Pathways Alliance

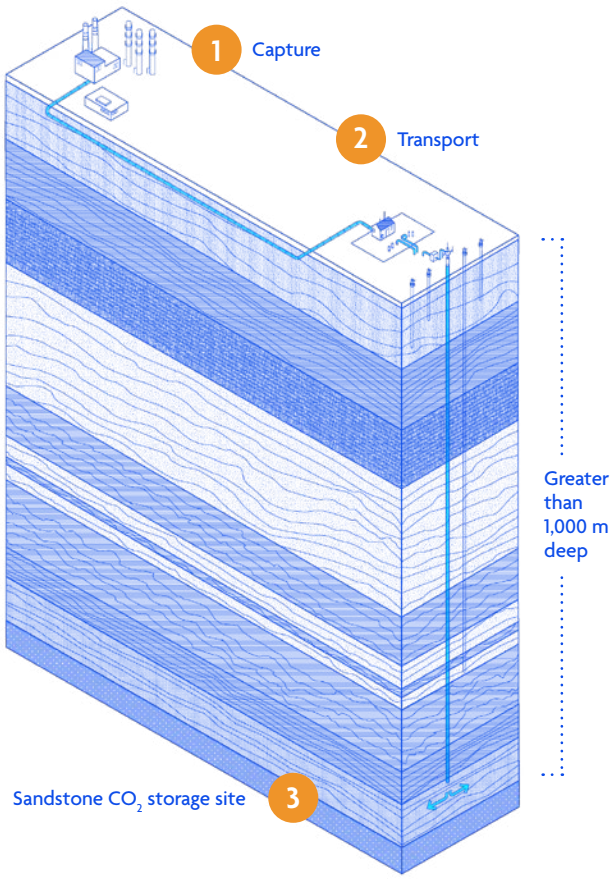
Carbon capture and storage

Carbon capture and storage (CCS) is a proven technology used around the world, including here in Canada. The Pathways CO_2 Transportation Network and Storage Hub project (referred to as the "Project") would have the capacity to transport captured CO_2 from multiple oil sands facilities to the Cold Lake area of Alberta for permanent underground storage.

The Pathways Project

CCS technologies capture CO_2 from a large emissions source before it reaches the atmosphere. The CO_2 is compressed and turned into liquid form, which can flow through a pipeline to a storage facility, where it is stored deep underground. Captured CO_2 is typically stored between 1,000 and 2,000 metres beneath the Earth's surface.

On behalf of Pathways Alliance, Canadian Natural is working with governments to obtain sufficient levels of fiscal support and the regulatory approvals required to make the Project a reality. Once operational, the Project could be made available to other oil producers and industries seeking CO_2 emissions sequestration.



How CCS works

CCS is a three-step process that includes capture, transport and storage. The Project focuses on the transportation and storage of CO_2. The capture part of the process will be undertaken independently by each member company at its own oil sands facility.

Step 1: Capture

In this process, capture equipment is fitted to a large emissions source in order to divert the CO_2 before it reaches the atmosphere. A chemical is used to separate the CO_2 from any remaining flue gas.

Step 2: Transport

The captured CO_2 is compressed so that it becomes a liquid, which can flow through the pipeline network to the storage facility.

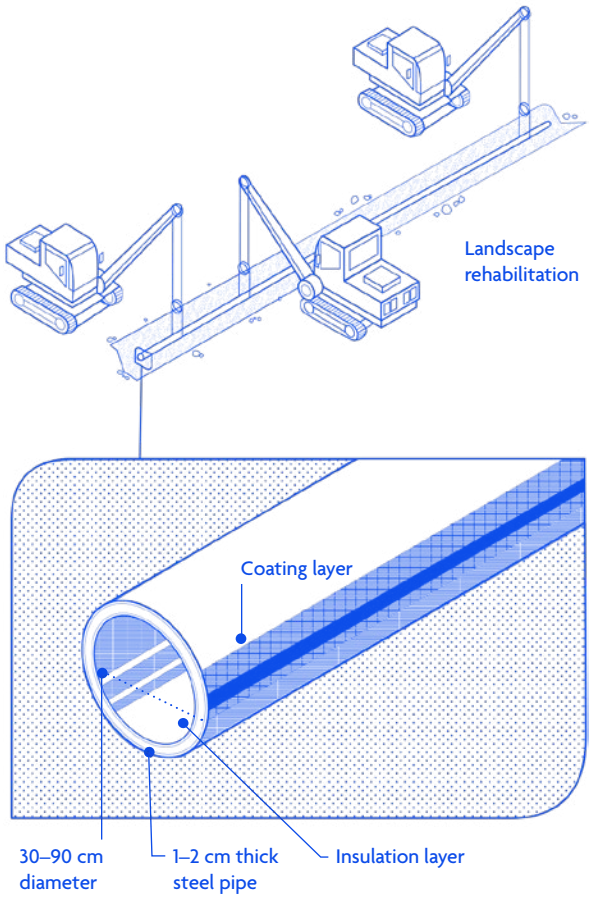
Step 3: Storage

The liquefied CO_2 is injected deep below the Earth's surface, typically between 1,000 and 2,000 metres. The liquefied CO_2 fits into tiny spaces in the sandstone storage layer. This layer is constantly monitored to make sure the liquid doesn't move into the surrounding rock.

CCS safety

Located in the Western Canadian Sedimentary Basin, the Basal Cambrian Sandstone geologic formation underlies large parts of Alberta and has great depth and multiple overlying layers of salt formations that act as seals to keep the CO_2 stored underground.

Alberta has experience and expertise in the safe construction and operation of large-scale projects. For example, between 2015 and 2022, the Quest facility captured and permanently stored 7.7 million tonnes of CO_2. According to operator Wolf Midstream, the Alberta Carbon Trunk Line (ACTL) project stores 1.6 million tonnes of CO_2 per year.



RIGHT: In the transport process, liquid CO_2 is transferred by a specially designed pipeline to the secure storage hub. The proposed Pathways CO_2 Transportation Line will follow existing pipeline routes wherever practical, to limit land disturbance.

Deep and safe storage

Captured CO_2 is stored deep below the Earth's surface, typically between 1,000 and 2,000 metres underground. By comparison, freshwater aquifers in this area are typically around 150 metres below the surface. The depth of the CO_2 storage layer is well below any freshwater sources.

Extensive work is undertaken to make sure a site is safe and appropriate for injection and storage. Ongoing seismic monitoring is a regulatory requirement for CCS projects in Alberta, and it forms a significant part of a project's Measurement, Monitoring and Verification program.

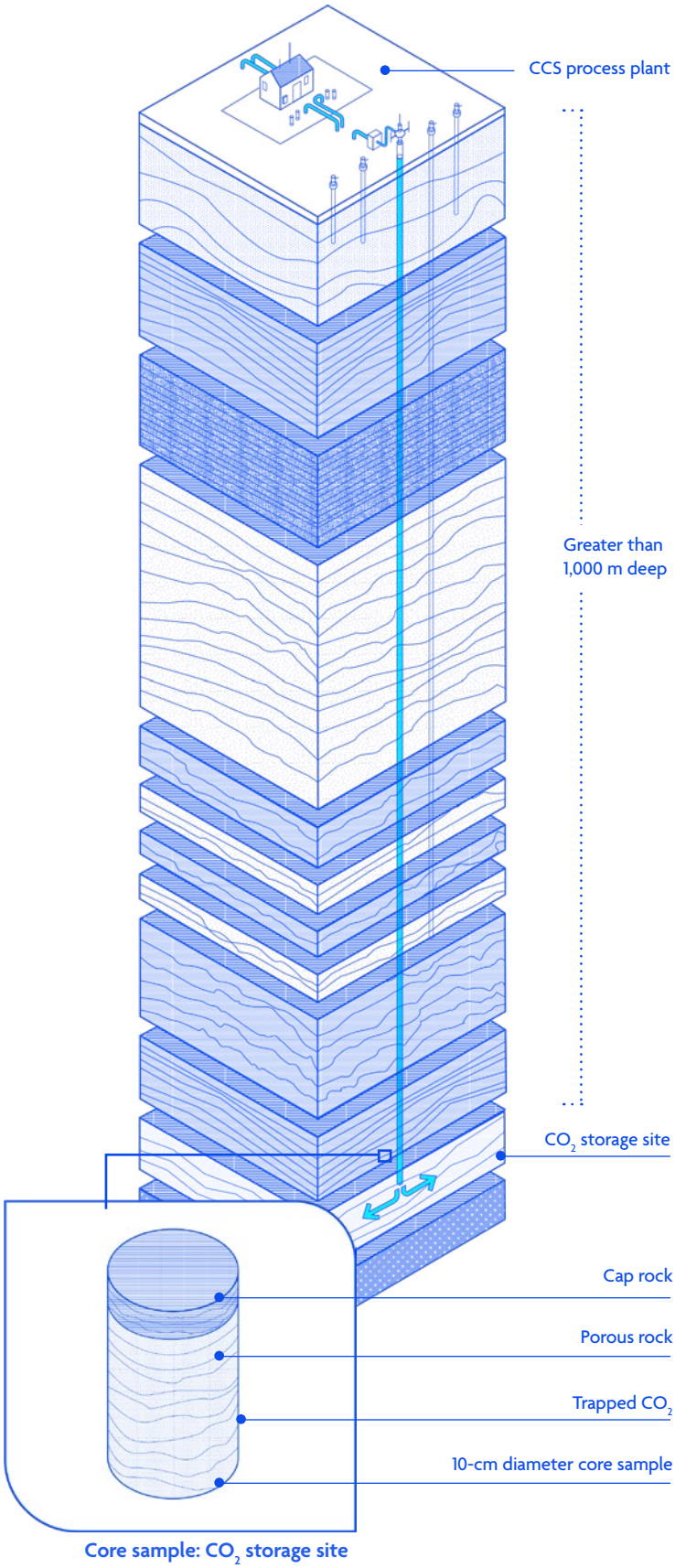
Monitoring

The proposed Project would have multiple monitoring points. This technology would be placed along the Pathways CO_2 Transportation Line, at the CO_2 injection site and down into the Pathways Storage Hub. Any unusual activity would trigger an immediate alert.

Human operators oversee the pipeline monitoring systems 24/7/365. Any change in pipeline pressure or temperature would alert the operator to isolate the affected section of pipe.

The proposed CO_2 storage hub would also be connected to multiple injection wells with real-time pressure monitoring. This helps distribute and track injection pressure in the storage space.

Once CO_2 is underground, seismic imaging would show how it's distributed through the storage layer. It would also monitor geological formations above the storage layer to confirm CO_2 is remaining in place and not moving upward.



ABOVE: Rock formations that have securely stored oil and gas for millions of years can also safely and permanently store CO_2. These multiple overlying layers of impermeable rock formations act as natural seals.

Learn more at
PathwaysAlliance.ca or reach us at
contact@pathwaysalliance.ca.