

Exploring the potential for CCS hubs – Part 3

An IMII Minerals Innovation Series



Introduction

In October 2023, the IMII announced that a collaborative project was underway exploring the potential for carbon capture and storage (CCS) hubs anchored by minerals and power production. A CCS hub is a deep geological reservoir where carbon dioxide (CO₂) emissions captured from one or more industrial facilities may be permanently stored underground. They are served by pipelines that transport captured carbon to the hub, and strategically built hubs could provide a pathway for reduced greenhouse gas (GHG) emissions from both potash and power production.



The project involved three areas of study – a preliminary investigation into the geological potential for carbon storage in the southern half of the province, a review of transportation considerations for moving captured carbon from industrial facilities to storage hubs, and consideration of legislative and financial elements that may influence the potential for hub development and investment.

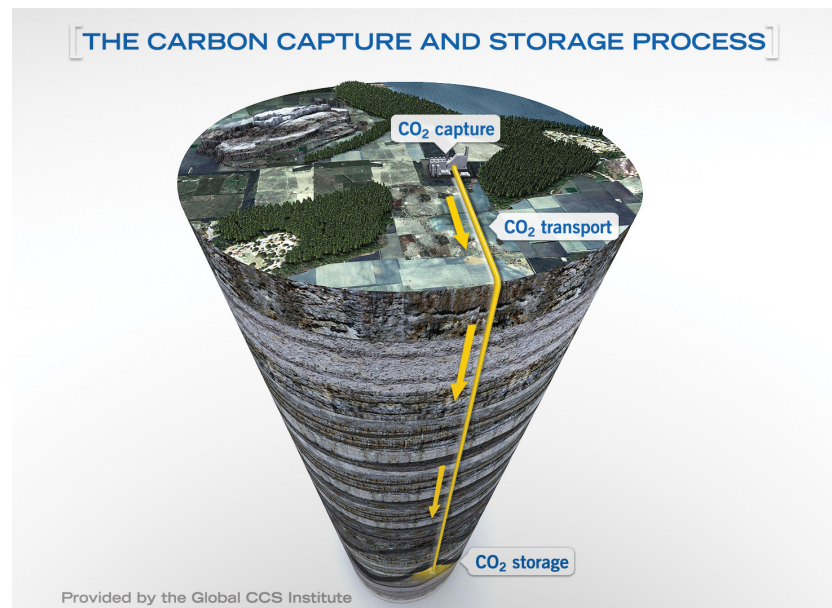
This is the third and final summary in a series of three published by IMII and focuses on the rationale for governments to consider making the capital investments initially required to develop CCS hubs. The first focuses on the geological storage potential. The second on transportation. All are available on IMII's website.

Developmental Considerations

IMII contracted the International CCS Knowledge Centre to undertake the study into developmental considerations for carbon capture and storage hubs, anchored by potash or power production, in Saskatchewan. The study identified critical factors that could positively influence the feasibility of CCS hubs within the province. These factors include enabling regulatory frameworks across the CCS value chain; sufficient incentives for capture, transport and storage; and public support.

The study identified and compared existing incentives (as of spring 2024) for CCS hub development in Canada, the United States and the United Kingdom, and found that:

- In Canada, the federal government's CCUS Investment Tax Credit is the largest available incentive for CCUS project investment but has timelines that could be difficult for new hub developments to meet.
- The Canada Growth Fund, under the Canada Development Investment Corporation, could provide construction support through carbon contracts for difference (CCFDs) on pricing for carbon. The US does not support CCFDs, while the UK does.



- Saskatchewan's Oil and Gas Processing Investment Incentive incorporates enhanced oil recovery (EOR), while Canada's do not. US incentives also allow for EOR.
- There may be an opportunity for CCS proponents in Canada and Saskatchewan to identify and assess options to support the development of large capacity CO2 transportation and storage infrastructure. This could include support for feasibility studies, FEED studies, construction costs and/or partnership development.
- Developing a comparatively low cost of transportation and storage of CO2 in Saskatchewan could be a competitive advantage compared to other jurisdictions.



The study also identified “public good benefits” from hub development experienced elsewhere. Development of CCS hubs could enable capture from multiple facilities, in addition to anchor facilities, which could drive larger-scale GHG reduction across regions. Partnering together in a CCS hub may also allow for smaller capital expenditures than taking on an entire project independently. By dividing the development and operation of compression, transport, and sequestration of CO2, the associated costs, risks, and liabilities may be shared across the companies involved, which could lower the barriers to entry for all. Consequently, CCS hubs may offer efficiency and economies of scale through shared infrastructure, improved access and scalability for emissions reduction, reduced investment risk, and the potential to boost research and development, all while aligning with environmental commitments.

Finally, the study suggests that CCS hubs could position export-dependent regions, such as Saskatchewan, to not only gain a competitive edge in the global market, but they could also provide economic attraction and retention opportunities for the industries involved. And, complementary to corporate goals of reducing emissions and meeting regulatory requirements, using CCS to maintain minerals production alongside reducing emissions can act to bolster competitiveness in markets increasingly focused on GHG emissions performance.

Notwithstanding these potential benefits, and Saskatchewan's geological potential and transportation opportunities, the province has a comparatively low number of high emissions facilities compared to others and this creates additional challenges to making hubs work. Demand for CO2 for utilization in industrial processes may be another key driver for the development of CCS hubs in Saskatchewan. Most notably, EOR is a significant use for captured carbon by boosting oil production from existing wells and/or extending the lifespan of oilfields.

Series Conclusions

The studies organized by IMII help build confidence that CCS hubs may be viable options for the potash and power industries on their path to net zero. Key considerations for potential hub development include:

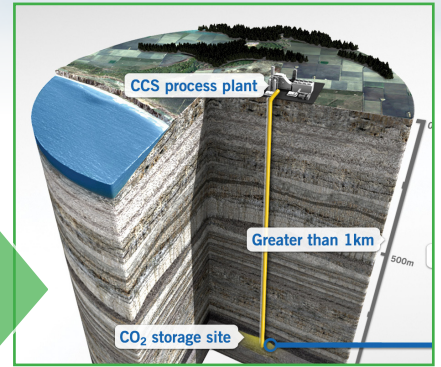
- Geological formations, such as the Deadwood in southern Saskatchewan, with the porosity and permeability geophysical properties to support the injectivity and capacity of a potential CO2 storage zone, exist.
- Transportation options, such as pipelines, built around anchor sources of captured carbon and a reasonable distance to a storage location, exist.
- The necessary elements for a supportive legislative and financial framework may be possible.



CO₂ CAPTURE



CO₂ TRANSPORT



CO₂ STORAGE

However, the potash and power industries face unique challenges when it comes to reaching net-zero GHG emissions:

- **Asset longevity and design** – potash operations and power plants tend to have major pieces of equipment with long lifetimes, typically 20-40 years. Retiring or replacing them early would incur very large costs and change the economic competitiveness of businesses impacted. Retrofitting existing equipment with carbon capture technologies could be faster and easier than rebuilding or replacing every mill or power plant.
- **Reliability of production** – Saskatchewan's economy relies on the potash and power industries to continue to make sustained contributions to local and the provincial economy. CCS could play an important role in allowing SaskPower to provide dispatchable, low-carbon electricity with plants operating at baseload, and the potash sector to provide fertilizer the world needs to feed a growing population.
- **High-temperature heat requirements** – potash operations require high temperature heat for many of their processes. Baseload electricity production requires steam to be generated 24 hours per day 365 days per year. Generating high-temperature heat from electricity, especially on an industrial scale and for electrically non-conductive applications such as drying mineral products, is impractical and costly with today's technologies. CCS could provide an option for continuing to use emissions-abated natural gas to meet such requirements.
- **Global markets** – Potash is traded in highly competitive global markets, and this makes it challenging for an individual producer or sector to turn to currently more expensive low-carbon production pathways to reduce emissions. As Saskatchewan is the most internationally trade dependent jurisdiction in Canada, several other industries that rely on SaskPower for electricity share in this challenge. CCS could be a path to continued access to global markets by meeting global expectations for GHG reductions.

Businesses and governments have set ambitious targets, aiming for net-zero GHG emissions. Decarbonization will require solutions beyond renewables if we want to sustain both an industrial base and jobs. The emergence of CCS hubs, while potentially anchored by potash or power production, will be dependent on collaboration among industry, governments and other partners to bring the required infrastructure and share costs. Doing so may improve the affordability of CCS as an option to abate CO₂ emissions while sustaining industry performance and advancing toward net-zero in Saskatchewan.

Limitations of Series

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