Exploring the potential for CCS hubs – Part 2

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 (CO_2) 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 second in a series of study summaries published by IMII and focuses on transportation. The first focuses on the geological potential. The third will speak about policy and other considerations that may support the development of CCS hubs for industry in Saskatchewan.

Transportation Potential

With growing interest in industrial decarbonization, CCS hubs may emerge due to a clustering of industrial or power facilities with proximity to transport options such as pipelines, or to markets (as is the case for enhanced oil recovery). For the purposes of the studies organized by IMII, the hub concept was built around the notion of an "anchor" – a single very large industrial source of captured carbon or possibly several large facilities concentrated in an area acting as an anchor, which could also be supported by transportation options to prospective geology for permanent storage.

The study completed by the Petroleum Technology Research Centre (PTRC) – reported on in the first summary in this series, suggested there are likely several areas associated with the Deadwood formation which may offer the required geology for storage. The results of this first study were provided to IMII's partner for the second study, Enbridge, and formed the basis for its work on transportation options.

In conducting its study, Enbridge identified several considerations necessary to plan the potential routing and pipeline-related activities that could support industry anchored "hubs". These would require pipelines to collect, and transport captured carbon to areas with high geologic potential for storage.

Two design options were examined at a high level – hub and spoke versus trunkline and feeders. The study concluded the hub and spoke model may work well in the case described by IMII and its project partners, given the locations of potential sources of captured carbon. The Alberta Carbon Trunk Line (ACTL) is an example of a trunk and feeder model. It consists of a 240 km pipeline which can gather, compress and store up to 14.6 million tonnes of CO2 per year, and inject this CO2 into depleted oil reservoirs for sequestration and enhanced oil recovery applications. The pipeline runs from the Alberta Industrial Heartland (Edmonton area) to an enhanced oil recovery (EOR) site in southern Alberta.

In coming to this initial conclusion, Enbridge took cost, technical and non-technical factors into account and sought to optimize theoretical routings within existing pipeline rights-of-way and/or utility corridors. The study suggests the potential for five pipeline hubs which could collect and transport CO2 from anchor sources. For the purposes of the study, anchors were defined as having greater than 0.5 million tonnes of captured CO2 per year and identified as a driving factor for any future hub.

The study also suggested that the larger the volume of captured CO2 (e.g., greater than 1 million tonnes per year) within a specific region the more viable a potential hub may be.

Equally important to cost and technical considerations of any future hub or hubs would be several non-technical considerations for siting storage facilities and routing pipelines. These include regulatory requirements, land management, Indigenous and stakeholder engagement, and environmental factors (to minimize the potential for significant adverse impacts on environmentally or culturally sensitive areas). Economic development considerations may also arise, such as opportunities to use captured CO2 in other industries.

The study also recommends that, in addition to a comprehensive consultation and communications program that starts very early in any development phase, the parties interested in advancing CCS hubs launch a public education campaign to advance understanding and address potential concerns related to CCS projects. Saskatchewan has experience with the SaskPower Boundary Dam CCS project and the PTRC Aquistore research and development project to help inform such efforts.

Next in the Series – Developmental Considerations