

# Hydrogen BC | Carbon Capture, Utilization, and Storage

## WHAT IS CARBON CAPTURE, UTILIZATION, AND STORAGE (CCUS)?

Carbon capture, utilization, and storage (CCUS) is a series of processes where carbon dioxide (CO<sub>2</sub>) is captured from industrial processes, transported, and either utilized or stored safely underground.

## HOW IT WORKS:

### 1. CARBON CAPTURE:

CO<sub>2</sub> can be captured from industrial processes, such as chemical production, hydrogen production, steel manufacturing, or power generation, before it is released into the atmosphere.

### 2. TRANSPORT:

Once captured, CO<sub>2</sub> is compressed and transported to a storage location. Pipelines are the most common mode of CO<sub>2</sub> transport, although trucks and ships can also be used in specific cases.

### 3. STORAGE:

The CO<sub>2</sub> is injected deep underground into rock formations where it can be securely stored without leaking back into the atmosphere. Monitoring, measurement, and verification (MMV) are critical components of this process to ensure long-term containment.

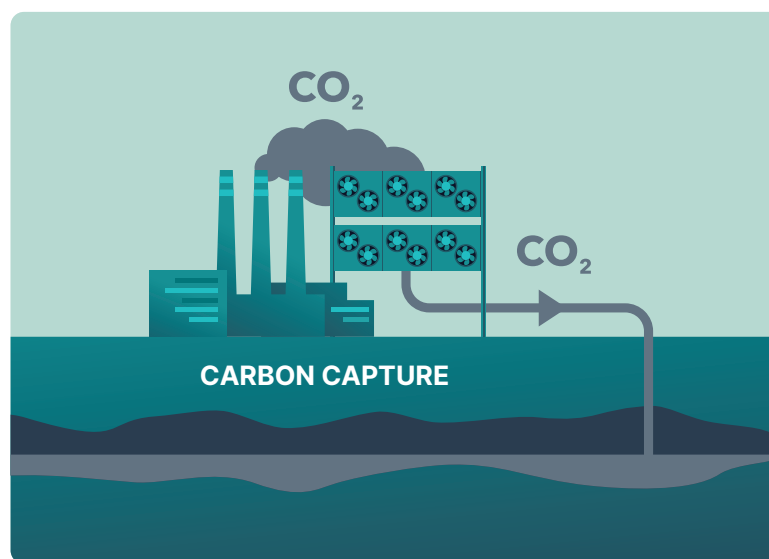
### 4. UTILIZATION:

Captured CO<sub>2</sub> can be used in various industrial applications, such as enhanced oil recovery (EOR) which involves injecting CO<sub>2</sub> into mature oil fields to increase the extraction of oil, providing an additional use for CO<sub>2</sub>.

## THE BENEFITS OF CCUS

The CleanBC Roadmap to 2030 identifies CCUS as an important pathway to reduce emissions in the industrial sector. CCUS technologies can be used as an emissions reduction strategy for hard-to-abate industrial sectors such as cement production, oil and gas, chemical production, and steel manufacturing where the CO<sub>2</sub> would normally be vented into the atmosphere.

Captured CO<sub>2</sub> can also be used as a feedstock to produce valuable products, such as chemicals, fuels, and building materials. For example, CO<sub>2</sub> is an important commodity used in fertilizer production, food and beverage production, metal fabrication, and other commercial uses. In Canada, EOR is the most common use of CO<sub>2</sub> captured from industrial processes.



The wide-scale adoption of CCUS technologies can increase carbon utilization, creating a circular economy by diverting atmospheric CO<sub>2</sub> emissions towards beneficial uses. By reducing the environmental impact of fossil fuel use, CCUS technologies can also provide socio-economic benefits, such as employment opportunities in carbon capture facilities and local health improvements through reduced emissions. This makes CCUS a valuable emissions reduction component for industries transitioning towards cleaner energy sources.



To learn more go to [www.canadah2bc.ca](http://www.canadah2bc.ca)

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## IS IT SAFE?

As with any industrial process, each step of the CCUS process must be managed safely, involving a series of technologies and precautions to minimize risks associated with storage, transportation, and utilization.

To ensure safety across the different components of CCUS, several precautions are necessary. During the capture process, engineering controls are implemented to minimize exposure to high concentrations of CO<sub>2</sub>. For transportation, strict guidelines on impurities, advanced leak detection technologies, and regular inspections help maintain pipeline integrity and prevent leaks. For underground storage, safety considerations include MMV protocols to ensure long-term containment. MMV efforts focus on selecting appropriate sites, managing pressure to ensure that CO<sub>2</sub> remains securely stored underground, and conducting consistent monitoring to prevent leaks and address any issues promptly.

During utilization, secure infrastructure and engineering controls are crucial to prevent unintended releases of CO<sub>2</sub>. Detecting leaks can be challenging because CO<sub>2</sub> is a colorless, odorless gas. Advanced leak detection technologies, such as infrared cameras and gas sensors, assist first responders and operators in quickly identifying and mitigating leaks from pipelines, storage sites, and during transport.

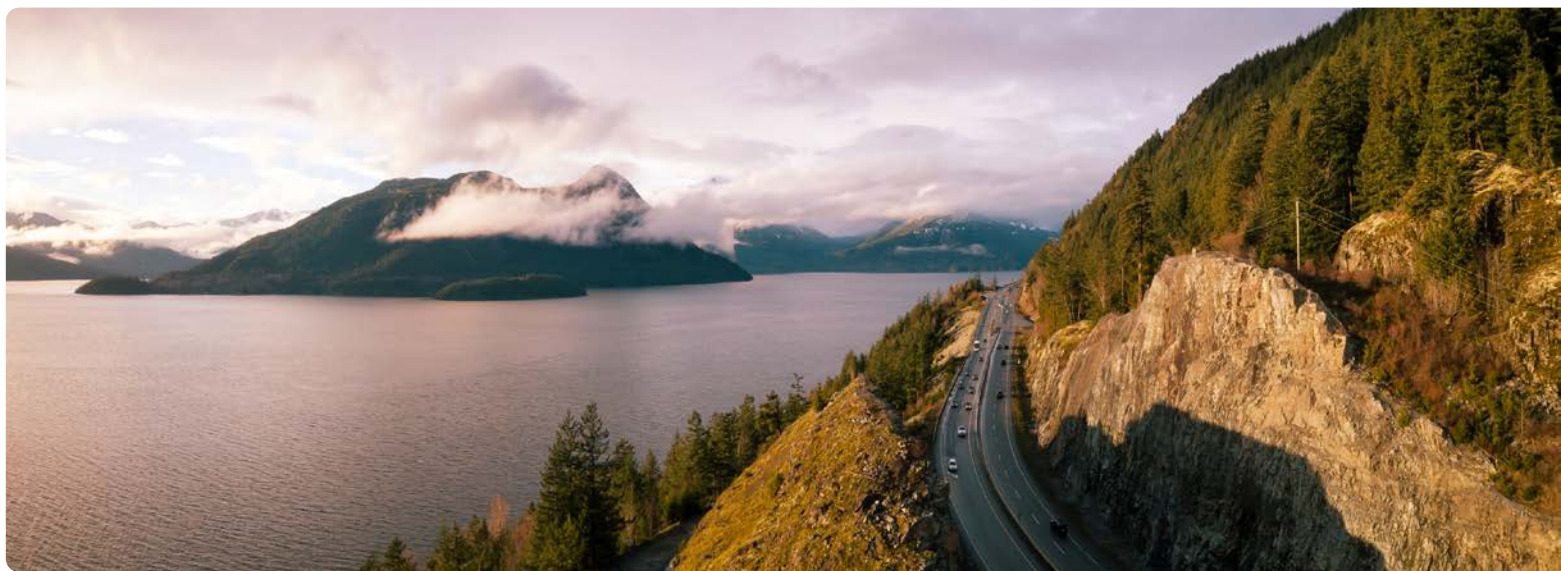
CO<sub>2</sub> is also highly soluble in water. The reaction of CO<sub>2</sub> with water can cause the deterioration of equipment and pipeline infrastructure, reducing structural integrity and increasing the likelihood of leaks. To mitigate these risks, strict guidelines on CO<sub>2</sub> impurities, especially on water content, are essential. Ensuring pipeline integrity is also critical as pipelines must withstand high pressures, and any deterioration from impurities weakens pipeline walls and leads to leaks.

## REGULATORY OVERSIGHT

Provincially, the BC Energy Regulator (BCER) regulates CCUS activity, covering the facilities that compress CO<sub>2</sub>, the pipelines that transport it, and the wells and reservoirs of a CCUS project. BCER ensures compliance with provincial standards and promotes safety in every phase of CCUS. In addition to provincial oversight, federal guidelines and collaboration with international bodies help align British Columbia's (BC's)

practices with global safety standards, ensuring that the province remains a leader in CCUS implementation. To learn more, check out these resources:

- [Standards and Guidelines for CCUS | CSA Group](#)
- [Regulatory framework for Carbon Capture and Storage in BC](#)
- [Carbon Capture and Storage | \(BCER\)](#)



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## HYDROGEN AND CCUS

CCUS is a key enabler for cost-effective and low-carbon hydrogen production from natural gas. Natural gas reforming uses heat to break down natural gas into hydrogen and CO<sub>2</sub>. By using CCUS during natural gas reforming, CO<sub>2</sub> emissions can be significantly reduced. Hydrogen produced from natural gas reforming with CCUS is commonly known as “blue hydrogen”.

As noted in the BC Hydrogen Strategy, BC has readily available access to low-cost natural gas reserves and geological storage capacity. By leveraging these resources, BC has the potential to produce blue hydrogen, and advance hydrogen production while working towards a clean energy transition.



## RESOURCES AND COMPANY PROFILES IN BC

The northeast region of BC boasts substantial carbon storage capacity. The province also has a thriving ecosystem of companies, both established and emerging, dedicated to advancing CCUS technologies. This presents a significant opportunity for BC to produce low-carbon hydrogen through natural gas reformation with adequate and permanent CO<sub>2</sub> storage.

To learn more about BC's CCUS capabilities, please check out these resources and select company profiles.



[Northeast BC Geological Carbon Capture and Storage Atlas | BC Centre for Innovation and Clean Energy \(CICE\), Geoscience BC, and the Ministry of Energy and Climate Solutions](#)

The Northeast BC Geological Carbon Capture and Storage Atlas identifies, assesses, and maps the best CO<sub>2</sub> storage available in northeast BC.



[Carbon Capture and Storage | BCER](#)

BCER is responsible for regulating CCS projects, which store CO<sub>2</sub> from all sources in underground reservoirs, as mandated by the Energy Resource Activities Act (ERAA).



[BC Carbon Management Blueprint | Deloitte Canada and CICE](#)

The BC Carbon Management Blueprint outlines existing carbon management approaches, their place in the value chain, and the market players that drive supply and demand of these solutions.



[Svante](#)

Svante is a leading Canadian clean tech company that manufactures filters and carbon capture machines that capture and remove industrial CO<sub>2</sub> emissions.



[Carbon Engineering](#)

Carbon Engineering Ltd. is a leading Canadian clean tech company focused on the commercialization of direct air capture technology that captures CO<sub>2</sub> directly from the atmosphere.



[CO<sub>2</sub> Lock](#)

CO<sub>2</sub> Lock is an emerging leader in the carbon mineralization<sup>1</sup> storage and sequestration sector developing technology to inject and store CO<sub>2</sub>-rich fluids into hard rock formations.

<sup>1</sup>Carbon mineralization is a process that removes CO<sub>2</sub> from the atmosphere and converts the CO<sub>2</sub> into a solid mineral, such as a carbonate, through exposure to certain rocks.

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