

REPORT TO THE LEGISLATURE



Use of Carbon Dioxide Removal to Meet Washington State's Emissions Reduction Limits Interim Progress Report

Background

The 2024 Supplemental Operating Budget ([Engrossed Substitute Bill 5950, Section 302\(51\)](#)) (See Appendix A) provides \$300,000 to the Department of Ecology (Ecology) to contract, in consultation with the Department of Commerce, with a third-party to complete a study of the extent to which carbon dioxide removal is needed to meet Washington's commitment to greenhouse gas emissions reductions, which are defined in the Revised Code of Washington (RCW) [70A.45.020](#). The Intergovernmental Panel on Climate Change defines “carbon dioxide removal” as “anthropogenic activities removing carbon dioxide from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products.”¹ The proviso requires that the study include recommendations on policies to grow Washington's carbon dioxide removal capacity, including through compliance market development and government procurement policies.

This is the interim report, due to the Legislature by November 30, 2024. A final report will be submitted by June 30, 2025, which will include:

- (i) A summary of feedback from relevant stakeholders
- (ii) An analysis of economic and climate opportunities for Washington
- (iii) Ways in which carbon dioxide removal might integrate with existing compliance programs
- (iv) Strategies to support industry sectors in integrating carbon dioxide removal and maximizing federal funding
- (v) Recommendations for monitoring, reporting, and verification standards to ensure carbon dioxide removal technologies can be compared and
- (vi) Consideration of carbon dioxide removal accounting mechanisms that account for varying durability of different approaches

¹ https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_AnnexVII.pdf

Pursuant to the budget, if [Initiative 2117](#) is approved in the 2024 general election, the funding for this work will be voided. If this happens, Ecology will cancel the contract and will not produce a final report.

Contractor Selection

Ecology used the Department of Enterprise Services Statewide Contract No. 2222 for Environmental Consulting Services and solicited proposals from three firms with expertise related to the directed scope of the Carbon Dioxide Removal Study. Ecology received two proposals. After review, the proposal submitted by EA Engineering, Science, and Technology, Inc., PBC (EA) was selected.

Carbon Dioxide Removal Study Plan

Pursuant to the proviso, this Carbon Dioxide Removal Study will assess the extent of carbon dioxide removal required to meet statutory limits on greenhouse gas emissions. The project will identify key carbon dioxide removal opportunities leading to both biological and geological sequestration, explore how they might be integrated into existing compliance programs, and recommend policies to enhance carbon dioxide removal capacity in Washington. Results will be provided in the June 2025 final report, which will be informed by engagement with interested parties and will detail strategies, recommendations, and potential pathways for the state to achieve its greenhouse gas emissions limits.

The study plan for this project is organized into six sections:

- Outreach and Engagement
- Analysis of Leading Carbon Dioxide Removal Opportunities
- Integration with Compliance Programs
- Strategies for Industry Sector Integration and Maximizing Federal Funding
- Monitoring, Reporting, and Verification Standards
- Carbon Dioxide Removal Accounting Mechanisms

Outreach and engagement

EA will engage with industries interested in deploying carbon dioxide removal technologies – trade organizations, climate and energy advocacy organizations, and others – to ensure the best available information from those in Washington’s carbon dioxide removal industry is incorporated in this analysis. EA will use the following process to transparently engage partners and interested parties working with Ecology:

- **Carbon Dioxide Removal Organizations Identification.** Before the end of 2024, Ecology and EA will identify interested parties to gain feedback on carbon dioxide removal technologies and the Washington market. Interested parties are considered those in the carbon dioxide removal industry, as well as industries interested in deploying carbon

dioxide removal technologies, trade organizations, climate and energy advocacy organizations.

- **Consultation and Feedback Sessions.** A series of consultation sessions with trade organizations and climate and energy advocacy organizations, such as interviews, focus groups, online surveys, and virtual meetings, will be conducted to gather insights and feedback on our findings and proposed recommendations.
- **Feedback Analysis.** The team will compile and analyze the information gathered through outreach efforts.

The insights and lessons learned from engagement with interested parties will be incorporated into the final report. This will include a summary of the perspectives from interested parties, analysis of the potential contribution of carbon dioxide removal to emissions reduction limits, policy and market development recommendations, and identification of key areas for further research.

Analysis of leading carbon dioxide removal opportunities

Pursuant to the proviso, the analysis of carbon dioxide removal opportunities will begin by confirming the extent to which carbon dioxide removal is needed to meet Washington’s limits on greenhouse gas emissions, based on the decarbonization pathways analysis and modeling included in the [Washington 2021 State Energy Strategy](#).² That strategy assumes that carbon dioxide removal will be needed to achieve 5% of the state’s 1990 baseline emissions by 2050, with the remaining 95% considered to be gross emission reductions.

The leading carbon dioxide removal opportunities that hold the greatest potential for achieving net-zero emissions will be identified. For each leading opportunity, this analysis will include the following metrics:

- Quantifying the carbon dioxide removal potential over time,
- Quantifying the carbon storage potential durability over time, in the context of the definition for “permanent sequestration” in Washington Administrative Code (WAC) [173-407-110](#),
- Details about uncertainties, and
- Estimated cost ranges per ton of carbon dioxide removed.

Results from this analysis may be used in the state’s forthcoming [Comprehensive Climate Action Plan](#), which will include an economy-wide emission-reduction-pathways model to inform comprehensive statewide climate action planning. The study will summarize other carbon dioxide removal opportunities considered and dismissed along with reasoning for their dismissal.

² <https://www.commerce.wa.gov/energy-policy/state-energy-strategy/>

Integration with compliance programs

After completing analysis of leading carbon dioxide removal opportunities that should be considered within the state, it is necessary to assess the extent to which selected carbon dioxide removal initiatives align with existing state and federal compliance programs, as such alignment will maximize regulatory compliance and funding opportunities.

The assessment of the current regulatory landscape in Washington will include relevant state laws, federal compliance programs, like the [Clean Air Act](#) and [45Q tax credits](#) (intended to incentivize investment in carbon capture and sequestration), and local policies that have the potential to positively influence or impede decarbonization efforts. Tasks will include the following:

- Comprehensive review of [Washington’s Climate Commitment Act](#) and other state-specific climate regulations,
- Analysis of federal programs and incentives available for carbon dioxide removal, including the 45Q tax credit and U.S. Department of Energy funding opportunities,
- Identification of regulatory gaps and barriers that may hinder the adoption and scaling of carbon dioxide removal technologies, and
- Development of recommendations for policy adjustments or new legislation to support the successful implementation of decarbonization activities.

These activities will allow the state to select carbon dioxide removal technologies with the most likely opportunity to provide benefit given existing regulations and compliance programs, without having to implement statutory changes. Information from this evaluation will feed further research activities related to maximizing federal funding and developing recommendations for monitoring, reporting, and verification protocols.

Strategies for industry integration and maximizing federal funding

Critical to meeting the state’s greenhouse gas emissions reduction limits is the identification of strategies to support industry sectors in integrating carbon dioxide removal and maximizing federal funding to support decarbonization projects that provide public benefits. It may also be necessary to implement new state policies that support further realization of the state’s Comprehensive Climate Action Plan.

There are a variety of federal funding opportunities available to support development and deployment of carbon dioxide removal technologies. These funding sources are aimed at accelerating innovation, reducing costs, and scaling up carbon dioxide removal solutions to mitigate climate change. Table 1 provides a summary of some of the funding sources potentially available. Recommendations will address opportunities best suited to Washington’s industries and opportunities for decarbonization.

Table 1. Potential Funding Opportunities

<i>Funding Opportunity</i>	<i>Description</i>	<i>Relevant Carbon Dioxide Removal Technologies</i>
<i>Grants and Research Funding</i>	U.S. Department of Energy and National Science Foundation provide grants for research and development in carbon dioxide removal technologies, including direct air capture, bioenergy with carbon capture and storage, and advanced materials for carbon dioxide utilization.	Direct Air Capture, Bioenergy with Carbon Capture and Storage, Carbon Dioxide Utilization
<i>Loan Programs</i>	The U.S. Department of Energy Loan Programs Office offers loan guarantees to support the commercial deployment of innovative energy projects, reducing financial risk.	Various carbon dioxide removal technologies
<i>Tax Incentives (45Q Tax Credit)</i>	Provides financial incentives for capturing, using, and storing carbon dioxide, significantly offsetting the costs of carbon dioxide removal projects.	Direct Air Capture, Bioenergy with Carbon Capture and Storage, Carbon Dioxide Utilization
<i>Public-Private Partnerships</i>	CarbonSAFE Initiative and collaborations with national laboratories support integrated storage complexes and technology transfer.	Carbon Capture and Storage, Bioenergy with Carbon Capture and Storage
<i>Innovation and Competitions</i>	Prize competitions encourage breakthrough technologies in carbon management, offering cash prizes and incentives.	Innovative carbon dioxide removal solutions
<i>Infrastructure/Deployment Support</i>	Federal funding supports infrastructure essential for carbon dioxide removal deployment, including carbon dioxide transportation networks and storage facilities.	Large-scale carbon dioxide removal projects
<i>Climate and Energy Programs</i>	State-level programs, such as the Climate Commitment Act, provide funding opportunities that align with state and national climate goals, potentially including carbon dioxide removal projects.	Various carbon dioxide removal technologies

Monitoring, reporting, and verification standards

The establishment of robust monitoring, reporting, and verification protocols will be essential for successful implementation of carbon dioxide removal technologies selected by the state. Monitoring, reporting, and verification protocols ensure the credibility and accountability of efforts to sequester carbon, including carbon dioxide removal, by providing a systematic approach to accurately measure, verify, and report the amount of greenhouse gases removed from the atmosphere.

To address the critical issue of sequestration longevity, EA's recommendations will include robust monitoring techniques for tracking long-term carbon storage stability, risk assessment strategies, and financial mechanisms to mitigate potential reversals. EA will also outline a framework for independent third-party verification, including qualifications for verifiers and a process for their accreditation. This approach incorporates an adaptive management system to ensure monitoring, reporting and verification standards remain current with scientific advancements and technological innovations.

Finally, we recognize the importance of integrating these standards with existing carbon markets and registries. EA's recommendations will include methods for aligning the proposed monitoring, reporting, and verification standards with current carbon credit systems and approaches for transparent tracking of carbon dioxide removal credits. This comprehensive approach will ensure that the resulting monitoring, reporting, and verification standards are robust, comparable, and compliant with state law.

Carbon dioxide removal accounting mechanisms

It is crucial to develop carbon dioxide removal accounting mechanisms that accurately reflect the varying durability of different sequestration opportunities. Not all carbon dioxide removal technologies provide the same level of permanence in carbon storage; some methods, such as geological storage, can sequester carbon for thousands of years, while others, like soil carbon sequestration, may have shorter durations influenced by factors like land use changes or natural disturbances. Developing mechanisms that account for these differences is essential to ensure the integrity of the state's overall carbon reduction strategy. By differentiating between the durability of carbon dioxide removal methods, these mechanisms allow for more accurate tracking of long-term carbon sequestration and help prioritize investments in the most reliable and effective technologies.

After The EA Team completes their initial assessment and identifies promising CDR technologies, they will research different carbon accounting protocols and identify the ones they believe are most suited for the CDR technology of interest. The approach will begin by classifying carbon dioxide removal methods based on their expected storage duration and developing standardized durability metrics to quantify the longevity of carbon storage for each method. EA will then

design a tiered evaluation system where methods are valued differently based on storage duration, with more durable storage methods receiving higher valuations.

The accounting mechanisms will be designed with adaptability and integration in mind. EA will consider compatibility with existing carbon markets and create a flexible system that can incorporate new carbon dioxide removal technologies and updated scientific understanding of carbon storage durability. This approach will result in a robust, objective, and scientifically grounded carbon dioxide removal accounting system that accurately reflects the varying durability of different carbon removal methods.

Next Steps

The Carbon Dioxide Removal Study is in the early stages. Over the next seven months, informed by engagement with industry leaders in Washington State, Ecology, and EA will execute the study, as described above. By June 30, 2025, Ecology will submit a final report that will include all the specific elements laid out in the budget proviso.

Appendix A

Proviso Language (ESSB 5950 Section 302(51))

(51)(a) \$300,000 of the climate commitment account—state appropriation is provided solely for the department, in consultation with the department of commerce, to contract with a third-party entity to conduct a study of the extent to which carbon dioxide removal is needed to meet Washington's emissions reduction targets defined in RCW 70A.45.020. The study must include recommendations on policies to grow Washington's carbon dioxide removal capacity, including compliance market development and government procurement policies. The department must provide an interim progress report to the appropriate committees of the legislature by November 30, 2024. The department must provide a final report by June 30, 2025, that includes:

- (i) A summary of feedback from relevant stakeholders;
- (ii) An analysis of economic and climate opportunities for Washington;
- (iii) Ways in which carbon dioxide removal might integrate with existing compliance programs;
- (iv) Strategies to support industry sectors in integrating carbon dioxide removal and maximizing federal funding;
- (v) Recommendations for monitoring, reporting, and verification standards to ensure carbon dioxide removal technologies may be compared; and
- (vi) Consideration of carbon dioxide removal accounting mechanisms that account for varying durability of different approaches.

(b) If Initiative Measure No. 2117 is approved in the 2024 general election, upon the effective date of the measure, funds from the consolidated climate account may not be used for the purposes in this subsection.

Publication information

This report is available on the Department of Ecology's website at <https://apps.ecology.wa.gov/ecy/publications/SummaryPages/2414078.html>

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³ www.ecology.wa.gov/contact