PEMBINA Institute

SUBMISSION

Balancing Integrity and Feasibility of Carbon Dioxide Storage in B.C.

Pembina Institute comments and recommendations

Submitted to the Ministry of Energy and Climate Solutions

Regarding: Carbon Capture and Sequestration Offset Protocol, Technical Discussion Paper

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Balancing Integrity and Feasibility of Carbon Dioxide Storage in B.C.

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Recommendation

- When it comes to the long-term integrity and safety of sequestered carbon dioxide, the Pembina Institute recommends setting a default monitoring length of time post-closure that can be adjusted based on project-specific risk assessments. Most comparable jurisdictions deploying this model have default monitoring periods of 20 to 50 years post-injection.
- The process for determining adjustments to the monitoring length of time should be transparent, predictable and conducted as early as possible to convey cost certainty to project developers.
- We recommend the establishment of an industry-funded financial security mechanism to ensure the Crown has sustainable means to manage long-term liabilities.

Context

The Pembina Institute welcomes the opportunity to provide input on the post-crediting monitoring period issue raised on the technical discussion paper of the Carbon Capture and

Sequestration Offset Protocol (CCSP) published on February 4, 2025.[1] The technical discussion paper proposes that an operator must monitor a site post-closure for a length of time that is determined by a project-specific assessment, rather than being fixed at 100 years as proposed in a previous draft of the protocol.

Discussion

Monitoring period

We recommend establishing a set timeframe for a monitoring period, but allowing the length to be adjusted based on a project-specific risk assessment, rather than using a fixed length of 100 years. Most comparable jurisdictions following this model have default monitoring timeframes between 20 to 50 years post-injection.

A well-defined post-closure monitoring period is essential to ensure the long-term integrity and safety of sequestered carbon dioxide. Early detection of potential issues allows for timely mitigation measures before leaks become significant, preventing environmental impacts and reassuring stakeholders — communities, governments and investors — that the carbon dioxide is permanently and safely stored.

However, monitoring requirements should be balanced with the costs and impacts on project development. As noted by the technical paper, the risk of reversal is highest during the injection period and diminishes over time. This is due to the pressure decreasing as the carbon dioxide spreads throughout the formation and stabilizing through secondary trapping mechanisms like solubility trapping, the dissolution of carbon dioxide in water, and mineral trapping, which is the conversion of carbon dioxide into stable solids.

There is a point in time when the risk of leakage is low enough that additional monitoring provides negligible additional value. An excessively long monitoring period could deter project developers from investing in carbon storage projects. By contrast, a balanced, risk-based approach safeguards both environmental protection and the economic feasibility needed for project developers.

The previously proposed 100-year monitoring period post-injection for carbon dioxide captured in an oil and gas reservoir or saline formation is significantly longer than what is seen in comparable jurisdictions. Most other jurisdictions offer shorter default monitoring timeframes,

[1] https://www2.gov.bc.ca/assets/gov/environment/climate-change/offsets/offsets-portfolio/ccsp_technical_discussion_paper.pdf

generally 20 to 50 years post-injection, along with the flexibility to modify this timeframe if sufficient evidence of storage safety is provided. A few examples include:

- In Alberta, project developers can transfer monitoring responsibilities and liabilities to the Crown soon after closure requirements are met. The Post-Closure Stewardship Fund, which all carbon sequestration operators pay into, helps offset costs associated with this long-term monitoring and maintenance.[2]
- The European Union (EU) allows transfer of monitoring responsibilities from the developer to the competent authority after a minimum period of 20 years post-closure. This period can be reduced if all available evidence indicates the complete and permanent containment of the carbon dioxide.[3]
- In the United States, projects with Class VI permits, i.e. projects with wells designated for the geologic sequestration of CO_2 as part of CCS projects, must carry post-injection site care and monitoring for 50 years by default. However, this length of time can be modified based on a project-specific risk assessment.[4]
- Isometric, a voluntary market carbon removal standard and registry, stipulates that for carbon dioxide stored in saline aquifers, monitoring should continue for 50 years post-injection if there is no guidance from regulations.[5]

An important consideration in balancing the trade-offs between development and risk in monitoring systems is the impact on project investment. Investment decisions rely on a clear understanding of future costs and revenues. The more potential variability in these values, the more difficult it is to make financing decisions. One way to reduce the risk associated with variable monitoring costs is to ensure that the process for determining monitoring requirements is determined early, transparently and predictably. This would include set assessment schedules and clear criteria for increasing or reducing the monitoring time.

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[2] Government of Alberta, "Carbon capture, utilization and storage – Leadership." https://www.alberta.ca/carbon-capture-utilization-and-storage-leadership

[3] European Parliament and Council, *Directive 2009/31/EC on the geological storage of carbon dioxide*, Article 18, Transfer of responsibility. https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A02009L0031-20181224

[4] U.S. Environmental Protection Agency (EPA), *UIC Program Class VI Well Plugging, Post-Injection Site-Care, and Site Closure Guidance*, Section 3.2.1, Duration of PISC, p.31 (2016) https://www.epa.gov/sites/default/files/2016-12/documents/uic_program_class_vi_well_plugging_post-injection_site_care_and_site_closure_guidance.pdf

[5] Isometric, *CO_2 Storage in Saline Aquifers v1.0*, Section 3.2, Post Injection Monitoring. https://registry.isometric.com/module/saline-aquifer-storage/1.0#post-injection-monitoring

Financial security

We recommend establishing a fund to which all project operators contribute, as it would provide financial security for future liabilities held by the Crown.

Crucially, any operator responsibility over an environmental liability comes with the risk of operator insolvency. This risk is heightened when it involves activities that occur long after the period of revenue generation has ended, like long-term post-closure monitoring of sequestration sites. The risk exists that these responsible parties become unavailable to fulfill these requirements. In that scenario, the Crown ultimately bears the responsibility to protect the public good, regardless of what is stipulated within regulations. This creates a financial risk for the Crown and undermines the project's safety if sufficient monitoring or liability management cannot be conducted.

A dedicated fund that is designed to cover future liabilities taken on by the Crown can ensure financial preparedness if a developer is no longer able to fulfill monitoring requirements. All projects could pay into the fund at a rate that provides sufficient coverage of future liabilities held by the Crown. This recommendation is in line with other jurisdictions such as Alberta and the European Union where financial security is required to cover future liabilities of carbon storage projects.

Conclusion

In closing, project monitoring after the carbon dioxide has been injected underground is important to ensure it remains durably stored there. However, monitoring requirements should be designed in a way that minimizes development costs while still meeting the same risk mitigation standards.

We support the proposed shift away from a fixed 100-year post-closure monitoring period and instead setting a monitoring period length that can adjust based on project-specific risk assessments. In order to minimize the impact of this variable on project investment attractiveness, we recommend that the process for adjusting this monitoring period be transparent, predictable and done as early as possible. Finally, we urge that the Crown establish financial security for future liabilities through a stewardship fund or similar mechanism.

We would like to express our gratitude for the continued work in supporting a growing suite of emissions reductions and removals. Thank you for the opportunity to provide written comments on the Carbon Capture and Sequestration Offset Protocol. We look forward to continued engagement on this issue.