Carbon Capture and Storage FAQs

What is carbon capture and storage?

Carbon capture and storage (CCS) takes carbon dioxide (CO_2) emissions from industrial facilities and permanently stores them deep underground. CCS is a viable way to meaningfully reduce greenhouse gas emissions from critically important industries. CCS moves us toward a cleaner future at the lowest possible cost to the economy.

Why do we need CCS?

While carbon cycles naturally through our atmosphere (air), hydrosphere (water), geosphere (land) and biosphere (people, plants, and animals), humans have significantly accelerated the release of carbon into the air (as CO_2) through the burning of hydrocarbons and other industrial activities. Industrial development has significantly improved our quality of life, but the world now faces an urgent need to reduce greenhouse gases like CO_2 to avoid serious climate change-related impacts.

Experts globally agree CCS is vital for meeting greenhouse gas reduction goals. That's why Enbridge is developing CCS solutions. CCS is a viable way to meaningfully reduce greenhouse gas emissions from critical industries like cement production, power generation, energy production and refining, along with fertilizer, plastics, chemicals and steel manufacturing.

Is CCS safe?

CCS technology has been safely used in North America for decades, including world-leading projects in Western Canada and throughout the U.S. Thousands of kilometres/miles of CO_2 pipelines already connect critical industrial facilities to storage or utilization infrastructure, where CO_2 is either permanently stored deep underground or repurposed.

What benefits should I expect from CCS investment?

CCS investment benefits communities, their economies and the environment. Locally, CCS creates direct and indirect construction and operations jobs, keeps important industries running, and brings economic investment into communities. CCS helps the environment as well by preventing CO_2 emissions from entering the atmosphere, ensuring cleaner air while meaningfully combatting climate change.

How is CO_2 captured?

CO_2 is captured in CCS projects in a variety of ways. Post-combustion capture involves sending flue gas from a facility through an absorber containing chemicals called "amines" that attach to the CO_2. Using heat, the CO_2 is then stripped from the amines, dehydrated to remove moisture, the amines are recycled, and the CO_2 is compressed for transportation and storage. CCS projects involving power generation or cement production, for example, use post-combustion capture CCS technology.

In pre-combustion capture, CO_2 is removed through various industrial processes from hydrocarbons (like coal or natural gas) before combustion occurs. CO_2 is then compressed for transportation and storage. Pre-combustion capture technology is best suited to gas processing, ethanol production and some forms of hydrogen production.

How is CO_2 transported?

Once CO_2 is captured and dehydrated, it is compressed to a phase in-between a liquid and a gas called "supercritical." The CO_2 is then transported, either by pipeline, truck or railcar. Enbridge is focused on developing CO_2 transportation solutions that use new, purpose-built steel pipelines along routes developed to minimize impacts to land, water, communities, and Aboriginal and Treaty rights.

Thousands of kilometres/miles of CO_2 pipelines already connect critical industrial facilities to storage and utilization infrastructure across North America. Enbridge intends to ensure the safety and integrity of its CO_2 pipelines through site-specific Measurement, Monitoring and Verification (MMV) plans, as well as through our world-class Pipeline Integrity Program, which uses measures like in-line inspections and periodic patrols.

How is CO_2 stored?

Once CO_2 arrives at a storage site via pipeline, truck or railcar, it is injected far underground using purpose-built wells, usually deeper than 800 metres/2,600 feet and as deep as over 3,000 metres/9,800 feet, depending on the region. CO_2 storage depths far exceed potable groundwater reservoirs, which are typically less than 200 metres/650 feet below ground.

CO_2 storage sites are carefully selected through a robust technical analysis of:

- **Containment:** a storage formation must have dense layers of impenetrable caprock above it, preventing unwanted migration of injected CO_2 out of the storage formation.
- **Capacity:** a storage formation must have sufficient porosity (pore space) to be able to safely and permanently store large volumes of CO_2.
- **Injectivity:** the permeability and thickness of a storage formation determines the ease with which CO_2 can be injected.

MMV plans are developed and implemented for the entire life of CO_2 storage infrastructure. MMV plans include sophisticated equipment, processes and procedures to ensure the protection of the atmosphere (air), hydrosphere (water), geosphere (land) and biosphere (people, plants and animals). This systematic, full lifecycle approach verifies the safety and permanence of CO_2 storage, facilitates knowledge sharing, and supports risk management and mitigation.

What is Enbridge doing in the CCS space?

Enbridge is working with industry, governments and communities to advance CCS solutions across North America. For example, near Edmonton, Alberta, Enbridge is developing the Open Access Wabamun Carbon Hub (the Wabamun Hub). The Wabamun Hub will support a Heidelberg Materials' carbon capture project in Edmonton that is set to revolutionize the cement industry by creating the world's first first full-scale carbon capture project at a cement plant. This cutting-edge facility will play a pivotal role in combating climate change, capturing over 1 million tonnes of CO_2 annually from cement production and an integrated heat and power facility.

While focusing on the Heidelberg Materials' project, the Wabamun Hub will remain open access for other nearby capture projects.

Enbridge is advancing CCS projects across North America as a key enabler to reaching national and international emissions reduction goals. This is one of a series of Enbridge fact sheets intended to provide an overview of the many facets of CCS.

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