PERMITTING COMMERCIAL GEOLOGIC CO_2 STORAGE PROJECTS: LESSONS LEARNED

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METHODS, PROCEDURES, PROCESS

Formed in 2003 as part of the U.S. Department of Energy's Regional Carbon Sequestration Partnership Program, the Plains CO_2 Reduction (PCOR) Partnership continues to build upon its 20-year applied research expertise and extensive stakeholder base to accelerate carbon capture, utilization, and storage (CCUS) projects in its region. The PCOR Partnership is identifying and addressing capture, transport, and storage challenges throughout its region, which encompasses ten U.S. states and four Canadian provinces in the upper Great Plains and northwestern regions of North America.

RESULTS, OBSERVATIONS, CONCLUSIONS

Commercial CCUS projects in the PCOR Partnership region include geologic storage of carbon dioxide (CO_2) in saline formations (dedicated storage) and utilization of CO_2 stored in association with enhanced oil recovery (EOR). Commercialization of CCUS has led to the expansion of existing CO_2 pipeline transportation networks and construction of new CO_2 pipelines connecting areas of the PCOR Partnership region with major industrial CO_2 sources to geologic formations best suited for permanent storage. As of the end of 2023, eight commercial CCUS projects are operating within the PCOR Partnership region: three located entirely in Canada, four in the United States, and one cross-border. Currently, geologic storage is occurring primarily via associated storage (CO_2 EOR), although dedicated storage in saline aquifers is also a component of the two Canadian projects and two of the U.S. projects. In the U.S. portion of the PCOR Partnership region, seven dedicated storage projects are approved to store CO_2: six in North Dakota and one in Wyoming. These approved projects range from single-source with nearby single injector to large-volume sources or multiple sources utilizing multiple Class VI injection wells (i.e., storage hub model). In addition, North Dakota and Wyoming both require storage units and pore space access to be addressed at the time of permitting. To date, the seven approved projects consist of 11 Class VI injection well permits; eight have been issued in North Dakota and three in Wyoming.

With financial incentives and state and national emission reduction goals, activity in the region is at an all-time high. Nearly 25 commercial-scale CCUS projects have been announced in the PCOR Partnership region, many with anticipated construction or injection operations planned before 2030. The PCOR Partnership's engaged membership base includes commercial, legal, regulatory, and societal stakeholders making CCUS a commercial reality. This industry–government partnership addresses the key business drivers motivating commercial developers as well as the current challenges facing them.

SIGNIFICANCE/NOVELTY

Public perception remains a significant challenge, with negative and technically inaccurate information readily disseminated via social media. Regulatory certainty, another challenge to commercial deployment, is needed to ensure continued advancements and scalability of CCUS technologies. Along with supporting a practical and comprehensive resource management regulatory framework, the PCOR Partnership played a key role in helping North Dakota secure primacy for Class VI injection well activities. This regulatory enforcement authority helped pave the way for six approved CO_2 storage facility permits, including the establishment of storage units; eight Class VI injection well permits; and two actively injecting CO_2 storage projects. At the time of this submission, two of the three states with Class VI primacy (North Dakota and Wyoming) reside within the PCOR Partnership region.

INTRODUCTION

The Plains CO_2 Reduction (PCOR) Partnership, a joint government–industry partnership that includes over 250 stakeholders from the public and private sectors, is one of four Regional Carbon Sequestration Partnership Initiatives funded by the National Energy Technology Laboratory (NETL) of the U.S. Department of Energy (DOE), the Oil and Gas Research Program and the Lignite Research Program of the North Dakota Industrial Commission (NDIC), and member organizations. Led by the Energy & Environmental Research Center (EERC) with support from the University of Wyoming (UW) and the University of Alaska Fairbanks (UAF), the goal of the PCOR Partnership is to accelerate the commercial deployment of carbon capture, utilization, and storage (CCUS) by identifying and addressing regional capture, transport, use, and storage challenges throughout a region that encompasses ten U.S. states and four Canadian provinces in the upper Great Plains and northwestern regions of North America (Figure 1).

The PCOR Partnership region is home to abundant and diverse sources of anthropogenic carbon dioxide (CO_2) (e.g., coal- and gas-fired power plants, gas-processing plants, ethanol plants), fitting geology for CO_2 storage and utilization, and an existing network of CO_2 transport pipeline infrastructure. Energy development continues to evolve as society pursues low- or no-carbon solutions to energy needs. While renewable energy development such as wind, solar, and hydroelectric continues to increase in popularity,

Figure 1. The geographic extent of the PCOR Partnership region comprises ten states (Alaska, Montana, Wyoming, North Dakota, South Dakota, Nebraska, Missouri, Iowa, Minnesota, and Wisconsin) and four Canadian provinces (British Columbia, Alberta, Saskatchewan, and Manitoba).

fossil fuel usage will continue to be the backbone for energy supplies for the foreseeable future. The supply and demand for energy varies across the PCOR Partnership region. Some states may transport fossil fuels (i.e., coal) to nearby states for energy generation (e.g., electricity), while other states may produce the energy (e.g., electricity, ethanol) in-state and transport the energy product to another jurisdiction (Noll and others, 2023). CCUS offers a unique opportunity to reduce energy-related CO_2 emissions from fossil fuel use while simultaneously giving the energy producer a competitive advantage with low-carbon marketable products (e.g., crude oil, ethanol, electricity, hydrogen).

The deployment of commercial CCUS projects in the PCOR Partnership region includes geologic storage of CO_2 in saline formations (dedicated storage) and utilization of CO_2 stored in association with enhanced oil recovery (EOR) (CO_2 EOR and associated storage). Commercialization of CCUS has led to the expansion of existing CO_2 pipeline transportation networks and construction of new CO_2 pipelines connecting major industrial CO_2 sources within the PCOR Partnership region to geologic formations best suited for permanent storage.

The PCOR Partnership region has over 500 large stationary CO_2 emission sources, defined as those facilities emitting more than 100,000 metric tons/year. A number of these CO_2-emitting facilities (e.g., power plants, ethanol facilities) in the PCOR Partnership region do not reside in the sedimentary basins where favorable geologic storage opportunities exist (Figure 2). Currently, most CCUS projects target coal-fired electric generating facilities and ethanol production plants. The PCOR Partnership region has about 150 electric generating facilities, with many of those located in the eastern parts of the region. About 120 ethanol facilities are found primarily in Iowa, South Dakota, Minnesota, North Dakota, and Nebraska. Often, the most cost-effective solution for multiple facilities in areas without favorable geology is collectively creating a pipeline network that combines their CO_2 streams and transports the CO_2 stream volume to a single storage target (consisting of one or multiple injection wells in one area), referred to as CCUS hubs or hub and cluster development. The transport and storage components of the system may be owned collectively by the capture facilities or by a third party. This approach efficiently utilizes storage resources and minimizes project development and operational costs (Noll and others, 2023).

PCOR Partnership Activity

The PCOR Partnership has been performing applied research in CCUS since 2003, through a multiphased collaboration with over 250 public and private partners to demonstrate permanent, safe, and practical storage. Each phase represents important advancements in carbon management and acts as a building block for commercial CCUS deployment.

- In Phase I of the program (fall 2003 to fall 2005), work focused on characterizing the stationary CO_2 emission sources as well as the geological storage layers suitable for CO_2 storage in the PCOR Partnership region.

- In Phase II (fall 2005 to fall 2009), the PCOR Partnership completed four small-scale field validation tests.

- The multifaceted Phase III program, active through December 2018, was built around commercial-scale demonstrations and unprecedented collaboration at the local, regional, and cross-border levels.

- The PCOR Partnership Initiative (2019–2024) is focused on identifying and addressing regional storage and transportation challenges facing the commercial deployment of CCUS.

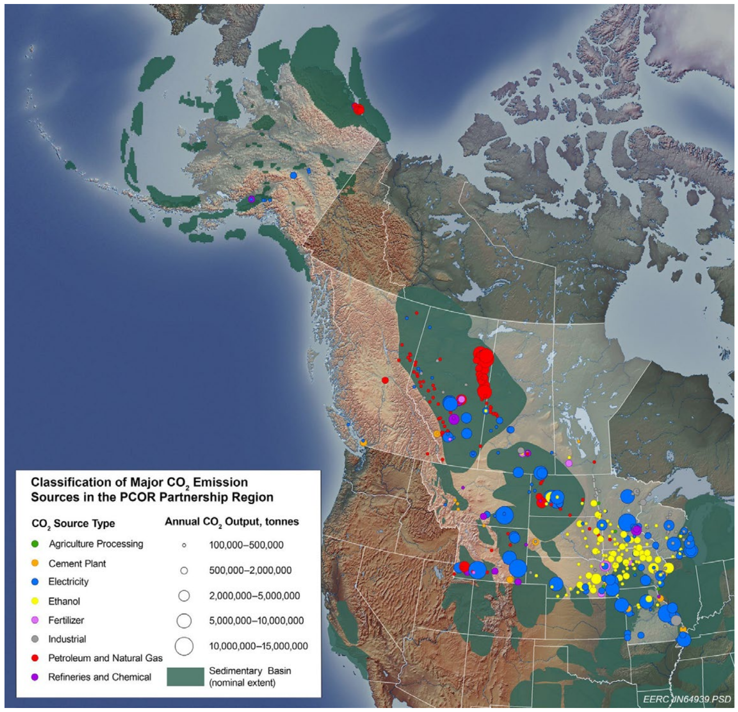

Figure 2. Classification of large stationary CO_2 emission sources in the PCOR Partnership region.

Since 1986, CCUS activities have been occurring in the PCOR Partnership region. These early efforts were initiated by gas-processing plants that captured CO_2 for transport and use through CO_2 EOR. As of May 2024, there are eight carbon capture projects in the PCOR Partnership region. Five of the eight CO_2 capture facilities supply CO_2 for use at ten active CO_2 EOR projects in Wyoming (Lost Soldier/Wertz, Salt Creek, Monell, Beaver Creek, Big Sand Draw, and Grieve), Montana (Bell Creek), North Dakota (Cedar Creek Anticline), Alberta (Alberta Trunk Line), and Saskatchewan (Weyburn/Midale). There are five active dedicated storage projects in the PCOR Partnership region, with three in North Dakota [Red Trail Energy, Blue Flint Ethanol, and Dakota Gasification Company (DGC)], Aquistore in Saskatchewan, and Shell Quest in Alberta (Figure 3). CO_2 that is being captured at DGC's Great Plains Synfuels Plant and SaskPower's Boundary Dam Station is being transported for both EOR and dedicated storage. Red Trail Energy, Blue Flint Ethanol, and Shell Quest are solely dedicated storage projects (i.e., CO_2 captured from a single emissions source and transported to a dedicated saline storage site).

In the U.S. portion of the PCOR Partnership region, seven dedicated storage projects have been permitted to store CO_2: six in North Dakota (three of the six projects currently in operation) and one in Wyoming. These approved projects range from single-source with nearby single injector to large-volume sources or multiple sources utilizing multiple Class VI injection wells (i.e., storage hub model). In addition, North Dakota and Wyoming both require storage units and pore space access to be addressed at the time of permitting. To date, the seven approved projects consist of eleven Class VI injection well permits; eight have been issued in North Dakota and are actively injecting, and three Class VI permits have been approved in Wyoming.

Existing CO_2 pipelines in the region cover approximately 1200 miles, with a primary focus on delivering CO_2 for EOR, e.g., DGC's pipeline delivering CO_2 from North Dakota to the Weyburn/Midale oil fields in southern Saskatchewan and the Salt Creek/Greencore pipeline in Wyoming to CO_2 EOR fields

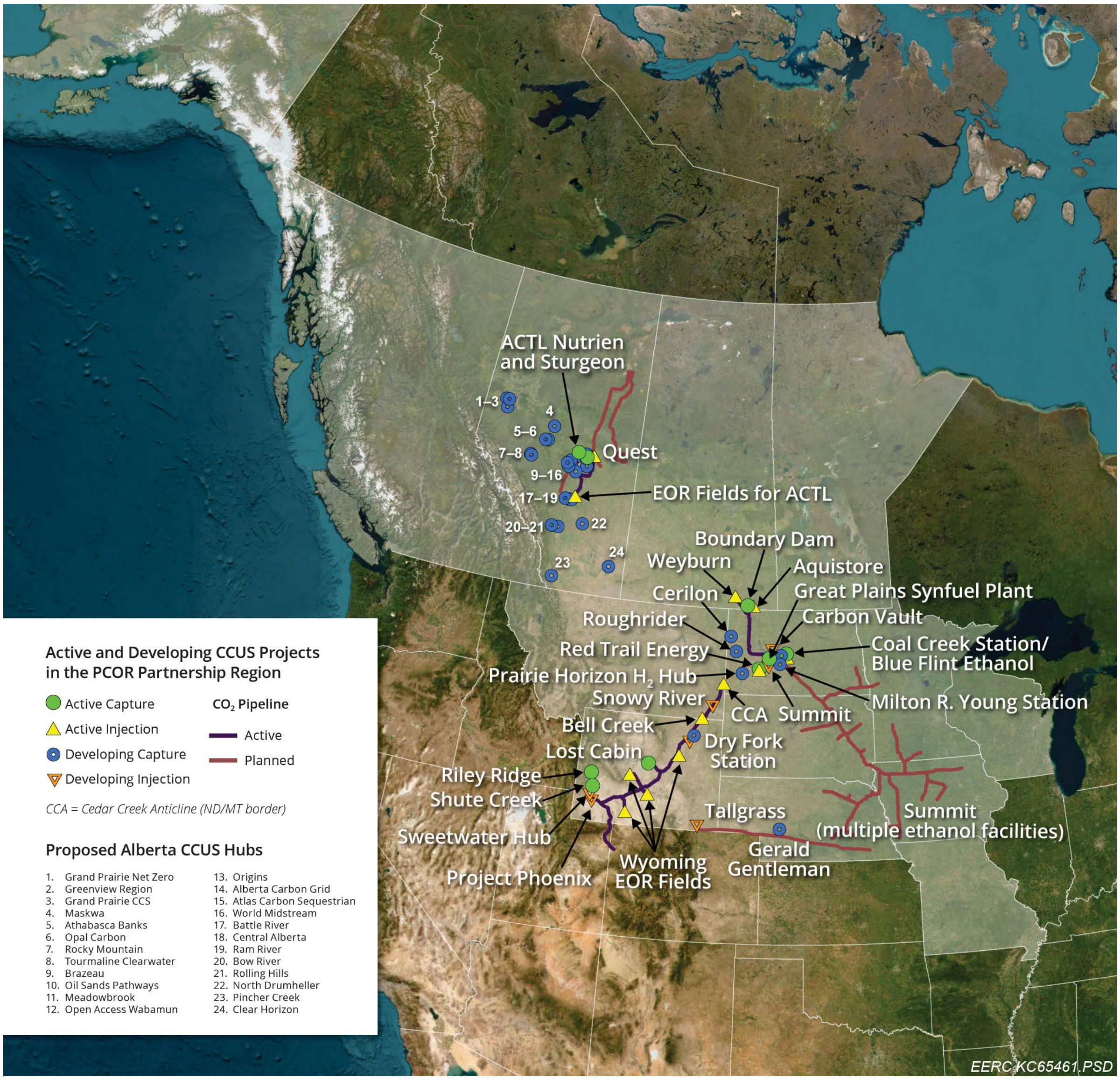

Figure 3. Active and announced projects under development in the PCOR Partnership region.

in Wyoming, southeastern Montana, and southwestern North Dakota. The Alberta Trunk Line near Edmonton, Alberta, is delivering CO_2 from multiple facilities to EOR fields near Red Deer, Alberta. Looking forward, current pipeline development efforts include the Summit Carbon Solutions project and a number of announced CCUS hub projects in the province of Alberta (Figure 3). Furthermore, the state of Wyoming has also designated CO_2 pipeline corridors under the Wyoming Pipeline Corridor Initiative that lay the groundwork for CCUS project expansion in the state.

Numerous commercial-scale CCUS projects have been announced in the PCOR Partnership region, with many of these slated to begin construction or injection operations before 2033. This next generation of commercial CCUS operations in the PCOR Partnership region will involve a mixture of dedicated and associated storage; however, there has been a shift in focus to dedicated storage compared to the existing commercial activity in the region (Connors and others, 2022).

Federal Tax Incentives

The evolution of the Internal Revenue Service (IRS) Section 45Q tax credit has played a key role in establishing important economic and business drivers for the commercial deployment of CCUS. Passage of the 2018 Bipartisan Budget Act expanded the 45Q tax credit to $35 a tonne for EOR and $50 a tonne for dedicated storage. A further increase in the tax credit to $60 a tonne for EOR and $85 a tonne for dedicated storage was put into place by the passage of the Inflation Reduction Act of 2022. The emerging commercial CCUS industry in the U.S. portion of the PCOR Partnership region is leveraging multiple business models that are in most cases fueled by government-backed IRS 45Q tax credit incentive.

The primary financial drivers for existing and announced CCUS projects, regardless of the contractual arrangements (i.e., business model) between the three primary project components (i.e., CO_2 capture, transport, and storage), are tax incentives (credits or avoidance) and CO_2 sales. Supporting drivers include premium markets for lower-carbon-intensity fuels that meet low-carbon fuel standards (LCFS) as well as regulatory/financial policies affecting the handling of the long-term responsibility of CO_2 stored in the subsurface and the impact of environmental, social, and corporate governance (ESG) metrics on the financial viability of a project. Lastly, constructing and operating a carbon capture and storage (CCS) project in a state with Class VI primacy provides a project developer with added certainty regarding the cost of meeting the requirements and timeline that are necessary to permit and start up a project, which will allow for the project to be financially vetted for investors. For an industry to move forward with a CCUS project, a business model catalyzed with one or more viable drivers (e.g., CO_2 EOR, tax credits) must be adopted that does not negatively impact a company's bottom line (Peck and others, 2022).

More specifically, over the past 30 years within the PCOR Partnership region, the existence of viable business models and drivers has produced a diverse commercial CCUS industry, which has recently shifted in the United States from resource recovery (CO_2 EOR and associated CO_2 storage) to green growth dominated by dedicated storage in saline aquifers. This fundamental shift is evident based on the list of newly announced CCUS projects within the U.S. portion of the region. Although these projects include CO_2 EOR, most are being driven by the 45Q tax credit or product value enhancement, such as LCFS credits associated with low-carbon-intensity fuels (Peck and others, 2022b). On the other hand, the green growth business model described by Ku and others (2020) is in play in Canada. This business model, which supports CO_2 emission reduction through government regulations, incentives, or social pressure, is being implemented in the form of an actively evolving carbon tax policy (essentially a CO_2 levy on fossil fuels). This could be an important driver for commercial CCUS projects in the Canadian provinces.

State Tax Incentives

Several states in the PCOR Partnership region offer tax incentives to encourage and support CCUS projects. Most of these existing state tax incentives are related to either the capture of CO_2 or the use of CO_2 in relation to EOR projects. The only state to offer a tax incentive for the dedicated storage of CO_2 is Alaska. Alaska offers a tax incentive related to the federal 45Q tax credit, in which the credit amounts determined by 45Q are increased to 18% and applied against state corporate net income taxes. Incentives offered by other states include the following (Connors and others, 2023). A more detailed summary of current state incentives in the PCOR Partnership region is presented in Table 1.

Table 1. Summary of State Tax Incentives in the PCOR Partnership Region

State	Incentive
Alaska	AS 43.20.021(d) – federal tax credits from the 45Q tax credit are scaled to 18% to be applied to state corporate net income tax.
Montana	House Bill 3 (2007) – coal gasification facilities sequestering at a rate of at least 65% may qualify for an abatement of property tax of 50% of the taxable value on up to the first $1 million of the value of the equipment at the facility for up to 19 years.
Montana	House Bill 156 (2015) – carbon sequestration equipment may be taxed at 1.5% of its reduced market value; certified CO_2 pipelines to be taxed at 3% of market value.
North Dakota	Senate Bill 2034 (2009) – oil produced by CO_2 EOR is exempt from oil extraction tax.
North Dakota	Senate Bill 2221 (2009) – CO_2 carbon tax credit for coal conversion facilities capturing at least 20% of emissions, allowing for up to a 50% tax reduction of the state general fund share of tax based on the gross receipts of a given facility.
North Dakota	North Dakota Century Code (NDCC) §54-17-7 – North Dakota Pipeline Authority is authorized to make grants, loans, or other forms of financial assistance to support pipeline development, including CO_2 transportation pipelines.
North Dakota	Senate Bill 2318 (2015) – 10-year personal property tax exemption for equipment (e.g., pipelines) that transports CO_2 for EOR; sales and use tax exemptions for personal property used to expand carbon capture systems, including the sale of CO_2 for EOR.
Wyoming	WY §§ 37-5-102, 104, 107 – Wyoming Pipeline Authority is authorized to issue bonds and provide loans for pipeline infrastructure, including CO_2 transportation pipelines. Wyoming Pipeline Authority has been incorporated into Wyoming Energy Authority.
Wyoming	WY § 39-15-105 – sale of CO_2 used for EOR is exempt from state sales tax.

REGULATORY PATHWAYS

In 2010, The U.S. Environmental Protection Agency (EPA) published regulations for Class VI injection wells under the authority of the underground injection control (UIC) program of the Safe Drinking Water Act (SDWA) (Connors and others, 2023). These regulations ensure the protection of underground sources of drinking water (USDWs) and address the unique nature of CO_2 injection for dedicated storage, including such factors as the buoyancy of CO_2, its subsurface mobility and corrosivity in the presence of water, and the anticipated large injection volumes. Section 1421 of the SDWA (codified at 40 Code of Federal Regulations [CFR] Part 144) directs EPA to promulgate regulations for effective UIC programs to protect USDWs and prohibits any underground injection activity except when authorized by a permit or rule. Class VI injection wells can only be authorized by permit. Primarily, permitting projects through EPA presents the risk of extending the regulatory/permitting process beyond the permitting timelines of primacy states. For example, the EPA Class VI permitting process is mostly untested, and it is anticipated that it will involve a multiyear effort. On the other hand, state Class VI primacy has shown to be advantageous to CCUS project developers as state agencies tend to minimize the risk of substantial permitting and regulatory delays. At the time of this writing, EPA maintains primacy for all Class VI injection well activities in every state except North Dakota, Wyoming, and Louisiana, which are the only three states to have received Class VI primacy (Figure 4).

North Dakota was the first state in the nation to receive this authority in 2018, following an almost 5-year application process with EPA (Region 8). Wyoming followed with a 2-year and 7-month EPA

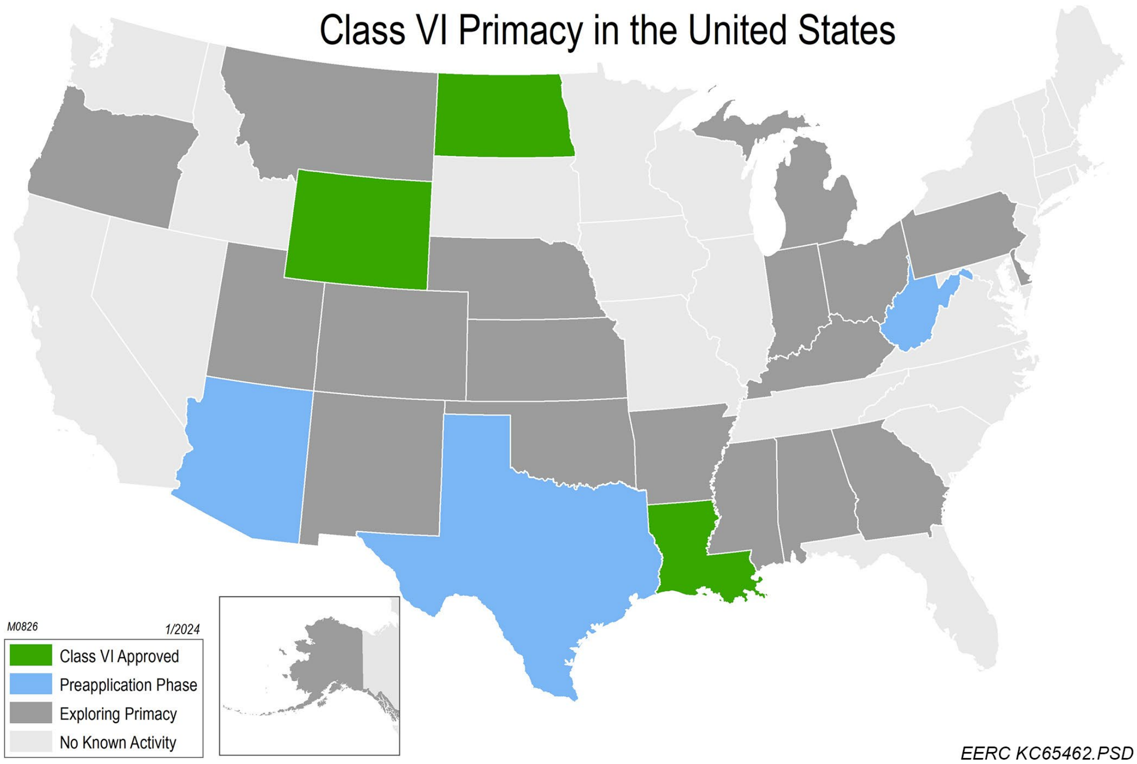

Figure 4. Current status of Class VI primacy in the United States as of May of 2022.

(Region 8) approval process. Louisiana is the most recent state to obtain primacy in December of 2023 following a 2-year and 3-month EPA (Region 6) review process. To receive Class VI primacy, a state must adopt rules that meet or exceed the stringency of EPA's UIC Class VI regulations for the protection of USDWs.

Regulatory Conclusion

In order to achieve wide-scale commercial CCUS deployment, regulators must 1) provide regulatory certainty, 2) have a well-defined permitting process, and 3) streamline permit decision making. A well-defined permitting process and streamlined permit decision making add to regulatory certainty but also contribute to a predictable regulatory environment where project developers know and understand the pathway to permit approval.

ADAPTIVE MANAGEMENT APPROACH FOR CCUS ACTIVITIES

The PCOR Partnership has formalized an adaptive management approach (AMA) for the commercial development of geologic CO_2 storage projects (Ayash and others, 2017). At the heart of the AMA are four technical elements necessary for any successful CO_2 storage project: 1) site characterization; 2) modeling and simulation; 3) risk assessment; and 4) monitoring, verification, and accounting (MVA) (Figure 5). These elements play a key role in gathering and assessing site-specific data that provide a fundamental understanding of the storage complex and its performance. While each of the four technical elements can provide useful data independently, integrating them through the AMA yields a streamlined, fit-for-purpose strategy for the commercial deployment of CO_2 storage.

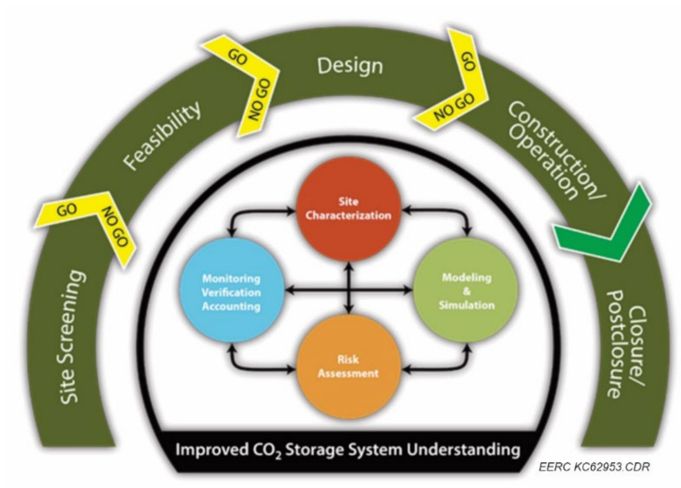

Figure 5. AMA for CCS project implementation.

Lessons learned from the development and permitting of the first wave of geologic CO_2 storage projects in North Dakota have been integrated with the AMA to generate a generalized timeline for implementing a geologic CO_2 storage project involving UIC Class VI injection that accounts for the permitting process (Livers-Douglas and others, 2023). This project development timeline comprises several phases: site screening, feasibility, project design/permit application, regulatory review of permit, investment/construction, and operations. The permit review and approval process may take several months or even years depending on what agency has UIC Class VI primary regulatory enforcement authority and should be accounted for in project scheduling. By understanding and planning for regulatory requirements and associated permit review timelines in the early phases of project development, a potential developer can use these considerations to guide business decisions.

Geologic Characterization

Characterization of the surface and subsurface at a storage site is necessary to assess the feasibility of a site for safe and permanent geologic storage of injected CO_2 (Livers-Douglas and others, 2023). Additionally, site-specific geologic data are required to address many of the regulatory requirements for permitting a geologic CO_2 storage site. Site characterization activities may include the acquisition and analysis of data (e.g., installation of wells, collection of seismic data) to develop an understanding of the site-specific properties and characteristics of the surface and subsurface environments. Depending on the project phase, several different types of data may be collected, including petrophysical, mineralogical, geomechanical, hydrogeological, geochemical, and others (e.g., well logs).

Operators of CO_2 storage projects being developed outside of regions studied by the oil and gas industry with limited existing data are finding it necessary collect 2D or 3D seismic data and drill stratigraphic test (appraisal) wells for characterizing potential storage sites. These data acquisition activities have proven to be essential for the development of CO_2 storage permit applications and ultimately proving the storage reservoir is suitable for safe and permanent storage.

Modeling and Simulation

For the geologic CO_2 storage projects that are permitted or in the project design and permit application phase, data collected from geologic cores, well logs, and seismic surveys were incorporated into petrophysical analysis, modeling workflows, and fluid flow and geochemical modeling (Livers-Douglas and others, 2023). Site-specific data were combined with existing well data and seismic surveys to construct a geologic model of the storage reservoir. The geologic model was used to simulate CO_2 injection to determine the wellhead and downhole pressure response resulting from CO_2 injection. The simulation results were used to determine the expected CO_2 injection capacity, CO_2 plume and pressure plume extents throughout injection and postinjection, stabilized CO_2 plume extent, and area of review (AOR). Simulation results were also used to inform the testing and monitoring plan.

Model and simulation efforts have been deemed an essential part of the Class VI permit application. These simulation results help inform project operators of other project details such as monitoring strategies, surface equipment specifications, and risk management.

Monitoring, Verification, and Assessment Strategies

For CCUS projects, MVA strategic plans are designed with three main objectives: 1) monitor/measure preinjection, injection, and postinjection conditions; 2) verify containment of CO_2 in the storage reservoir; and 3) account for/report CO_2 volumes stored in the subsurface and any out-of-zone migration (Hunt and others, 2023). The same three objectives apply generally to carbon utilization and storage projects, with Objectives 1 and 3 being most similar to dedicated geologic storage regulations. Objective 2 differs most in that utilization projects either do not need to verify CO_2 storage by nature of the operation (e.g., CO_2-to-fuel projects) or verification of containment of CO_2 in the storage reservoir occurs through monitoring production and injection operations (i.e., enhanced oil and/or gas recovery projects) at the wellbore (e.g., 40 CFR Part 146, Subpart C). The overall goal of the project (i.e., utilization and storage vs. dedicated storage) determines the extent to which Objectives 1–3 must be fulfilled and documented.

Selecting the appropriate MVA practices (i.e., defining the tools/equipment and the testing design, cost, frequency, duration, and target area) to fulfill these three goals and comply with all regulations and incentive program requirements is dependent on many factors, including the scope of the project (e.g., utilization and storage vs. dedicated storage), funding, technology available, industry standards, permit regulations and incentive program requirements, site-specific conditions, and operator preference. As a project operator tailors the MVA strategy to a set of dynamic factors and gathers more information, MVA practices are anticipated to evolve throughout the life of the project. In general, verification strategies are preferred over monitoring strategies when implementing MVA. This is because verification provides more actionable information to project operators.

Risk Assessment for CCUS Activities

Risk management for a geologic CO_2 storage project addresses a set of risk scenarios that are identified for a project (Finnigan and others, 2023). The risk scenarios comprise a chain of circumstances that has the potential to occur and produce a negative impact on a component or objective of the project. In this context, risk is expressed in terms of the severity of the consequences (negative impacts) produced by the occurrence of a risk scenario and the associated likelihood of its occurrence (chance of a scenario happening, described using general terms or mathematically by specifying a probability of occurrence over a given period). Many of the risk scenarios for storage projects relate to storage permanence and the potential consequences that could negatively impact the commercial, safe, or long-term containment of CO_2.

There is no one-size-fits-all risk management approach for storage projects. Instead, risk management is about having a detailed process in place, adhering to that process throughout the project life cycle, and adapting the process depending on site-specific conditions, applicable regulatory requirements, and any additional requirements imposed by pursuing one or more financial incentive programs.

SUMMARY

Commercial deployment of CCUS in the PCOR Partnership region will be accelerated by 1) facilitating the deployment of the current commercial CCUS projects that are in the planning stages, 2) demonstrated ability to develop and advance projects from site-screening through the permitting phase and into operations, 3) continuing the momentum with capture technology innovation and scale-up (e.g., postcombustion capture, direct air capture), and 4) sharing project lessons learned with government and industry to ensure future barriers and challenges are identified and overcome.

The current and planned commercial CCUS projects in the PCOR Partnership region represent the culminative effort of over 20 years of applied research, demonstration, and commercialization. Future CCUS development will be driven by the deployment and sustained by regulatory certainty, economic incentives, and technological advancements. Future CCUS activities may evolve from the CO_2 generator owning and operating all components of a CCUS project to a more sectioned business model with additional companies owning different segments of the CCUS value chain. These details will be driven by various factors such as location of CO_2 generators, proximity to appropriate geology for dedicated storage or storage associated with EOR, and financial drivers.

CCUS deployment provides an avenue for reducing energy-related CO_2 emissions while simultaneously providing a competitive advantage with low-carbon marketable products. The CO_2 profile across the PCOR Partnership region is more complex than simply where the fossil fuels are being produced or the CO_2 is being emitted. The supply and demand for energy varies across the region. Some states may transport fossil fuels (i.e., coal) to nearby states for energy generation (e.g., electricity), while other states may produce the energy (e.g., electricity, ethanol) in-state and transport the energy product to another jurisdiction. CCUS deployment can be a catalyst to drive investment that will extend the operational life of certain facilities and maximize oil recovery, thereby providing and retaining high-paying energy jobs that, in turn, sustain state and local economies.

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