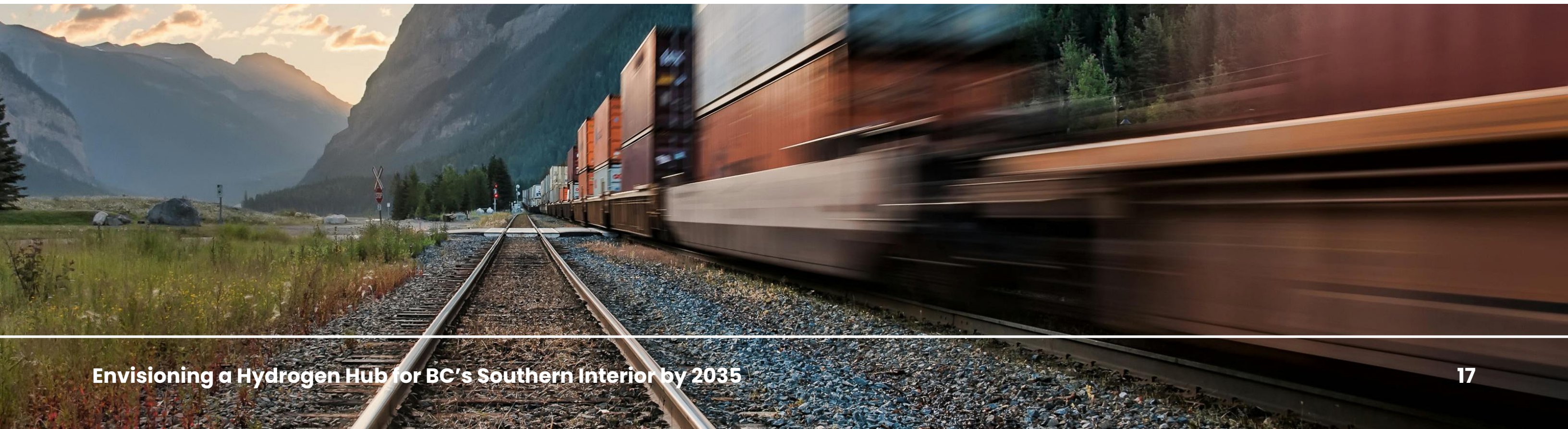
After production, hydrogen can be transported by truck, rail, or pipeline. Hydrogen requires specialized storage and transportation methods, such as compression, liquefaction, or conversion to alternative carriers like ammonia, methanol, or liquid organic hydrogen carriers (LOHCs). Each method has its own technical and economic trade-offs, and the choice depends on factors like distance, volume, and end-use requirements. [26]

Pipelines can be used to transport blended hydrogen, which involves mixing a certain percentage of hydrogen into natural gas in pipelines. Foresight's study investigating hydrogen transportation considerations in BC noted that "1-20% hydrogen by volume can be injected into natural gas pipelines with no major safety or operational concerns." [27] However, generalizing blending limits is considered "problematic because hydrogen compatibility depends on existing infrastructure component factors." [28] Additionally, issues such as hydrogen permeation/leakage and pipeline embrittlement mean that the transport of pure hydrogen via pipelines will require significant infrastructure upgrades. With support from the Province, FortisBC and Enbridge have commissioned a comprehensive blending feasibility study, for their transmission pipelines. FortisBC is also supporting research at UBC Okanagan to investigate these challenges and opportunities further. [29,30,31]

Transportation is an important part of the life-cycle emissions associated with hydrogen. According to NorthX Climate Tech, transporting hydrogen by truck would add an average of 2.8 g CO2eq per MJ of hydrogen (in this case measured over an 80 km distance). [10] The use of existing pipeline infrastructure for distribution would minimize but not necessarily eliminate the transportation emissions associated with compressed hydrogen (0-1.02 gCO2e/MJ). [10]

Transporting hydrogen does pose significant costs. According to the Transition Accelerator report "The Techno-Economics of Hydrogen Pipelines," transporting hydrogen can account for up to 70 per cent of its total cost. The report highlights that pipelines are the most cost-effective method for transporting large volumes of hydrogen over long distances, but the initial capital costs for new pipeline infrastructure are substantial. [32]

For more information on the risks, opportunities, and infrastructure needs associated with transporting hydrogen in BC—including the use of carriers such as methanol, ammonia, and LOHCs—readers are encouraged to review Foresight's detailed "Hydrogen Transportation and Infrastructure Analysis" report. [27]



What We Heard: Expert Feedback on Supply

In our workshop, participants were gathered and asked: "What are the key challenges and opportunities related to increasing the production, distribution, and transportation of hydrogen in the region?" The following themes represent the summarized feedback collected by facilitators.

Regional Strength for Hydrogen Production

- Diverse low-carbon electricity potential in the region such as wind and solar (given the region's climate and geography) offer varied feedstocks for future green hydrogen production.
- There is regional potential in waste-to-energy sources (e.g., from pulp and paper mills) and use of forestry residues for biomass energy.
- Existing industrial sites and closed pulp and paper facilities offer valuable infrastructure that could be leveraged for new purposes.
- The region boasts a skilled workforce and a supportive environment for innovation. UBC Okanagan is the focal point for research and development in the region, and other post-secondary institutions such as Okanagan College (which has campuses in several cities) and Cranbrook's College of the Rockies would be well placed to develop new programs for technicians, engineers, and skilled trades professionals.

Infrastructure and Co-location Opportunities

- Strategic infrastructure development and co-location are seen as key. This involves co-locating hydrogen production with wind and solar facilities or industrial users to maximize efficiency.
- Utilizing existing sites to co-locate potential early supply and demand is viewed as important. There are existing industrial sites that could be leveraged in Trail (Teck Cominco smelter) and Castlegar (Mercer Celgar forest products), and in the Okanagan such as the Brenda Mine site and the Central Okanagan landfill. Kelowna International Airport was also identified as a high-location.

Economic Viability and Market Development

- Some proponents believe there is a need for further public and market education, particularly for potential demand-side actors, to increase awareness of hydrogen's opportunities and identify adoption issues.

- The high infrastructure costs and the need to achieve cost parity with existing energy sources are important limiting factors for the market. Currently, the cost for offtakers to purchase hydrogen is considered out of reach for demand-side actors. Project development and transportation costs still need to be reduced. The hub approach is well suited to address these challenges given that when supply and demand are co-located, transportation costs decrease.

- Finding uses for hydrogen co-products (e.g., oxygen, waste heat) to enhance economic value is important and perceived as another benefit of the hub model.

Resource Management

- As in other parts of the province, addressing water scarcity will be an important factor for green hydrogen development in the Southern Interior. Being more innovative with water use in the region goes hand in hand with energy innovation and many proponents believe it is essential hydrogen doesn't compete with other critical regional economic sectors with high water demand such as agriculture and viniculture.

Supply-Side Recommendations for Hub Partners

- **Provide further public clarity on electricity infrastructure adaptation and growth.** There is concern from potential hub partners and project proponents about the future availability of clean electricity. Proponents would benefit from improved communication of long-term utility modelling and how BC's utilities are planning for potential hydrogen production load requirements in long-term resource planning. Timely completion of BC Hydro and FortisBC's planned electricity transmission and distribution upgrades in the Southern Interior will also be key. Further clarity will help build the confidence of hydrogen project developers, investors, and local governments. The 2025 IRP is a good opportunity to strengthen communication on these challenges. **[Recommendation Lead: Province, Utilities]**

- **Continue support for market-based policies that increase competition between hydrogen and carbon-intensive fuels.** Experts cited economic viability as a key area of concern. For regional hydrogen production to compete with well-established fuels, continued pollution pricing and market-based regulations will play an essential role and allow the least carbon-intensive technology to succeed in the market. **[Recommendation Lead: Province]**

- **Map industrial sites in high opportunity zones to support project proponents and investors.** Building off of Foresight's initial scan and mapping, regional districts and municipalities could work in collaboration with industry and academia to identify key sites with supply/demand co-location opportunities in the regions. Some initial mapping using the GIS resources already available to the public could help draw attention to high-potential sites for project proponents and investors. **[Recommendation Lead: Local Governments]**

- **Incorporate hydrogen development zones in land-use planning.** Municipalities could designate specific industrial areas or greenfield sites suitable for hydrogen production facilities and refueling stations, for example, considering factors like proximity to transportation corridors, existing infrastructure, and safety. This could begin with communities with anchor demand prospects, such as Kelowna, Trail, and Castlegar. **[Recommendation Lead: Local Governments]**

Demand-Side

The Canada Energy Regulator's (CER) net zero modelling projects approximately 5-6 PJ of economy-wide hydrogen demand in BC in 2030, and 17-20 PJ by 2035. However, virtually all of this demand (over 90 per cent) is projected to come from the transportation sector, with a small portion from industry. [33] BC's climate accountability reporting corroborates this sectoral distribution through its own modelling conducted by Navius Research. The modelling scenario—only available to 2030—where the province meets its CleanBC climate targets—projects 2030 hydrogen demand will be slightly higher at 8 PJ (approximately 66,667 tonnes of H2), coming almost entirely from heavy-duty trucks and rail, with a small portion from heavy industry. [34] There is no publicly available modelling for the Southern Interio; therefore, assumptions must be made based on provincial-wide forecasts.

Potential End-Uses in 2035

In BC, experts have outlined a variety of potential end uses for hydrogen, which are listed in the following table. While publicly available modelling does not indicate that all these sources of demand will appear in the next decade, some may be generated in the long term and are worth noting in this assessment.

Legend	
Hydrogen Suitability Indicator Colour	**Suitability (2025 - 2035)**
H — H	Well Suited for the Region
H — H	In Development/Further Evidence Needed
H — H	Not Suitable for the Region

Table 3. Potential end uses of hydrogen in BC's Southern Interior.

End-Use	Description
Transportation Fuel	Modelling by the CER found that in the long run in Canada "hydrogen primarily fuels long-haul transportation in heavy trucks and marine shipping, and hydrogen-based fuels are used to help decarbonize aviation." [35] Navius Research's Canada Energy Dashboard supports the conclusion that hydrogen's main use in BC will be as a transportation fuel. [25] **Heavy-Duty Vehicles (HDVs)** Fuel cells use hydrogen as a fuel to create electricity, water, and heat. Fuel Cell Electric Vehicles (FCEVs) are being explored as an internal combustion engine replacement for on and off-road transportation applications that have limited cost-effective decarbonization options. In most cases, Battery Electric Vehicles (BEVs) are projected to be the most energy-efficient and cost-effective method of decarbonizing on-road transportation over time. [36] This is particularly true in the case of light-duty vehicles—22 per cent of light-duty vehicles sold in BC in 2024 were BEVs. [37] This is also true of most medium-duty vehicles, including buses, drayage, short-haul, and urban freight vehicles. [38] However, battery technology does not currently have near-term prospects to meet the demands of most of the heaviest vehicles. There is a large and growing opportunity to build the provincial hydrogen sector around the heavy-duty market. According to most experts, FCEVs are the most promising solution to replace heavy diesel class 8 vehicles that need to travel long, mountainous distances and carry large cargo loads. A cost analysis from National Renewable Energy Laboratory (NREL) projected FCEVs to be cost-competitive in the US for these types of long-haul trucks by 2035. [39] Policy support for these vehicles through the CleanBC Commercial Vehicle Pilots Program and Go Electric Hydrogen Fuelling Infrastructure is strong, and dedicated infrastructure projects such as HTEC's H2 Gateway are actively targeting trucking corridors in the province. Establishing refueling infrastructure for FCEVs in key junctions (e.g., Kamloops, Kelowna, Cranbrook, Golden) along Highways 1, 3, 5, and 97 would be the best next step for the region to spur the sector. Focusing on key corridors to deploy new infrastructure helps ensure that initial investments catalyze further adoption. [40] Another technology pathway already being deployed in BC, dual-fuel co-combustion technology for heavy-duty vehicles, enables long-haul trucks to lower their GHGs by using a mix of low-carbon hydrogen and diesel. This technology could be reliably deployed in the Southern Interior if refueling infrastructure is available. The City of Kelowna has been taking a lead in the Southern Interior to develop new refueling infrastructure and decarbonize heavy-duty fleets. Requests for Information were issued in early 2025 to gather proposals from industry for dual-fuel technology. [41,42] The city's goal is to take a phased-in approach with 4 dump trucks, followed by 10 more trucks, and eventually scale refueling support to 100 vehicles daily.

Transportation Fuel

Rail

Similar to on-road vehicles, rail operators are piloting hydrogen fuel cell technologies as an alternative to fossil fuel-powered locomotives. In the absence of new electrified alternatives, fuel cell engines could help decarbonize the transportation of goods across the Southern Interior, including hydrogen itself.

Elk Valley Resources partnered with Canadian Pacific Kansas City (CPKC) to pilot hydrogen locomotives for transporting steelmaking coal from mines in the southeastern Kootenays to Western ports. The pilot project, which began in 2024, will run until 2026 and started with a successful test from Sparwood to Golden. [43,44] CPKC's pilot focuses on retrofitting existing diesel-electric locomotives with hydrogen fuel cell and battery technology, potentially offering a more cost-effective strategy compared to replacing locomotives with entirely new infrastructure. [45] CPKC has also built operational refuelling stations in Edmonton, Calgary, and Golden to support the pilot. [46] Success in such pilots could open a substantial market for hydrogen, particularly in areas with heavy rail freight traffic.

Other regional initiatives on rail include the proposed Okanagan Valley Electric Regional Passenger Rail (OVER PR) initiative, led by the SMARTer Growth Research Lab at UBC Okanagan. [47,48] UBC researchers have conducted feasibility studies examining the potential for hydrogen-powered light rail along a 342 km route between Osoyoos and Kamloops. Their findings argue that favourable economic analyses point to its value for the region as an alternative to increased reliance on passenger vehicles. [49,50]

Aviation

Hydrogen can be a key feedstock for the production of low-carbon sustainable aviation fuels (SAF). [51] The groundwork for SAF production in Canada is being laid: the Canadian Council for Sustainable Aviation Fuels roadmap set an ambitious target of producing a billion litres of sustainable aviation fuel by 2030. Hydrogen can also be used in fuel cells or combusted in modified turbine engines. Technical challenges include the low volumetric energy density of hydrogen, which requires large and heavy storage tanks, and the high costs of hydrogen production. The role of hydrogen as a direct fuel is projected to expand after 2040, but is not expected to play a role within the upcoming decade. [51] Alternatives being considered include biofuels and battery-electric aircrafts. However. the former is limited by feedstock availability and the latter by energy density constraints.

If co-locating multiple sources of demand was a priority (e.g., truck refueling stations), the largest airport in the region—the Kelowna International Airport—is well suited to be a testbed for SAF and is conveniently located along highway 97-. In the long term, the Southern Interior has several airports with short-haul routes connecting to Kelowna such as Penticton Regional Airport (YYF), Cranbrook/Canadian Rockies International Airport (YXC) and West Kootenay Regional Airport (YCG) that could explore fuel cell or battery-electric aircrafts.

Industrial Decarbonization

In industries where direct electrification technologies do not exist or are not technically or financially feasible, hydrogen holds potential as a decarbonization solution. While the public modelling detailed above suggests that hydrogen is not expected to be a major source of emission reductions in the next decade, the Southern Interior has a few potential sources of demand.

BC's Southern Interior hosts a variety of industrial activities that could have appropriate uses for low-carbon hydrogen. There is significant mining activity in the region, including Teck Resources' metallurgical coal operations in the Elk Valley and its large lead-zinc smelter in Trail, as well as the Highland Valley Copper mine in the northeast of the Thompson-Okanagan region.

BC's forestry and bioeconomy industry, specifically the pulp and paper sector, has a large presence in the Southern Interior and could test hydrogen as a replacement for natural gas in the drying of wood chips and other biomass.

Other manufacturing exists in the region, including metal fabrication and food processing. Smaller scale industries could represent secondary markets for hydrogen, particularly for process heat. The development of a hydrogen economy could also attract new clean technology manufacturing or service industries to the region. Large industry could provide the stable, large-volume demand needed to underpin initial hydrogen production projects, potentially forming the core of regional hydrogen hubs.

Hydrogen for Heat

In many of these industrial processes, fossil fuels are used as energy sources and combusted to produce high-temperature heat. Low-carbon hydrogen can be combusted directly in boilers, furnaces, and turbines to generate heat without producing CO_2 emissions. In any industry with a demand for high-temperature heat, fossil fuels could be replaced by hydrogen or RNG.

While broad substitution of natural gas for heat faces cost hurdles, specific applications in forestry (e.g., drying kilns) or other manufacturing processes where electrification is impractical or prohibitively expensive could become viable as hydrogen costs decrease and carbon prices rise. Identifying these niche industrial opportunities requires detailed site-specific assessments.

Off-Road Equipment

As previously noted, FCEVs or dual-fuel combustion vehicles could be used to lower transportation emissions. In many industrial sectors, off-road equipment such as logging trucks run on diesel fuel. As technology availability improves, substituting old equipment and vehicles could reduce industrial emissions in the region and improve air quality.

The concentrated nature of mining operations and the heavy energy demands of large-haul trucks make mine sites ideal candidates. A major mine adopting FCEVs for its fleet could provide sufficient demand to justify dedicated on site or nearby production and refuelling infrastructure, acting as a catalyst for regional supply. There are some companies already in the early stages of testing or exploring hydrogen-powered mining vehicles. [52,53,54]

Industrial Decarbonization

Hydrogen as a Chemical Feedstock

Hydrogen serves as a crucial feedstock in various chemicals, such as ammonia—one of the largest global consumers of hydrogen, driven by the fertilizer industry—and methanol. The Southern Interior doesn't currently have any low-carbon ammonia or methanol projects under development, nor any petroleum refineries. However, in Alberta there are a few proposed ammonia and methanol projects. [55,56,57]

Agriculture

Another source of industrial demand could come from the Southern Interior's agriculture sector. In the Kootenays, cattle ranching accounts for a sizable portion of the sector, with fruit and vegetable production concentrated in areas such as Creston Valley. The Thompson-Okanagan region is the heart of BC's wine industry and has far larger and more diverse farming operations including fruits, vegetables, vineyards, and ranching.

Tractors and other farm equipment used on site, as well as trucks used for transporting agricultural products, livestock, and supplies, could be transitioned to FCEVs.

Conventional ammonia production, a key ingredient in nitrogen fertilizers, is highly carbon intensive. Large-scale farming operations in the Southern Interior could explore the possibility of co-locating green hydrogen production and leveraging it to create low-carbon fertilizers in the region, improving regional resilience and reducing transportation emissions.

Energy Storage	Hydrogen fuel cells can convert hydrogen into electricity with zero point-source emissions. In industrial sites, there is a possibility that hydrogen fuel cells could provide on-site power generation for facilities, complementing grid electricity. After production, hydrogen can be stored until needed and used as a source of power generation during peak demand or when intermittent resources are unavailable, either through a fuel cell or combustion. Using hydrogen for energy storage could complement low-carbon electricity. This approach would only be sensible if the cost and carbon intensity of the hydrogen used was lower than alternative fuels such as diesel or natural gas, and if it was deployed in climates where battery storage proves to be prohibitively ineffective. The relative efficiency (energy conversion loss) of hydrogen compared to electrification is low, and use for storage would require new infrastructure for storage and distribution. Research from NorthX Climate Tech's report "Powering the Future with Energy Storage: The Role of Energy Storage in Enabling Electrification and Grid Decarbonization" suggests that in BC, the likeliest use case for hydrogen as a form of long-term energy storage is on industrial sites that will have already invested in hydrogen infrastructure and co-located supply and demand; it could be used as a backup to smooth out power demand or provide competitive combined power and heat. [58] Otherwise, its levelized cost is uncompetitive. [58]
Built Environment Heating	Some companies are exploring using hydrogen to reduce the carbon intensity of gas supply by blending it with natural gas and injecting it into the pipeline network for commercial and residential buildings. The University of British Columbia Okanagan's (UBCO's) newly established Hydrogen Research Lab (H2LAB) is undertaking research on the impacts of blending, how hydrogen and hydrogen-enriched natural gas affect current infrastructure, and what codes and standards are needed for safe and reliable delivery. FortisBC and Enbridge have also commissioned a comprehensive blending feasibility study to examine these questions further. Analysis in the "Carbon Intensity of Hydrogen Production Methods" report found that "blending hydrogen at approximately 20 per cent by volume" into the provincial gas grid could yield emissions reductions of only 1.7 per cent to four per cent, and should be considered a low priority use of hydrogen. [10] Research by the Canadian Climate Institute corroborates this: a new report found that building heat will not be a cost-effective use of hydrogen in the long term—buildings account for only a small portion of low-carbon gas use in a cost-optimized net zero modelling nationwide. [59] Blending could serve as an initial offtake or as anchor demand while regional demand grows, to stabilize the market; however, the latest evidence suggests that it should not be considered a high-priority use of hydrogen in the medium or long-term. Other approaches to decarbonizing the built environment in the Southern Interior, such as deep retrofits, demand-side management, dual-fuel heat pumps, and renewable natural gas are likely better suited.

Cost Trends

The cost of hydrogen can fluctuate significantly as it is contingent upon the specific technology pathway employed. These costs are influenced by many factors, including the prices of feedstocks (such as natural gas or electricity), the capital investments required, ongoing operational expenditures, and transportation costs. Costs are generally projected to decline as economies of scale are achieved. For example, in its 2023 Energy Futures report the CER assumed that electrolyser capital costs will decline by 80 per cent by 2030. [35] Additional factors that will vary over time include taxes and possible offsetting revenue streams for the producer (e.g., solid carbon).

HTEC's current retail price for hydrogen at its fuelling stations across BCm including their station in Kelowna, is $14.70 per kg. [60,61] The BC Hydrogen Strategy estimated that a competitive production cost would need to be no higher than $3 per kg by 2030 (approximately $25 per GJ based on an assumed hydrogen energy content of 120 MJ per kg). [1]

Table 4. Projected 2030 production cost at a national level.

Source	2030 Hydrogen Production Cost Projection	Production Method
Canada Hydrogen Strategy[11]	$1.38 - $4/kg	SMR + CCS
Transition Accelerator[62]	$1.38/kg	SMR + CCS
	$3.17/kg	Electrolysis
Canada Energy Regulator[35]	$1.50 - $10.50/kg	All technologies
ESMIA[63]	$1.71 - $2.03/kg	All technologies

Three BC studies from 2019 to 2024 completed analyses to project cost curves for each major hydrogen production method. The results are available in the following table.

Table 5. Projected 2030 production cost in BC.

Production Method	Projected 2030 Production Cost in BC		
	The Potential for Methane Pyrolysis in BC (2024)[8]	B.C. Renewable and Low-Carbon Gas Supply Potential Study (2022)[10]	BC Hydrogen Study (2019)[49]
Electrolysis	$6.07 - $9.87/kg	~$35 - ~$41/ GJ ($4.2 - $4.92/kg)	$5.13 - $7.38/kg
Pyrolysis	$2.71 - $6.71/kg	~$18/GJ ($2.16/kg)	$1.68 - $2.28/kg
ATR + CCS	$2.71/kg	-	-
SMR + CCS	-	~$18/GJ ($2.16/kg)	$2.14/kg

Unlike the other literature, the report "The Potential for Methane Pyrolysis in BC" went a step further and undertook valuable analysis to present cost projections for delivered hydrogen for each technology. The study found that "hydrogen compression, loading, and transport can add significant costs to the total LCOH, between $0.2/kg to $6/kg depending on the transport distances, volumes, and transportation method." The federal Hydrogen Strategy presented a target cost for delivered hydrogen (which includes all production and transportation-related costs) of $1.5-$3.5/kg, after 2030.[11]

While the best available public estimates indicate that hydrogen production costs will be near the BC Hydrogen Strategy's target for global competitiveness of $3/kg, new research signals that processing and transportation costs are expected to add significantly to the final price, particularly in smaller production quantities. This is especially important to consider in the context of a co-located hydrogen hub where demand is not expected to reach large quantities in the next decade.

What We Heard: Expert Feedback on Demand

In our workshop, participants were gathered and asked: “What are the key challenges and opportunities related to the end use of hydrogen in the region?” The following themes represent the summarized feedback collected by facilitators.

Agriculture

- Hydrogen has a potential role to decarbonize parts of the Southern Interior’s agriculture sector, which contributes significantly to BC’s GHG emissions. Potential applications include powering agricultural equipment (e.g., tractors), grain drying, and natural gas abatement.

- Hydrogen could also enable the production of value-added products in the sector (e.g., hydrogenated fats and oils).

- Developing agriculture hubs for hydrogen and renewable fuel use is considered an opportunity to expand refueling infrastructure. There could also be opportunities for knowledge sharing within the industry while scaling new technologies.

Rail

- Participants felt strongly that there were strategic opportunities for light and heavy rail hydrogen adoption in the Southern Interior. The Canadian Pacific Kansas City (CPKC) pilot was cited as a promising starting point to decarbonize goods movement in the region.

- Academics in the region are exploring the potential for an Okanagan hydrogen rail corridor from Osoyoos to Kamloops to address inter-city transportation needs and traffic congestion challenges in the Okanagan Valley.

Industrial Decarbonization and Energy Storage

- Data centres are a perceived source of hydrogen demand due to the growing power demands of AI. Some participants believe expanded clean energy supply could be a major attraction to bring tech companies to BC and that hydrogen could provide peaking power support and energy storage for growth in the region.

- Hydrogen is favoured over some other low-carbon fuels, such as renewable natural gas (RNG), due to its lack of point-source emissions.

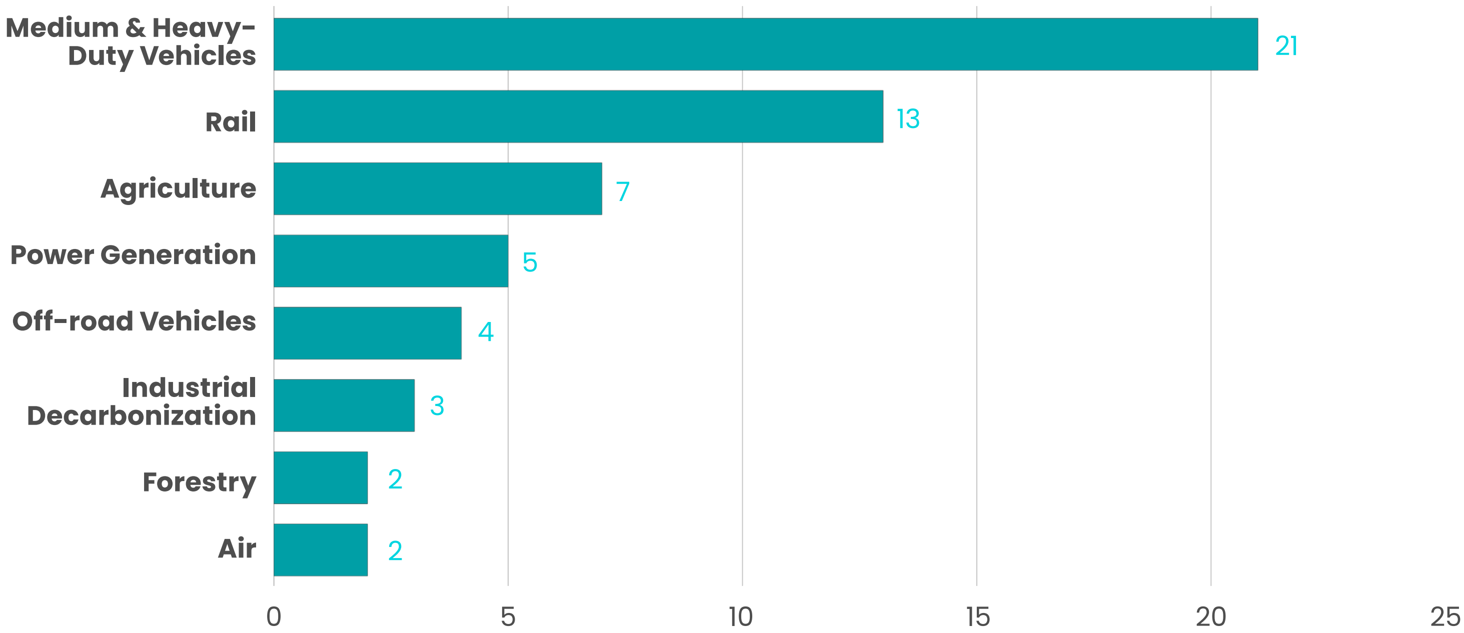
- Off-road applications in the construction industry represent another potential demand source. Participants believe hydrogen or blended hydrogen engines could be used in several types of off-road diesel vehicles (e.g, tractors).

- Pulp mills in the Southern Interior could utilize hydrogen or other renewable and low-carbon fuels as a replacement for natural gas.

Mobility - On-Road Demand

- Potential on-road applications in the Southern Interior include municipal fleets (transit buses), return-to-base fleets (e.g., Purolator, Canada Post, Amazon), and waste/garbage vehicles.
- The hub model is seen as a way to expand local transportation use and support long-haul Class 8 truck adoption by strategically expanding potentially shared infrastructure.
- FCEVs are perceived as a solution to the common concerns in the region with medium and heavy-duty electric vehicles, such as range anxiety, weight penalty, and cold-weather performance.
- Strategic placement of infrastructure will be critical for the early growth of a transportation network in the hub. For example, refuelling stations could be strategically placed in locations such as landfills for waste vehicles that have return-to-base characteristics.

Figure 2. Workshop polling results: Likeliest sources of regional demand in 2035.



Demand-Side Recommendations for Hub Partners

1. **Focus the Southern Interior hub's development around heavy transportation** The latest evidence and expert consensus suggest that heavy-duty transportation will be the primary source of hydrogen demand in the province. In the next decade, on-road class 8 vehicles will be a target with supportive infrastructure (e.g., refuelling stations) already being built. Policy-makers should work with industry to plan infrastructure development and incentives accordingly and closely monitor how the costs of hydrogen end-use technologies compare to electrification counterparts over time. Governments should continue federal and provincial funding support (e.g., Zero Emission Vehicle Infrastructure Program, Canada Infrastructure Bank funding, Pacific Economic Development Canada, CleanBC Go Electric Hydrogen Fuelling Infrastructure Program) specifically for building a network of heavy-duty hydrogen refuelling stations along key Southern Interior transportation corridors (Hwy 1, 3, 5, 97) to catalyze private investment. **[Recommendation Lead: All Partners]**

2. **Limit consideration of blended hydrogen for heat as a pathway to reduce emissions.** Consider blended hydrogen for heat as a short-term anchor tenant in the region, if supply outpaces the demand side of technology adoption. There is research underway in the region at UBCO's H2LABI to explore the benefits and challenges of hydrogen blending. Given that blending hydrogen is unlikely to make a meaningful difference in BC's emission reduction goals, the comparatively small amount of hydrogen expected to be produced in the region by 2035 would likely be more effectively utilized in other sectors, such as on-road and off-road transportation. [10,59] **[Recommendation Lead: Province, Utilities, Academia]**

3. **Continue government funding for demonstration projects and communicate outcomes.** Canada has an adoption problem across all cleantech sectors. Continued government support for pilot and demonstration projects is critical to build confidence in potentially key end-use technologies and pave the way for commercialization (e.g., ICE Fund). Existing BC support for new projects is building the foundation for sectoral growth. Furthermore, it is essential for project proponents and government funders to disseminate the findings and outcomes of early adopters, including information such as technical feasibility and limitations, return on investment, and carbon intensity, to build greater understanding of technology development in the market. **[Recommendation Lead: Province, Industry]**

Regional Considerations

Regional Overview

The Kootenay and Thompson-Okanagan regions, while distinct in some aspects, share notable similarities and potential synergies that are critical for the development of a hydrogen hub in the Southern Interior.

Background

The Kootenay region is characterized by mountainous terrain and wide landscapes, spanning the southeastern corner of British Columbia. With a population of approximately 176,000 residents, its major communities include Cranbrook, Nelson, Trail, and Revelstoke. [65] Historically, the region's economy has been rooted in heavy industry, such as mining and forestry. These sectors continue to contribute significantly to the regional economy and represent substantial existing industrial energy demand. The climate varies widely across the region, from the heavy snowfall in the Selkirk and Purcell Mountains to the warmer, drier valleys. Infrastructure includes a well-established network of highways (notably Highway 3 and Highway 1) connecting communities and industrial sites, as well as FortisBC's extensive natural gas distribution network and major hydroelectric generation assets along the Kootenay River.

By contrast, the Thompson-Okangan region, is defined by its warmer, drier valleys and agricultural lands. It is a more densely populated and growing region with a population of more than 660,000. [65] Major urban centres such as Kelowna, Kamloops, Penticton and Vernon are drivers of regional economic activity. The region is economically diversified, encompassing a major agriculture sector (renowned for its orchards and vineyards), a robust tourism industry, an emerging technology sector, and continued activity in forestry and mining. [66] The climate is marked by hot, dry summers and milder winters compared to the Kootenays. Infrastructure is well-developed, featuring highways (Highway 97 and Highway 1), major airports in Kelowna and Kamloops, and a network of electric and natural gas infrastructure.

Similarities and Complementary Strengths

Both regions share a foundational reliance on natural resource industries such as mining, forestry, and agriculture, complemented by robust tourism and recreation sectors. While these industries could generate substantial demand for low-carbon hydrogen, their contribution to feedstock supply is, as explored in the report's supply section, comparatively limited (e.g., forestry and agricultural waste). Crucially, both regions are well connected to BC's electricity grid and are well-served by FortisBC's extensive natural gas distribution network. The major transportation corridors, notably Highway 1, 3, and 97, traverse both regions, creating shared opportunities for decarbonizing heavy-duty trucking and connecting potential hydrogen supply and demand points.

Differences and Unique Characteristics

Despite their commonalities, the Kootenay and Thompson-Okanagan regions possess distinct features that could influence respective hydrogen development. With significant mining (e.g., Teck Resources) and forestry (e.g., Mercer Celgar) operations, BC's Kootenays region offers strong "anchor" opportunities for industrial decarbonization. Regional hydroelectric generation capacity, particularly from Kootenay River dams, also provides clean power access. The Thompson-Okanagan, with its larger population centres (Kelowna, Kamloops, Vernon, Penticton) and sizable agricultural and tourism sectors, could experience earlier adoption of hydrogen in heavy-duty transportation. Its strong agricultural base, including orchards and vineyards, could also pilot hydrogen-powered farming equipment and explore low-carbon fertilizer production. While both regions face the same province-wide grid capacity challenge, the specific nature and timing of planned infrastructure upgrades by BC Hydro and FortisBC may vary across regions.

Synergies

The differences between the regions could be leveraged as synergistic strengths within a strategy for the Southern Interior. The Kootenays' industrial demand could drive initial large-scale green hydrogen production, while the Thompson-Okanagan's population centres and transportation corridors could provide early markets for hydrogen use in vehicles (and possibly early but limited blending). Shared infrastructure development, such as a refuelling network strategically located along major highways, would benefit both regions by enabling connective long-haul hydrogen transport. Collaboration between regional economic development bodies (e.g., Economic Trust of the Southern Interior), academic institutions (e.g., UBCO's H2LAB, College of the Rockies), and utilities would help leverage the experience of both regions. As discussed in the supply section of this report, the viability of CCS for blue hydrogen is less certain geologically in the Southern Interior, suggesting a shared emphasis will be needed on green and turquoise hydrogen technology pathways. A coordinated Southern Interior hydrogen hub between the two regions would optimize resource allocation, achieve economies of scale, and attract further investment to both regions by linking supply with diverse demand.

Competitive Advantages

Academic Leadership

UBCO, with support from FortisBC, launched a new initiative to advance hydrogen research in the Southern Interior region. The newly established Hydrogen Research Lab (H2LAB) was provided $500,000 in research funding from Fortis and $800,000 from the Natural Sciences and Engineering Research Council of Canada to complement $2.3 million from UBC. The 2000 square-foot lab will support cutting-edge research such as: the impacts of blending hydrogen into BC's gas supply, how hydrogen and hydrogen-enriched natural gas affect current infrastructure, what codes and standards are needed for safe and reliable delivery, and various demand-side applications of hydrogen in the region. The H2LAB will serve as a focal point for academia and industry to work together and advance a hydrogen hub in BC's Southern Interior.

Resource Synergy

The co-location of hydroelectric resources, natural gas infrastructure, and biomass potential from forestry provides flexibility. This allows for the potential development of multiple low-carbon hydrogen production pathways—green, turquoise, or biomass gasification—offering resilience and the ability to adapt to evolving technology costs and policy landscapes.

Established Industrial Base

The presence of large, energy-intensive industries such as mining and forestry creates potential anchor demand. These industries often operate large vehicle fleets and require significant process heat, representing substantial decarbonization opportunities where hydrogen could play a role.

Strategic Transportation Corridors

The Kootenay and Thompson-Okanagan regions serve as critical arteries for the movement of goods between the BC coast, Alberta, and the United States via major highways (Trans-Canada Hwy 1, Hwy 3, Hwy 5, Hwy 97). This high volume of heavy-duty truck traffic presents a significant, geographically concentrated demand opportunity for hydrogen as a zero-emission fuel.

Supportive Government Policy

The provincial government's commitment to reducing emissions and promoting clean technologies creates a favourable environment in BC as a whole. Incentives, grants, and supportive regulations encourage investment and innovation in the sector. CleanBC programs and policies, including the Low Carbon Fuel Standard, Zero Emission Vehicle Act, Go Electric program, and others advance hydrogen technology adoption and its competitiveness with other energy sources. BC carbon pricing on industrial emitters also increases the operating cost of carbon-intensive activities and the use of fossil fuels, making low-carbon hydrogen comparatively more attractive as the tax rate escalates.

The "stacking" of various financial supports can also help drive the economic viability of new projects. Federal Investment Tax Credits can reduce capital costs depending on the technology and carbon intensity, and grants from programs such as the Clean Fuels Fund or low-interest loans from the Canada Infrastructure Bank (CIB) could further improve project economics.

Opportunities for Collaboration

The development of a regional hydrogen hub presents significant opportunities for collaboration both within British Columbia and with neighbouring Alberta, creating a synergistic network that could accelerate the growth of the hydrogen economy across Western Canada.

Intra-BC Collaboration

The Southern Interior hydrogen hub could form strategic partnerships with other emerging hydrogen hubs in the province, such as those in the Lower Mainland, Northern BC, and Vancouver Island. These collaborations could focus on knowledge sharing, technology transfer, and the development of integrated supply chains. For instance, the Southern Interior and Lower Mainland hubs offer cutting edge research and development and can act as a testbed for innovative technologies.

Collaboration with Alberta

Alberta is a leader in the hydrogen industry due to its extensive energy infrastructure and expertise in oil and gas. Alberta's expertise in hydrogen production and use, with its existing sources of supply and demand, is complemented by significant investments in CCUS technologies, making it a competitive region for development. Of note for the Southern Interior is the Calgary Hydrogen Hub, which launched in early 2025. [67] Most cities—in the Kootenays, for instance—are closer to Calgary than they are to Vancouver. The strong local industrial base and investments in hydrogen production and storage position the region as a competitor and collaborator with BC. Major emerging hydrogen projects in Alberta include: the $2 billion Linde Blue Hydrogen Project, Air Products' Edmonton-based "Canada Net-Zero Hydrogen Energy Complex," and "Ekona Plant One" located at ARC's Gold Creek Natural Gas Plant in Grande Prairie. [68,69,70]

Collaboration with Alberta across all of BC's future hydrogen hubs will be essential to enhance the hydrogen supply chain in Western Canada. Inter-provincial partnerships can facilitate knowledge sharing, technology transfer, and help establish a cohesive regional market to improve market stability.

Anchor Points

Based on resource availability, infrastructure, and local demand opportunities, several areas within the Southern Interior regions could be considered as potential anchor points for hub development:

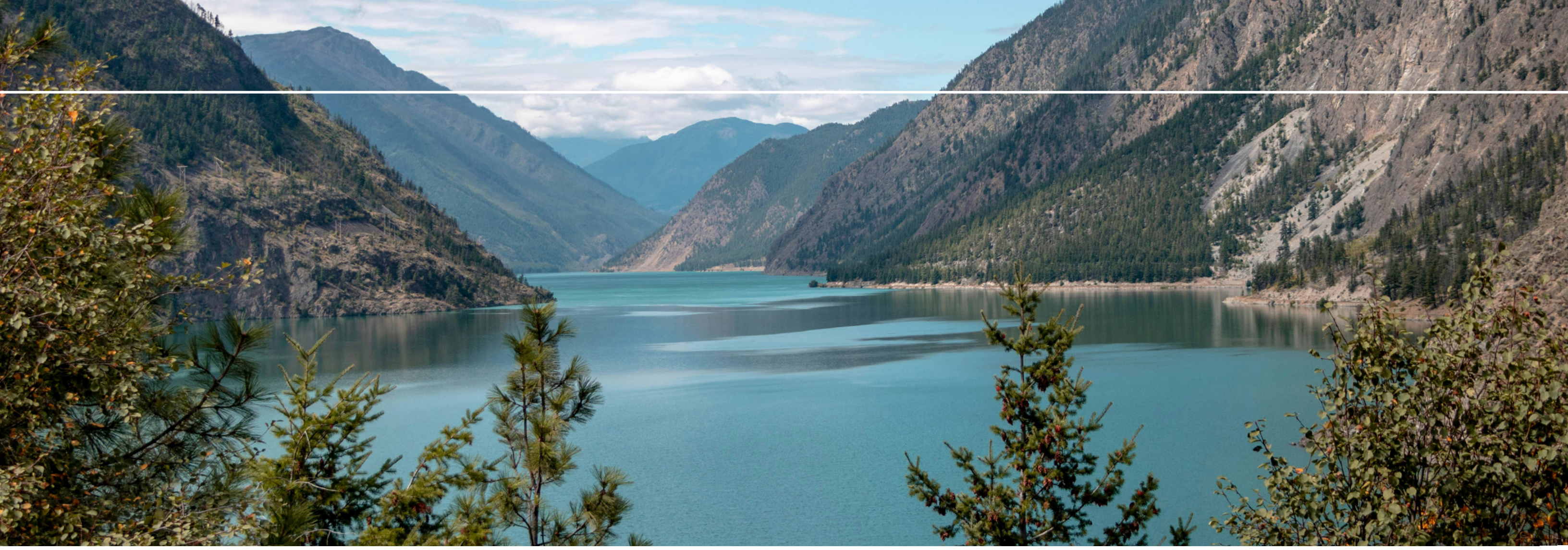
- **Trail Area (Kootenays):** Potential industrial anchor (Teck smelter), proximity to FortisBC hydro generation, potential for by-product H_2, access to rail and highway transport.

- **Elk Valley (Kootenays):** Major mining operations, existing natural gas infrastructure, significant heavy truck and rail activity.

- **Kamloops Area (Thompson-Okanagan):** Major transportation hub (Hwy 1 and 5 junction), proximity to a large mine (Highland Valley Copper), existing gas infrastructure, major population centre.

- **Okanagan Valley (Kelowna/Vernon/Penticton):** Largest population centres in the two regions, significant transport routes (Hwy 97), extensive FortisBC gas and electric services, potential for fleet conversions (transit, delivery) and blending.

- **Castlegar Area (Kootenays):** Location of Mercer Celgar pulp mill (potential biomass/by-product source/demand), FortisBC hydro assets nearby.



Potential Barriers to Overcome

Regulatory and Policy Needs

Aligning regulations related to hydrogen production, storage, and distribution will be important for development in Western Canada. Standardized safety protocols and environmental regulations can mitigate these challenges. CSA Group is working to address these barriers to promote safety and harmonize requirements across North America.

The transition from oil and gas regulations to a comprehensive framework for hydrogen, ammonia, and methanol projects may create short-term challenges. However, progress has been made with the introduction of the Hydrogen Facilities Regulation in 2025. [71] Coordination between various regulatory bodies, including the BC Energy Regulator (BCER), Technical Safety BC, and local municipalities, is crucial to continue to streamline the permitting process.

Infrastructure and Transportation

While the region has extensive natural gas infrastructure, adapting it for hydrogen production and distribution poses significant challenges. The region's vast geography and relatively sparse population centres create logistical hurdles. Developing a new hydrogen pipeline network and/or establishing efficient transportation routes (e.g., trucking or rail) would be crucial but costly. [27] Alignment between regional partners will also be critical; building the necessary infrastructure requires coordination between regions (both intra-BC and interprovincial) and differences in readiness could create bottlenecks.

Market Development and Demand

Developing end-use applications for hydrogen and fostering partnerships with potential large-scale consumers across the region (e.g., industrial decarbonization, long-haul transportation) may be key to the hub's future success, and it would be critical for project proponents in the Thompson-Okanagan and Kootenay regions to work together to foster a collaborative market. Joint efforts to stimulate demand, such as joint public-private partnerships and incentives for hydrogen adoption in various sectors, can play a role to enhance market attractiveness. [72,73,61]

Workforce Development Needs

The development of a hydrogen hub has the potential to create numerous multi-sectoral opportunities, necessitating a highly skilled workforce. This transition creates both challenges, notably retraining, and significant opportunities for economic diversification and new job creation. Broadly, the hydrogen industry will require diverse talent in a wide range of professions in order to grow, including:

- **Engineers:** Professionals skilled in chemical, mechanical, electrical, and process engineering.
- **Renewable Energy Experts:** Expertise in integrating hydrogen production with renewable energy sources, such as wind, solar, and hydroelectric power.
- **Safety and Compliance Officers:** Specialized training in safety protocols, hazardous materials handling, and compressed gas to ensure safe operations and adherence to industry standards
- **Technician and Operators:** Skilled technicians and plant operators to manage the day-to-day operations of hydrogen production plants, storage facilities, and distribution networks.
- **Digital Experts:** Professionals with digital skills and expertise in generative AI, design, data analytics, and automation.
- **Automotive Specialists:** Skilled trades and technicians to maintain and service FCEVs and refueling stations.
- **Business and Policy Professionals:** Professionals with project management, sales and commercial skills to support the growth of the hydrogen economy, and experts who understand the regulatory and compliance requirements specific to the hydrogen industry.
- **Innovators and Researchers:** Experts who can innovate and improve hydrogen production methods, storage solutions, and application technologies.

To meet these needs, specialized training and education programs must be developed. At the early stages of a sector's growth, there is often a disconnect between what industry needs and what post-secondary institutions are offering. At a high level, this means a hydrogen hub would require:

- **Vocational Training:** Programs focused on specific technical skills related to hydrogen production, safety, and maintenance, as well as end-use technologies such as refuelling stations, vehicle and fuel cell maintenance.

- **Higher education programs:** Universities and colleges offering courses and degrees in hydrogen technology, renewable energy systems, and engineering.

- **Continuing education and upskilling opportunties:** Opportunities to train existing workforces through workshops, certifications, and on-the-job training. BCIT's Hydrogen Symposium identified three elements for an upskilling package:
  "1) certification for working with materials at extreme high pressure,
  2) training in cryogenics for extreme low-temperature materials, and
  3) hydrogen safety training." [74]

There are no specialized training and education programs related to hydrogen currently in the Southern Interior. However, FortisBC and large industries in the region regularly upskill and prepare their labour force for new technologies and technical requirements. Collaborations such as the H2LAB at UBCO will also catalyze higher education work on hydrogen in the region.

Comprehensive resources that break down the workforce development considerations and needs of the BC hydrogen industry were developed by Creative Links Inc., including a Labour Market and Skills Analysis, Capacity-building Strategy and Action Plan, and Hydrogen Value Chain and Workforce Map. [75] For more information about workforce development, readers are advised to consult these resources.

What We Heard: Local Feedback on Regional Considerations

In our workshop, participants were gathered and asked: "What are the competitive advantages associated with hydrogen hub development in the region (compared to other prominent hubs in development) and what are the opportunities to collaborate with neighbouring jurisdictions?" The following themes represent the summarized feedback collected by facilitators.

Infrastructure and Transportation Considerations

- The regions have existing industrial sites and closed pulp and paper facilities that offer infrastructure advantages for hydrogen development (e.g., zoning, grid connectivity) and potential co-location of supply and demand.
- Road infrastructure can be vulnerable to extreme weather events (e.g., landslides), which poses a challenge for transportation of hydrogen by truck. This is a pervasive challenge for BC as a whole and does impact the risk assessment of a company choosing to pursue trucking over rail, for example.
- The regional transportation needs include both on-road (municipal fleets, commercial vans) and potential rail applications.
- Opportunities exist to collaborate on developing transportation corridors and redesigning depot infrastructure to support hydrogen use. For example, return to base vehicles can have maintenance and refueling co-located.

Unique Regional Attributes

- The Southern Interior has diverse energy resources, including wind and solar potential, which are competitive advantages for hydrogen production.
- The region's location presents opportunities to serve both local demand (e.g., agriculture within a 150km radius) and broader markets (growing urban energy and industrial demand in the Okanagan).
- There are opportunities to collaborate with neighbouring jurisdictions on addressing energy storage challenges and high-value peaking power support.
- Seasonal demand variations across sectors (e.g., agriculture in summer, transportation in winter) need to be considered.

Economic Diversification and Innovation

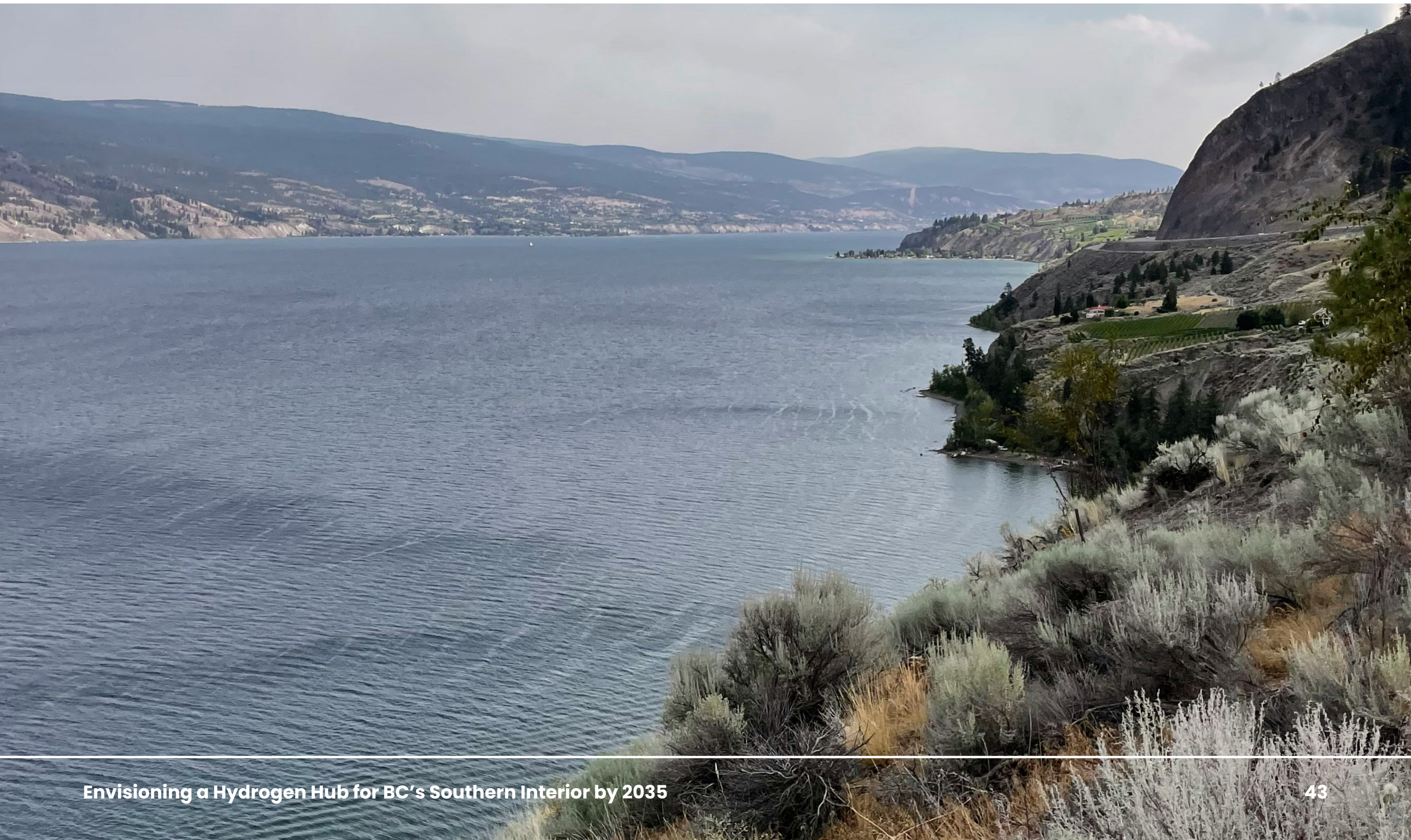
- The region's economy includes sectors with high energy demands and emissions, such as agriculture, industry, and transportation, offering potential demand for hydrogen.
- The presence of institutions such as UBCO provides a competitive advantage in terms of innovation and developing hydrogen technologies.
- Opportunities exist to collaborate on diversifying the regional economy by attracting new industries (e.g., data centres) and supporting the development of hydrogen-related industries.

Regional Recommendations for Hub Partners

- **Incorporate hydrogen development into Official Community Plans (OCPs):** Local governments in the region could explicitly mention and support hydrogen development in OCPs, signalling a long-term commitment and providing policy guidance for land use decisions. **[Recommendation Lead: Local Governments]**
- **Explore new ways to enhance knowledge transfer within the Southern Interior.** Hydrogen development in the Southern Interior would have greater success as a close collaboration between the Thompson-Okanagan and Kootenay regions. Knowledge transfer within the region and beyond will be critical given the bulk of research and development is occurring at UBC Okanagan. Joint research initiatives and collaboration on skills training between post-secondary institutions in the two regions is recommended to ensure balanced regional preparedness. Furthermore collaboration between regional districts and municipalities in both regions is recommended to improve the planning of potential shared infrastructure investments. **[Recommendation Lead: All Partners]**
- **Explore the creation of a regulatory task force.** There is a need to streamline regulatory and permitting barriers to project development for hydrogen all across the province. There may be a role for CEMPO to play in facilitating regular collaboration between industry, utilities, First Nations, and municipalities, to identify the barriers facing project developers and overcome them promptly. This recommendation aligns closely with the policy action in the BC Hydrogen Strategy to "Establish a working group made up of representatives from the hydrogen industry, regulatory agencies, and government to implement B.C. Hydrogen Strategy actions." **[Recommendation Lead: Province, Utilities, BCER]**

- **Create a hydrogen workforce development strategy.** Part of the collaborative approach to develop and retain talent should include setting measurable, actionable targets to develop the hub's labour force. BC does not currently have a dedicated labour strategy for the clean economy. A dedicated hydrogen workforce strategy should build on the existing consultations to avoid duplication, and rely on partnerships with post-secondary institutions and municipalities. There is a need for ongoing collaboration between academia and industry to ensure that the skills needed by industry are being taught and that they are marketed as a tangible career path for workers of all ages looking to join the low-carbon workforce. The Province partnered with Fraser Basin Council and Creative Links to complete a gap analysis to identify resources for hydrogen labour and skills development in BC; this could lay the groundwork for the strategy. [75]
  [Recommendation Lead: Province, Industry, Post-Secondary Institutions]

- **Continue support for public education and awareness activities.** There still appears to be a limited public understanding of hydrogen province-wide. Further efforts are needed to disseminate the latest evidence surrounding hydrogen's role in the local economy—from carbon intensity to safety to best end uses and more. Accessible, summarized resources and "101" content can help dispel myths and increase public awareness of the role hydrogen can play in the decarbonization of local communities, thereby building buy-in. The Province partnered with Fraser Basin Council and the Canadian Hydrogen Association to develop new hydrogen education materials to inform the public. This is a good first step and should be a building block for ongoing public-private-nonprofit sector collaborations to advance awareness and education. **[Recommendation Lead: Province, Local Governments]**



Clean Energy Across BC

The BC government is committed to reduce emissions by 40% by 2030, and reach net zero by 2050, which will involve the adoption of various clean energy technologies. The IEA'S Global Energy Review 2025 noted that global energy demand grew by 2.2% in 2024, faster than the average rate over the past decade. The transition will require wide-range of solutions and technologies. In order to continue to provide low-carbon and low-cost energy, the Province is looking to explore various clean energy opportunities, including expanding hydro capacity, developing renewable natural gas facilities, and further integrating wind, solar, and geothermal into the grid. The Province is also investing in supporting technologies such as energy storage solutions to manage intermittent renewable energy sources, upgrading the existing energy grid, and improving energy efficiencies. [23] Energy diversification also includes adapting existing energy sources to be less carbon intensive, using technologies such as CCUS. With demand for various fuels and technologies continuing to expand, hydrogen is expected to be complementary to the broader clean energy goals of BC going forward.

Conclusion

Establishing a successful hydrogen hub in BC's Southern Interior requires anchor tenants, multi-partner investment in shared infrastructure, adequate low-cost energy supply, clear regulatory and permitting processes, and meaningful partnerships with local communities and First Nations.

Together, the Thompson-Okanagan and Kootenay regions possess diverse potential feedstocks for hydrogen production. Hydroelectric resources offer a pathway for green hydrogen via electrolysis. However, significant challenges remain regarding electricity costs and grid capacity, necessitating substantial planned infrastructure upgrades by BC Hydro and FortisBC. Natural gas infrastructure exists and could be leveraged to enable turquoise hydrogen production.

While the natural gas network offers potential for blending, major upgrades or dedicated transmission pipelines would be needed for higher hydrogen concentrations. The electricity grid requires substantial investment to support load growth and potential large electrolyser demands. The lack of dedicated hydrogen transportation and refuelling infrastructure, particularly for heavy transport, remains a critical bottleneck, although projects in other parts of the province such as HTEC's H2 Gateway are beginning to address this.

Ultimately, the most compelling opportunities for hydrogen in the Southern Interior lie in leveraging the region's role as a transportation corridor and addressing the decarbonization needs of its major resource industries (mining, forestry, agriculture). Heavy-duty trucking along major transportation corridors (Hwy 1, 3, 97) represents a primary opportunity, leveraging hydrogen's advantages for long-haul applications, along with the development of key rail corridors. Large industrial operations, especially in mining (e.g., Teck Resources) and forestry (e.g., Mercer Celgar), could serve as crucial "anchor" loads. Blending hydrogen into the existing natural gas network, pursued by FortisBC, offers broad reach but is a transitional measure due to blend limits, limited emissions reduction benefits, and competition from RNG.

In conclusion, the development of a Southern Interior hydrogen hub is a compelling opportunity for economic growth and decarbonization. However, its realization demands a concerted effort from all partners. Addressing supply-side challenges, fostering demand in priority sectors, promoting regional collaboration, and investing in workforce development are all crucial steps towards establishing a thriving hydrogen ecosystem in the region by 2035. This will require ongoing commitment, innovation, and strategic investments. By embracing the unique roles of hydrogen in a regional clean economy, Southern Interior BC could potentially position itself at the forefront of the next wave of clean economic growth.

All Recommendations for Hub Partners

Category	Recommendation	Lead Partner(s)	Timeline
Supply-Side	**1.** Provide further public clarity on electricity infrastructure adaptation and growth	Province, Utilities	2025-2030
	2. Continue support for market-based policies that increase competition between hydrogen and carbon-intensive fuels	Province	Ongoing
	3. Map industrial sites in high-opportunity zones to support project proponents and investors	Local Governments	2025-2030
	4. Incorporate hydrogen development zones in land-use planning	Local Governments	2025-2030
Demand-Side	**1.** Focus the Southern Interior hub's development around heavy transportation	All Partners	2025-2030
	2. Limit consideration of blended hydrogen for heat as a pathway to reduce emissions	Province, Utilities	2025-2030
	3. Continue government funding for demonstration projects and communicate outcomes	Province	2025-2030
Regional Considerations	**1.** Explore new ways to enhance knowledge transfer within the Southern Interior	All Partners	2025-2030
	2. Explore the creation of a regulatory task force	Province, Utilities, BCER	<1 year
	3. Create a hydrogen workforce development strategy	Province, Industry, Post-Secondary Institutions	2025-2030
	4. Continue support for public education and awareness activities	Province, Industry	Ongoing
	5. Incorporate hydrogen development into Official Community Plans (OCPs)	Local Governments	2025-2030

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