

Changes to Alberta's Draft Quantification Protocol for CO₂ Capture and Permanent Geologic Sequestration

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On November 2, 2024, the Government of Alberta released the [Draft Protocol for CO₂ Capture and Permanent Geologic Sequestration](#) (draft protocol) for public comment. The changes to the draft protocol represent the collaborative approach of Alberta Environment and Protected Areas to continually improve the functionality of Alberta's Emission Offset System in regard to CCS development and deployment.

We encourage all parties that may be impacted to provide feedback on the draft protocol. The comment period closes Monday, December 2 at 5:00 pm MST with comments to be submitted using this [comments table](#) and sent by email to epa.ghg@gov.ab.ca

What is the Draft Protocol and how does it relate to Carbon Capture and Storage (CCS) in Alberta?

The draft protocol defines the framework for calculating net geological sequestration of CO₂ for carbon capture and storage (CCS) projects to generate offset emission credits under Alberta's large emitter carbon pricing and emissions trading system under the Technology Innovation and Emissions Reduction (TIER) regulation. The draft protocol will replace the existing [2015 version of the protocol](#). **The core of the protocol is a comparison between a projection-based baseline (CO₂ emissions in the absence of the project) and the project condition, considering all associated emissions and reductions.** It outlines methodologies for quantifying emissions from various sources (including upstream and downstream of the project) and sinks (i.e. dedicated sequestration sites).

The draft protocol emphasizes the importance of accurate measurement and monitoring, specifying requirements for data management, record keeping, and quality assurance/quality control. Notably, the protocol addresses the potential for CO₂ reversals (leakage from storage), outlining procedures for quantifying and accounting for these events. The protocol also outlines what flexibility measures are in place for project developers.

What changes were made to the 2015 protocol?

The 2015 and 2024 CCS quantification protocols, while sharing the fundamental goal of calculating net geological sequestration of CO₂, exhibit several key differences. In general, the draft protocol updates terminology, creates a distinction for removal credits, adds more flexibility measures, includes changes that allow for the limitation of some liabilities and includes measures that facilitate scenarios for shared carbon transportation and storage hubs.



CO₂ Removal Credits and Flexibility to include DAC facilities

The 2024 protocol introduces the concept of “Removal Credits” and explicitly includes DAC facilities in support of the growing number of Carbon Dioxide Removal (CDR) projects being developed in the province. It is unlikely that a DAC facility emit enough for TIER to apply and may not qualify to opt-in. To address this, the 2024 protocol introduces a dedicated flexibility mechanism for Direct Air Capture (DAC) facilities as emission sources, requiring specific quantification considerations.

The draft protocol allows for CO₂ captured from DAC facilities or biogenic sources, commonly known as Bio-Energy with Carbon Capture and Storage (BECCS), to be classified as removal credits on the Alberta Emission Offset Registry. Removal credits are an emission offset specifically for CO₂ removal and permanent storage in geological formations. Projects aiming to generate removal credits will need to meet specific requirements including declaring their intent to the Director and undergoing verification to confirm the emission reductions associated with the removal activities. For BECCS projects, regular radiocarbon analysis is needed to determine CO₂ streams’ biobased content – this is particularly relevant for carbon storage hubs that combine CO₂ from both biogenic and non-biogenic sources.

Importantly for DAC project proponents, upstream emissions from electricity production are included in determining emissions reduced. Any electricity accessed from the grid, regardless of any power purchase agreements in place, would need to use the latest grid intensity factor in calculating upstream emissions – projects would be able to generate electricity on-site at lower emissions intensity than the grid factor, but this will not be possible for all projects.

Scope of Geological Storage

The 2015 quantification protocol specifically focuses on CO₂ capture and permanent storage in **deep saline aquifers**. The 2024 protocol adopts a more general approach to geologic storage, encompassing **any permitted geologic storage zone suitable for permanent sequestration**. The shift towards broader geologic storage in the 2024 protocol allows for the inclusion of a wider range of CCS projects, potentially encompassing storage in depleted oil and gas reservoirs, saline formations beyond the traditional definition of “deep saline aquifers”, and other suitable geological structures. The 2015 protocol also had requirements related to depth of storage. The draft protocol doesn’t include a depth requirement, though AER’s regulatory process is sufficient to ensure that CO₂ is managed responsibly and safely through the lifecycle of a project.



Reversals and Liability

The draft protocol also makes changes related to the definition and quantification of reversals. The draft protocol includes changes to the definition of a reversal, timeframes for reversal accounting, and liability management to support the inclusion of limited liability options for credit reversals.

The 2015 protocol describes a reversal as "an accidental or intentional release or removal of injected CO₂ from the **deep saline aquifer**." The protocol didn't define the criteria for an accidental release; however, it emphasized reversals occurring after the project crediting period need to be "trued up" before the issuance of a closure certificate.

The 2024 protocol provides a more detailed definition of a reversal, focusing on the criteria for an **accidental reversal**.

- **Regulator determination:** The Alberta Energy Regulator (AER) determines that a loss of containment has occurred under the emission offset project's D065 scheme approval.
- **Irremediable Loss:** The loss of containment cannot be remediated.
- **Foreseeable Leakage:** An expert investigation determines that the CO₂ subject to the loss of containment will foreseeably leak into the atmosphere within 100 years.

The 2015 protocol primarily focuses on reversals happening before closure certificate issuance. The 2024 protocol defines three distinct timeframes for reversals: Net Reversal, Post-Crediting – Pre-Closure Certificate Reversal, and Post-closure Reversal. Each timeframe has procedures for quantifying and accounting for the reversal, including error correction processes, emission offset cancellation, and true-up requirements for large emitters using the offsets for compliance.

The draft protocol introduces a discount factor applied to injected CO₂ to mitigate post-closure reversal risks. It also offers a flexibility mechanism allowing project developers to limit their reversal true-up liability by applying an increased discount factor. A discount factor of 0.005 is applied to injected CO₂ during quantification to mitigate the risk of post-closure reversals. This discounted amount is considered "retired to the atmosphere."

The draft protocol includes a liability limitation flexibility mechanism. Project developers can choose to limit their reversal true-up liability to a maximum of three years of injected volume (based on the average annual injection) by applying an increased discount factor (0.01) starting from year 4 until closure certificate issuance.

There is also a flexibility mechanism included in the 2024 protocol related to pore space tenure that does not include liability transfers. *Flexibility Mechanism 4: Tenure Mechanism without Liability Transfer* addresses situations where tenure arrangements don't allow for liability transfer through a closure certificate. In such cases, project developers must apply the increased discount factor and fulfill additional conditions to demonstrate the absence of post-crediting reversals. Though not directly cited in the draft protocol, it appears likely that this applies to sequestration tenure granted for small-scale and remote projects.

Quantification Methodology and Data Management

- **Detailed Quantification Tables and Guidance:** Both protocols provide detailed tables outlining quantification methodologies and variables, but the 2024 protocol expands upon these, offering more comprehensive guidance on measurement and monitoring requirements for specific variables.



Flexibility Mechanisms

- **Specific Flexibility Mechanisms:** The 2024 protocol outlines four distinct flexibility mechanisms, including **DAC source utilization, project boundary adjustments, increased discount factor for liability limitation, and tenure mechanisms without liability transfer**. The 2015 protocol offers more general flexibility options related to alternative technologies and boundary deviations.

These differences highlight the evolution of the CCS quantification framework in Alberta, reflecting advancements in technology (like DAC), increased focus on long-term CO₂ containment and liability management, and a more detailed approach to emissions accounting in complex project configurations.

Role of the AER

The 2024 CCS Quantification Protocol marks a significant shift in the AER's role compared to the 2015 version, with enhanced regulatory responsibilities integrated into the offset system.

Key changes include:

- **Broadened AER Approval Requirements:** The 2024 protocol mandates AER approval under **Directive 065** before project registration on the Alberta Emission Offset Registry, ensuring site suitability and regulatory compliance as prerequisites for offset eligibility.
- **Explicit Reference to Directive 051:** The inclusion of **Directive 051** underscores the importance of injection well integrity, requiring adherence to detailed standards for design, operation, and monitoring to minimize CO₂ leakage risks.
- **Alignment with Containment Assurance Reporting:** Annual **Containment Assurance Reports** during the closure period must align with AER's **Directive 065** approvals, reinforcing the link between offset requirements and regulatory oversight. This also has implications for the definition of reversals.
- **Increased Focus on AER Directives:** The 2024 protocol highlights compliance with directives such as **Directive 020** (well abandonment), **Directive 060** (flaring and venting), and others, ensuring safe and responsible CCS operations.



What are key areas that interested parties should consider providing comments on?

The draft protocol generally represents responsive changes that better meet the needs of potential CCS projects and projects in development. Project proponents, however, may be looking for greater clarity and understanding of the implications of some changes. The following areas have been areas whereby interested parties may want to provide feedback to Alberta Environment and Protected Areas.

Understanding the Implications Related to Liability

This mechanism offers developers a choice to limit their liability for CO₂ reversals, with implications for project emissions calculations:

- **Standard Discount Factor:** A default discount factor of 0.005 applies to injected CO₂, accounting for post-closure reversal risks. Developers who opt for this implicitly accept full true-up liability for the entire volume of injected CO₂ during both crediting and post-crediting pre-closure stages.
- **Increased Discount Factor:** Developers choosing this option limit reversal liability to a maximum of three years of injected volume but at the cost of a higher discount factor:
 - **Years 1-3:** The standard 0.005 factor applies.
 - **Year 4 Onward:** The discount factor increases to 0.01 until a closure certificate is issued, reducing the volume of CO₂ eligible for credit.

Feedback could focus on whether the trade-offs between risk mitigation and financial impacts are reasonable, especially for projects with varying containment confidence levels or under tenure mechanisms restricting liability transfer.

How would the liability changes affect insurance availability and cost for projects? Feedback related to the role of insurance in managing risk and how developers can adjust strategies for long-term liability, including financial resources for monitoring and remediation after liability transfer may be warranted.

Alignment with Other Protocols

The protocol's alignment with other provincial and federal regulations, including alignment with Alberta's EOR protocol may require attention. Formal intergovernmental cooperation to streamline CCS development stands to benefit projects writ large.



