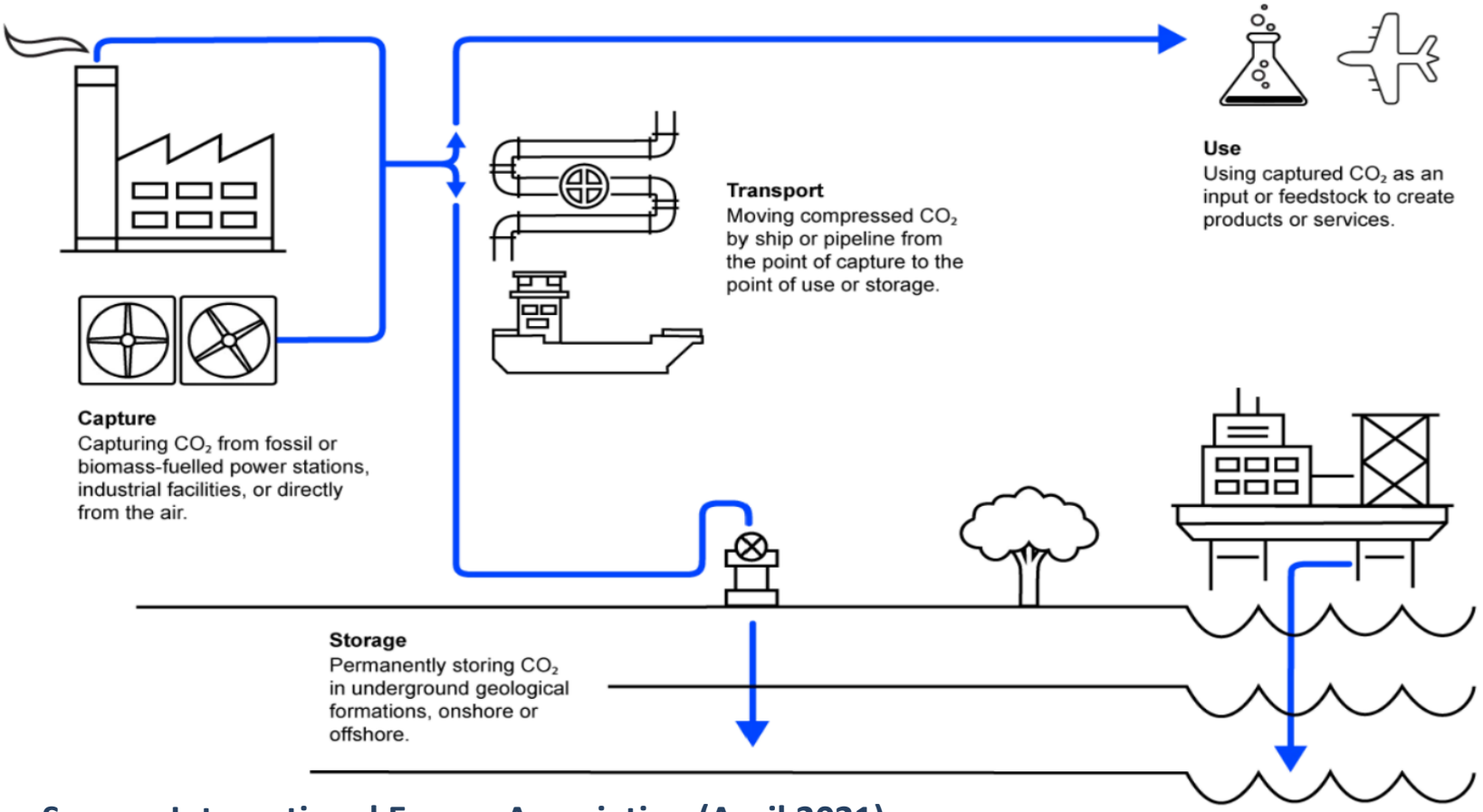
BRITISH COLUMBIA | Ministry of Energy, Mines and Low Carbon Innovation

Carbon Capture, Use and Storage in B.C.
An Overview

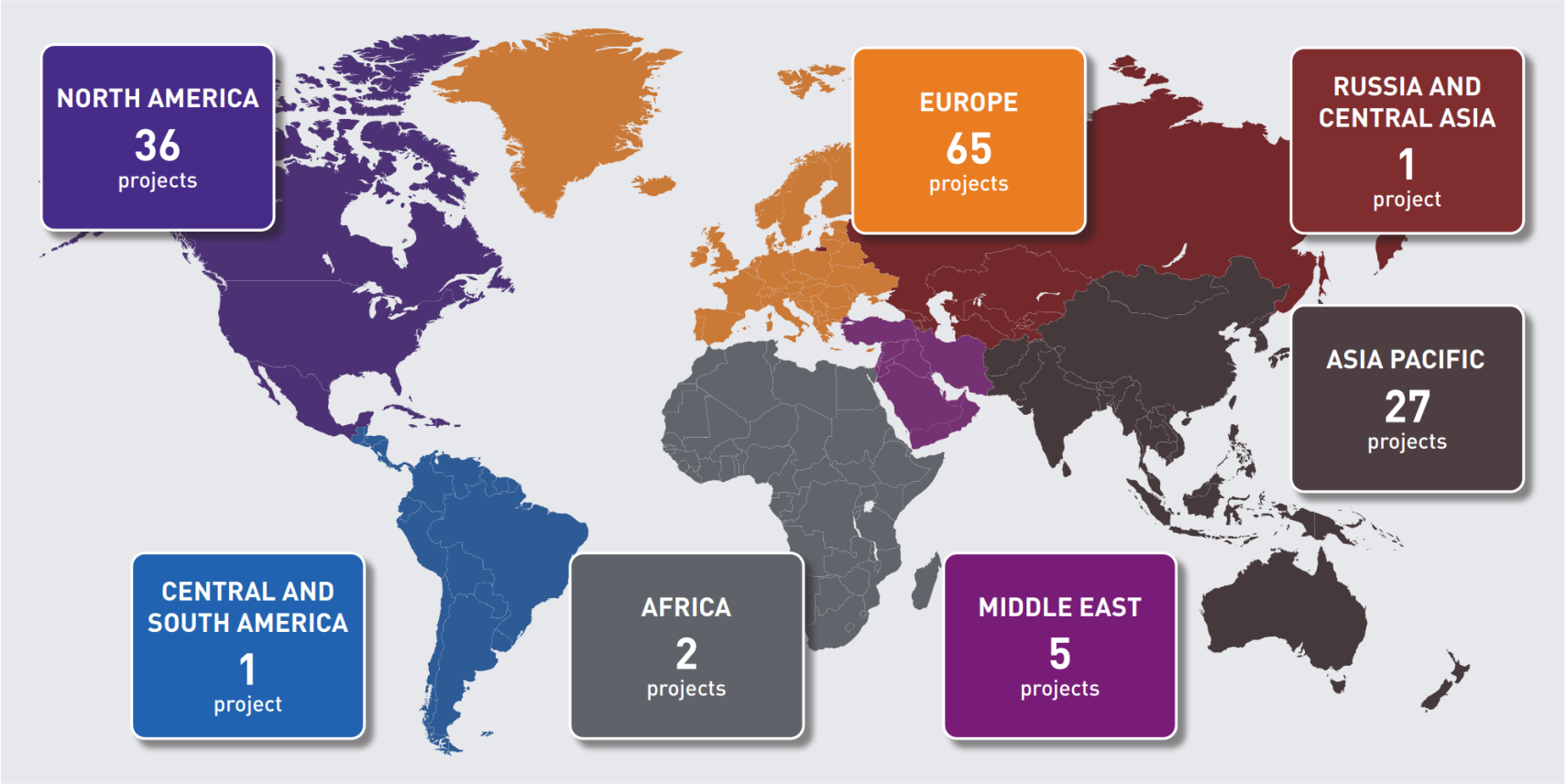
Vida Ramin
Director, Regulatory Policy
Oil and Gas Division

What is CCUS?



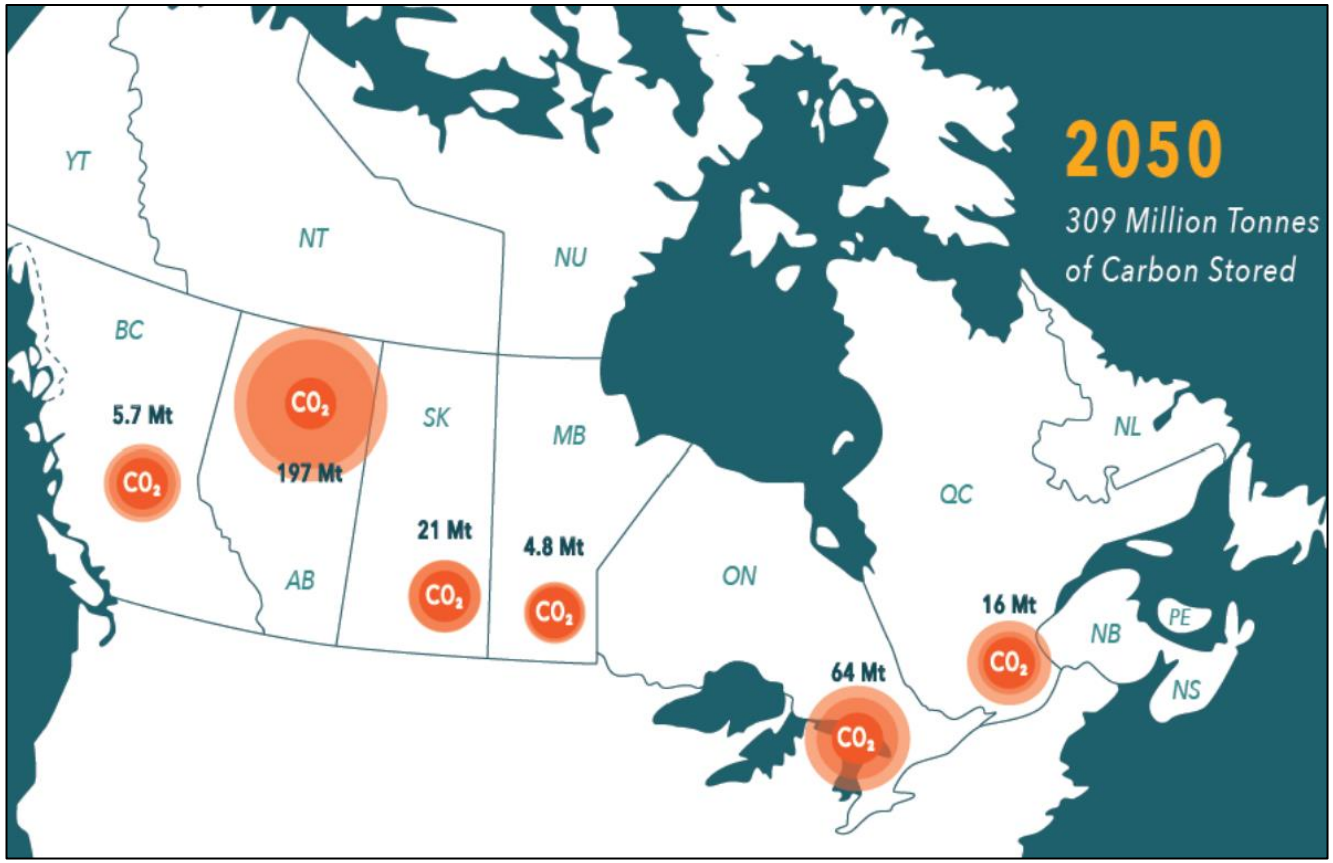
Source: International Energy Association (April 2021)

Global CCUS Projects



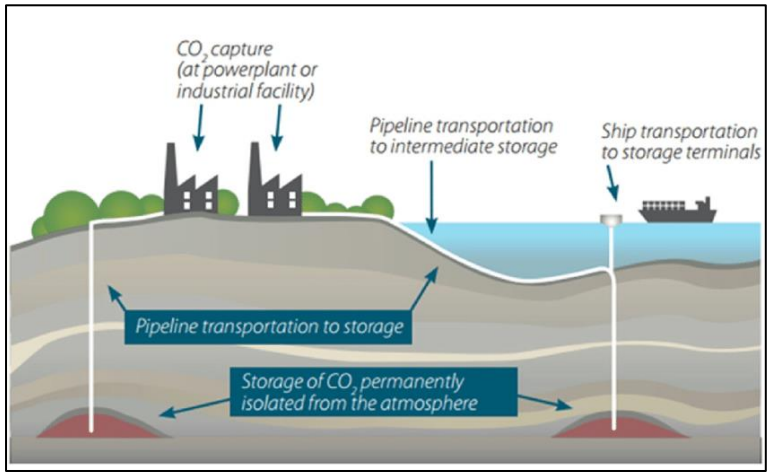
Source: International Association of Oil and Gas Producers (January 2022)

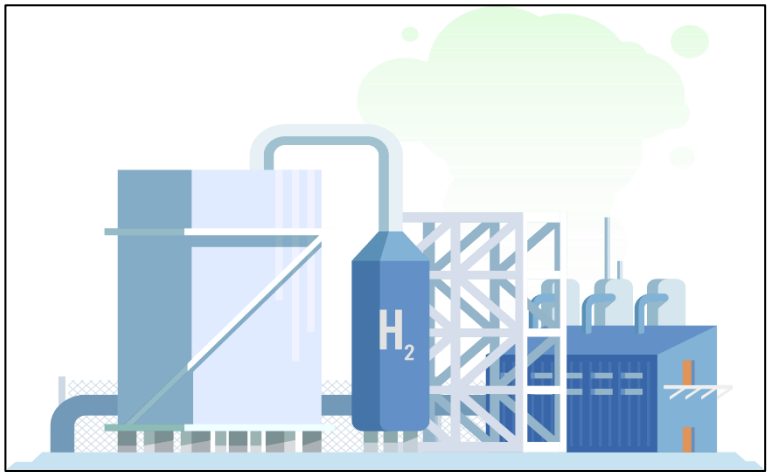
CCS in Canada's Net Zero Future

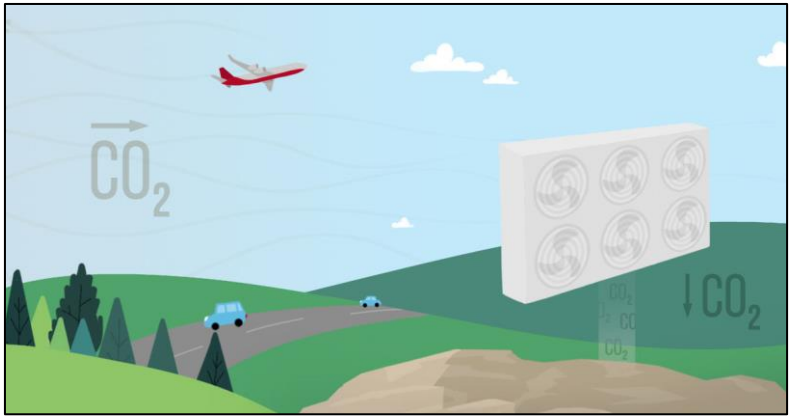


Source: Navius Research (July 2021)

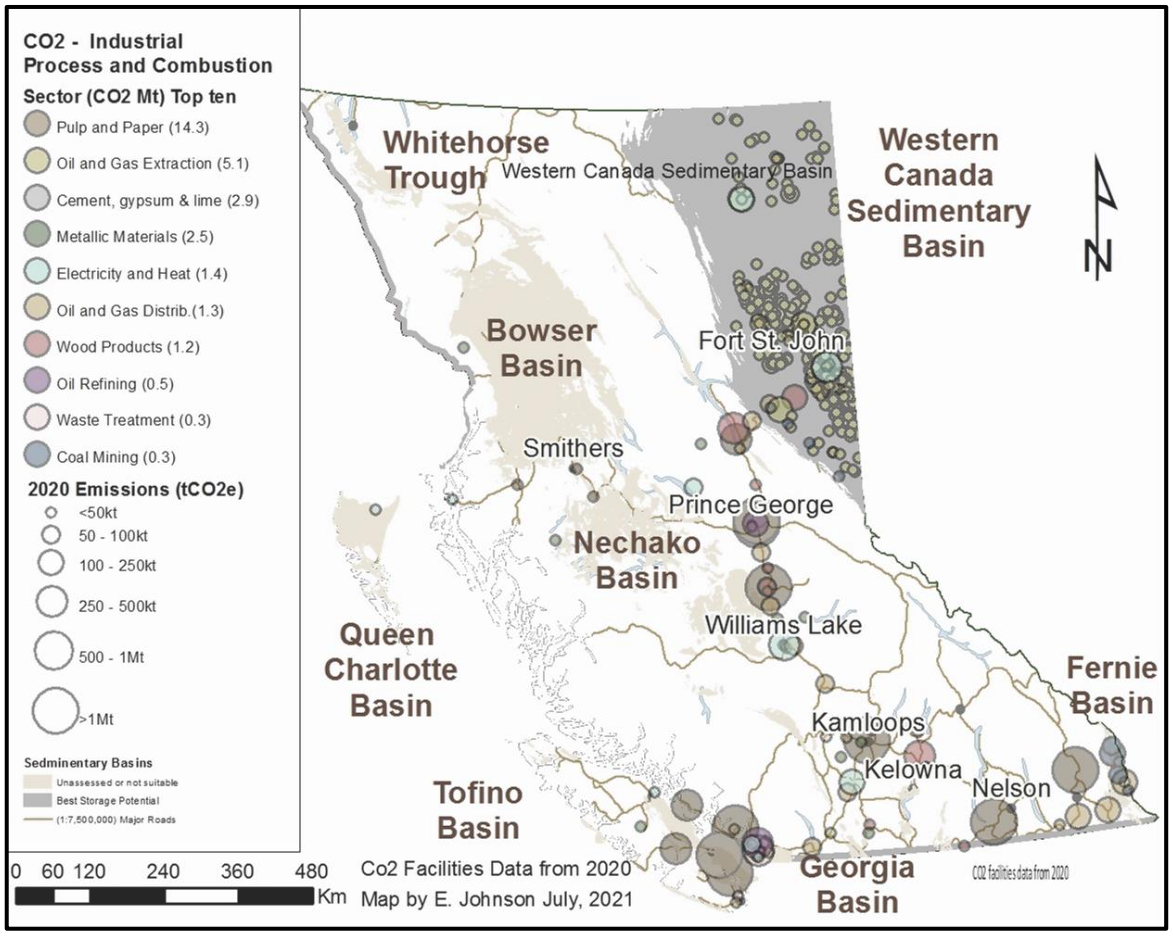
Role of CCUS in B.C.'s Transition to Net Zero







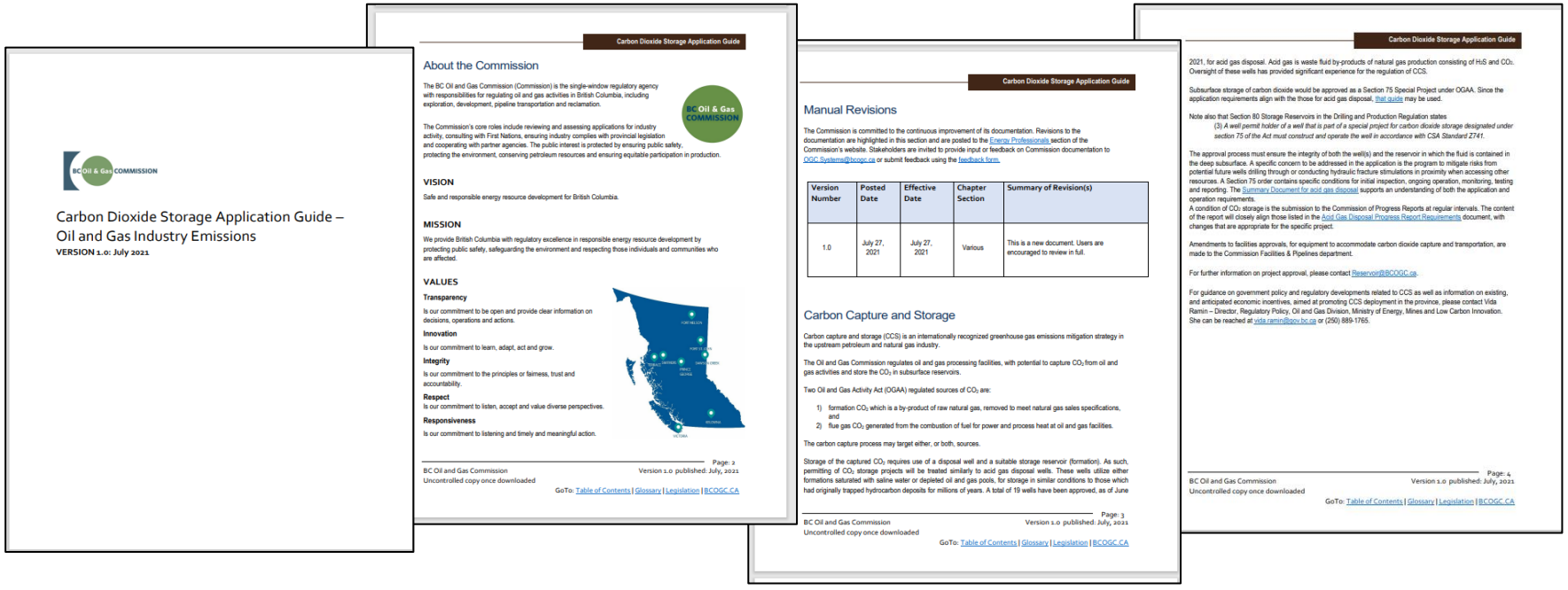
Carbon Sources and Sink(s) in British Columbia



Regulatory Framework – Tenure Acquisition

- Part 14 of the *Petroleum and Natural Gas Act*
- Exploration licence (s.126)
- Lease of storage reservoir (s.130)
- Prohibition respecting the Lower Mainland
  – s.3 of the Storage Reservoir Regulation

Regulatory Framework – Project Permitting



Carbon Dioxide Storage Application Guide – Oil and Gas Industry Emissions
VERSION 1.0: July 2021

Carbon Dioxide Storage Application Guide

About the Commission

The BC Oil and Gas Commission (Commission) is the single-window regulatory agency with responsibilities for regulating oil and gas activities in British Columbia, including exploration, development, pipeline transportation and reclamation.

The Commission's core roles include reviewing and assessing applications for industry activity, consulting with First Nations, ensuring industry complies with provincial legislation and cooperating with partner agencies. The public interest is protected by ensuring public safety, protecting the environment, conserving petroleum resources and ensuring equitable participation in production.

VISION

Safe and responsible energy resource development for British Columbia.

MISSION

We provide British Columbia with regulatory excellence in responsible energy resource development by protecting public safety, safeguarding the environment and respecting those individuals and communities who are affected.

VALUES

Transparency
Is our commitment to be open and provide clear information on decisions, operations and actions.

Innovation
Is our commitment to learn, adapt, act and grow.

Integrity
Is our commitment to the principles or fairness, trust and accountability.

Respect
Is our commitment to listen, accept and value diverse perspectives.

Responsiveness
Is our commitment to listening and timely and meaningful action.

Page: 2
BC Oil and Gas Commission
Version 1.0 published: July, 2021
Uncontrolled copy once downloaded
GoTo: Table of Contents | Glossary | Legislation | BCOGC.CA

Carbon Dioxide Storage Application Guide

Manual Revisions

The Commission is committed to the continuous improvement of its documentation. Revisions to the documentation are highlighted in this section and are posted to the Energy Professionals section of the Commission's website. Stakeholders are invited to provide input or feedback on Commission documentation to OGC.Systems@bcogc.ca or submit feedback using the feedback form.

Version Number	Posted Date	Effective Date	Chapter Section	Summary of Revision(s)
1.0	July 27, 2021	July 27, 2021	Various	This is a new document. Users are encouraged to review in full.

Carbon Capture and Storage

Carbon capture and storage (CCS) is an internationally recognized greenhouse gas emissions mitigation strategy in the upstream petroleum and natural gas industry.

The Oil and Gas Commission regulates oil and gas processing facilities, with potential to capture CO_2 from oil and gas activities and store the CO_2 in subsurface reservoirs.

Two Oil and Gas Activity Act (OGAA) regulated sources of CO_2 are:

1) formation CO_2 which is a by-product of raw natural gas, removed to meet natural gas sales specifications, and
2) flue gas CO_2 generated from the combustion of fuel for power and process heat at oil and gas facilities.

The carbon capture process may target either, or both, sources.

Storage of the captured CO_2 requires use of a disposal well and a suitable storage reservoir (formation). As such, permitting of CO_2 storage projects will be treated similarly to acid gas disposal wells. These wells utilize either formations saturated with saline water or depleted oil and gas pools, for storage in similar conditions to those which had originally trapped hydrocarbon deposits for millions of years. A total of 19 wells have been approved, as of June

Page: 3
BC Oil and Gas Commission
Version 1.0 published: July, 2021
Uncontrolled copy once downloaded
GoTo: Table of Contents | Glossary | Legislation | BCOGC.CA

Carbon Dioxide Storage Application Guide

2021, for acid gas disposal. Acid gas is waste fluid by-products of natural gas production consisting of H_2S and CO_2. Oversight of these wells has provided significant experience for the regulation of CCS.

Subsurface storage of carbon dioxide would be approved as a Section 75 Special Project under OGAA. Since the application requirements align with the those for acid gas disposal, that guide may be used.

Note also that Section 80 Storage Reservoirs in the Drilling and Production Regulation states

(3) *A well permit holder of a well that is part of a special project for carbon dioxide storage designated under section 75 of the Act must construct and operate the well in accordance with CSA Standard Z741.*

The approval process must ensure the integrity of both the well(s) and the reservoir in which the fluid is contained in the deep subsurface. A specific concern to be addressed in the application is the program to mitigate risks from potential future wells drilling through or conducting hydraulic fracture stimulations in proximity when accessing other resources. A Section 75 order contains specific conditions for initial inspection, ongoing operation, monitoring, testing and reporting. The Summary Document for acid gas disposal supports an understanding of both the application and operation requirements.
A condition of CO_2 storage is the submission to the Commission of Progress Reports at regular intervals. The content of the report will closely align those listed in the Acid Gas Disposal Progress Report Requirements document, with changes that are appropriate for the specific project.

Amendments to facilities approvals, for equipment to accommodate carbon dioxide capture and transportation, are made to the Commission Facilities & Pipelines department.

For further information on project approval, please contact Reservoir@BCOGC.ca.

For guidance on government policy and regulatory developments related to CCS as well as information on existing, and anticipated economic incentives, aimed at promoting CCS deployment in the province, please contact Vida Ramin – Director, Regulatory Policy, Oil and Gas Division, Ministry of Energy, Mines and Low Carbon Innovation. She can be reached at vida.ramin@gov.bc.ca or (250) 889-1765.

Page: 4
BC Oil and Gas Commission
Version 1.0 published: July, 2021
Uncontrolled copy once downloaded
GoTo: Table of Contents | Glossary | Legislation | BCOGC.CA

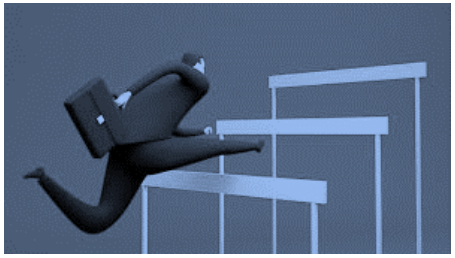
Source: https://www.bcogc.ca/files/operations-documentation/Reservoir-Management/Subsurface-Disposal/Carbon-Dioxide-Storage-Application-Guideline.pdf

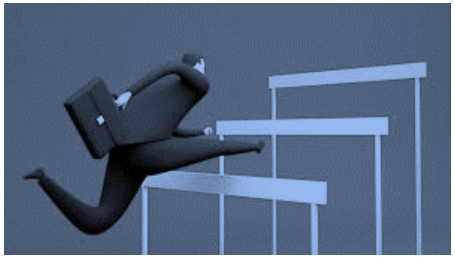
Provincial Supports

- CleanBC Industry Fund
- Clean Growth Infrastructure Royalty Program (2022)
- Low Carbon Fuel Standard
- Innovative Clean Energy Fund
- Centre for Innovation and Clean Energy

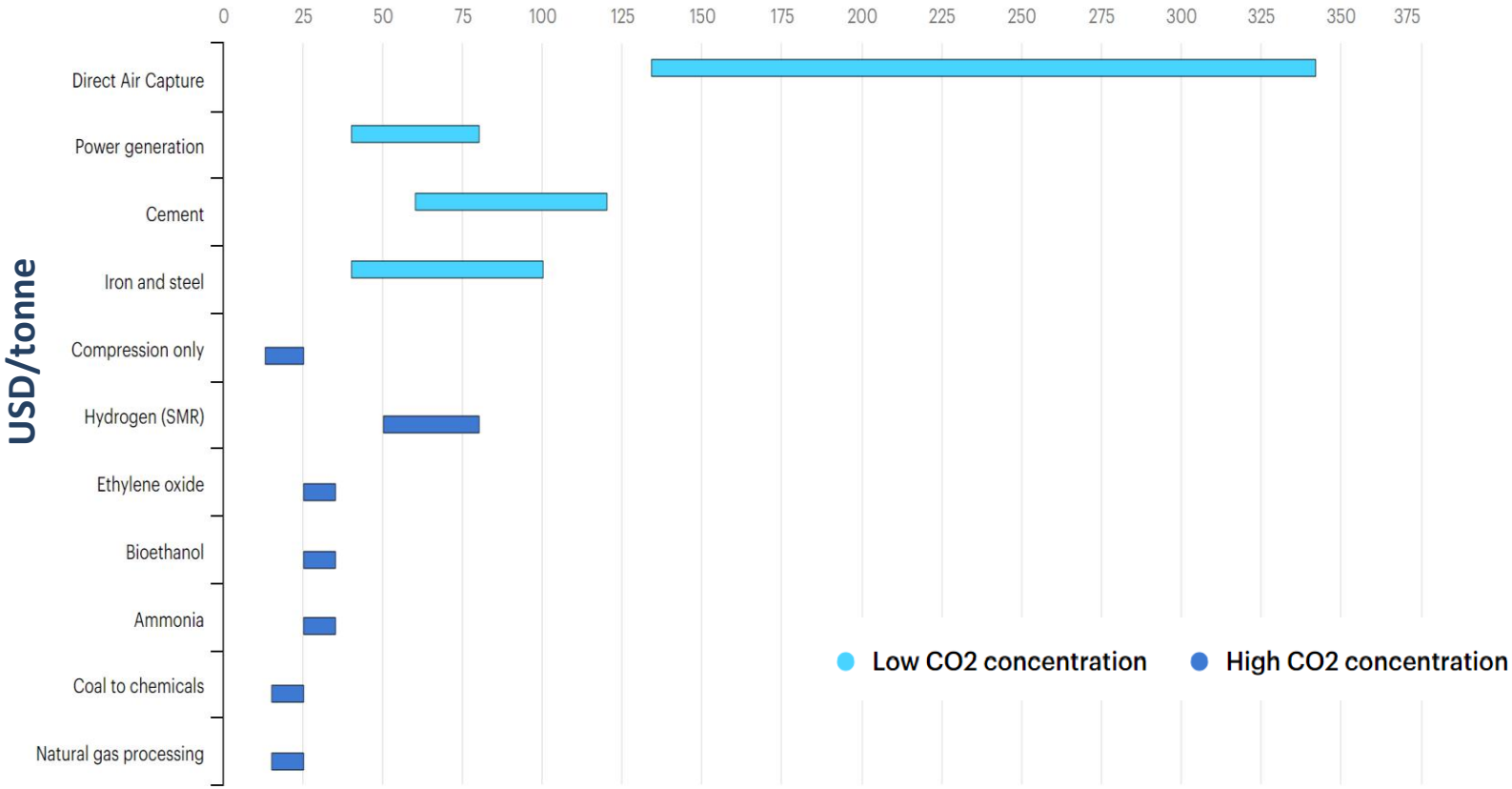
Challenges

- High Costs – Capex and Opex
- Limited revenue generation options (for now)
- Geographic disparity between emissions sources and known sink(s)
- Business models adopted elsewhere (nationally and internationally) may not be optimal options for B.C.



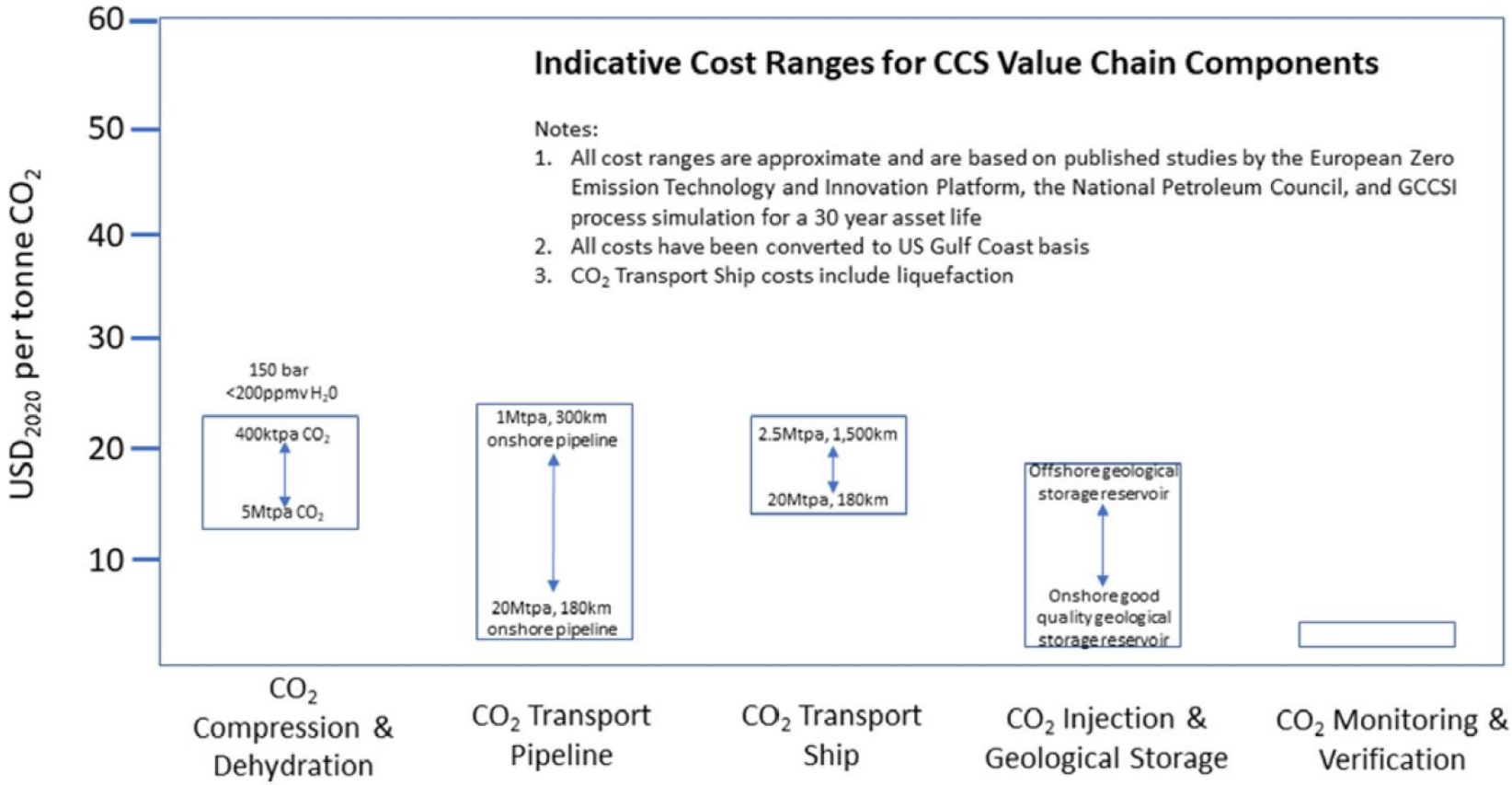


Levelized Capture Costs Across Sectors



Source: International Energy Agency, 2019

Transport and Storage Costs

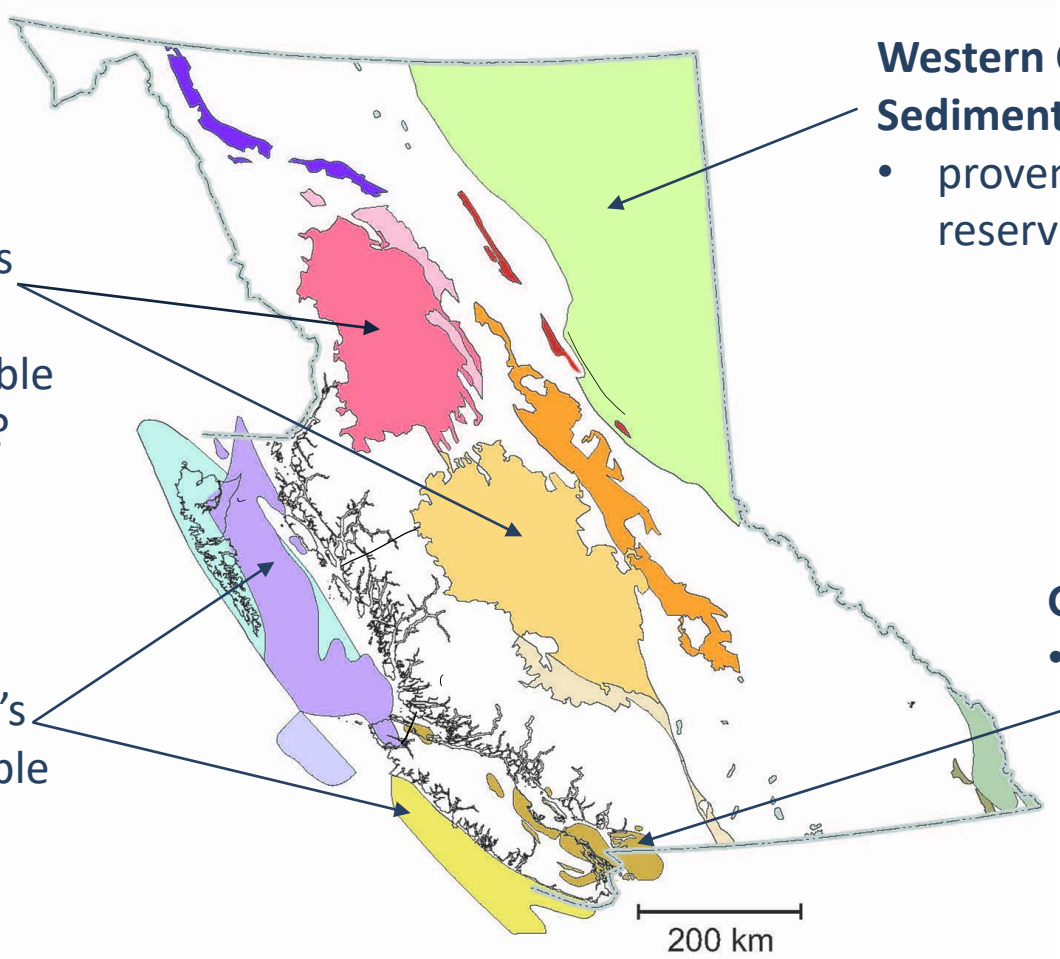


Source: Global CCS Institute (2021)

Known and Potential Carbon Sinks?

Western Canadian Sedimentary Basin
- proven suitable reservoirs

Interior Basins
- overlain basalts (target?)
- lack of favourable characteristics?



Georgia Basin
- lack of geologic seals

Offshore Basins
- drilling in 1970's
- potential suitable reservoirs

Next Steps

- Carbon pricing review underway
- Development of an offset protocol underway
- Modernizing the Low Carbon Fuel Standard
- Ensuring that *Oil and Gas Activities Act* applies to the geologic sequestration of carbon captured by sectors other than oil and gas
- Site-specific geological assessments in NEBC and high-level assessment(s) of sedimentary basins outside NEBC

Vida Ramin
Director, Regulatory Policy
Oil and Gas Division
Email: vida.ramin@gov.bc.ca
Tel: 236 478-0699