



January 31, 2020

Ms. Karlene Fine
Executive Director
North Dakota Industrial Commission
600 East Boulevard Avenue, Department 405
State Capitol, 14th Floor
Bismarck, ND 58505-0840

Dear Ms. Fine:

Subject: Quarterly Progress Report for the Period of October 1 – December 31, 2019, “PCOR Initiative to Accelerate CCUS Deployment”; Contract Nos. FY20-XCI-226 and G-050-096

Attached please find the Energy & Environmental Research Center (EERC) Quarterly Progress Report for the subject project. If you have any questions, please contact me by phone at (701) 777-5236 or by e-mail at kconnors@undeerc.org.

Sincerely,

A handwritten signature in blue ink, appearing to read "Kevin C. Connors", is written over a light blue horizontal line.

Kevin C. Connors
Principal Policy & Regulatory Strategist

KCC/kal

Attachment

c/att: Michael Holmes, Lignite Energy Council
Brent Brannan, North Dakota Industrial Commission (NDIC) Department of Mineral
Resources, Oil and Gas Division

c: Corey Irion, EERC



PCOR INITIATIVE TO ACCELERATE CCUS DEPLOYMENT

Quarterly Technical Progress Report

(for the period October 1 – December 31, 2019)

Prepared for:

Karlene Fine

North Dakota Industrial Commission
600 East Boulevard Avenue, Department 405
State Capitol, 14th Floor
Bismarck, ND 58505-0840

Contract Nos. FY20-XCI-226 and G-050-96

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PCOR INITIATIVE TO ACCELERATE CCUS DEPLOYMENT
Quarterly Progress Report
October 1 – December 31, 2019

EXECUTIVE SUMMARY

The U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL) conditionally awarded funding to the Energy & Environmental Research Center (EERC) for the PCOR Initiative. The PCOR Initiative is one of four projects selected under the Regional Initiative to Accelerate CCUS (carbon capture, utilization, and storage) Deployment Funding Opportunity Announcement (FOA) (DE-FOA-0002000). Contract definitization efforts were ongoing during the reporting period. Contracting for the project is anticipated to be completed the first quarter of 2020.

Preaward funds were set up under Task 1.0 – Project Management and Planning for contract definitization and early project planning efforts. The EERC project manager attended the DOE NETL FOA 2000 kickoff meeting in Pittsburgh, Pennsylvania, on November 13, 2019. Planning efforts are under way for the PCOR Initiative annual membership meeting, which is targeted for June 2020 in Wyoming.

Preaward funds were set up under Task 3.0 – Data Collection, Sharing, and Analysis for activities related to the SMART (Science-Informed Machine Learning for Accelerating Real Time Decisions in Subsurface Applications) Initiative. The EERC attended the DOE SMART Initiative Task 4 Kickoff Meeting held at DOE’s Pacific Northwest National Laboratory in Richland, Washington, on November 6–7, 2019.

PCOR INITIATIVE TO ACCELERATE CCUS DEPLOYMENT
Quarterly Progress Report
October 1 – December 31, 2019

INTRODUCTION

The goal of the PCOR Initiative is to identify and address onshore regional storage and transport challenges facing commercial deployment of carbon capture, utilization, and storage (CCUS) in an expanded region, compared to past initiatives. To achieve this goal, the PCOR Initiative will meet the following objectives:

1. Address key technical challenges by advancing critical knowledge and capabilities
2. Facilitate data collection, sharing, analysis, and collaboration
3. Evaluate regional infrastructure challenges and needs
4. Promote regional technology transfer

The project goal and objectives will be accomplished through five tasks over two budget periods (BPs), corresponding to a 5-year period of performance. The Energy & Environmental Research Center (EERC) and project partners will collaborate to identify and address technical challenges facing deployment of CCUS in multiple categories, including stacked storage opportunities, CO₂ storage performance and monitoring, and risk assessment. Existing data sets and technologies will be analyzed and evaluated to highlight current challenges limiting commercial adoption of CCUS, as well as to identify potential solutions. The project team will support the U.S. Department of Energy (DOE) National Risk Assessment Partnership (NRAP) and machine-learning (ML) initiatives by drawing on data sets and experience available through the team. Assessments of infrastructure, site readiness, techno-economics, and socioeconomics will provide an overview of the CCUS landscape within the defined PCOR Initiative region. Potential business case scenarios will be evaluated, taking into account current economic incentives to identify opportunities in CCUS project development. Technology transfer activities will inform and educate CCUS stakeholders of project learnings through annual membership meetings, regulatory roundup meetings, technical advisory board meetings, webinars, reports, and conference presentations/papers. These activities will facilitate knowledge sharing and support DOE program goals.

ACCOMPLISHMENTS

Task 1.0 – Project Management and Planning

The objective of Task 1.0 is to manage and direct the project in accordance with a Project Management Plan (PMP) to meet all technical, schedule, and budget objectives and requirements. Activities will be coordinated in order to effectively accomplish the work. The project manager will ensure that project plans, results, and decisions are appropriately documented and project reporting and briefing requirements are satisfied.

Significant accomplishments for Task 1.0 during the reporting period, all under the preaward, include the following:

- Worked on contract definitization negotiations with DOE.
- Attended and presented at the DOE Regional Initiative to Accelerate CCUS Deployment Funding Opportunity Announcement (FOA) 2000 kickoff meeting for the four initiatives in Pittsburgh, Pennsylvania, on November 13, 2019. The presentation entitled “PCOR Initiative to Accelerate CCUS Deployment” is provided in Appendix A.
- Met with representatives from project partner University of Wyoming on December 18, 2019, to discuss status of contracting and next steps.
- Engaged in conversations with current and prospective partners.
- Began planning the annual membership meeting. Dates in June 2020 are targeted in Wyoming.
- Proposals for cost-share funding were submitted to the North Dakota Industrial Commission’s (NDIC’s) Lignite Research and Oil and Gas Research Programs. Presentations giving an overview of the proposals were presented to the Oil and Gas Research Council on October 14, 2019, and the Lignite Research Council on November 14, 2019. Both meetings were held in Bismarck, North Dakota. Funding from both groups was awarded, and contract negotiations are under way.
- Attended the Midwestern Regional Carbon Sequestration Partnership Annual Partner & Stakeholder Meeting held November 4–5, 2019, in Columbus, Ohio.

Next steps to accomplish the goals under Task 1.0 include the following:

- Complete contract negotiations with DOE. Adjust deliverable (D) due dates as needed during negotiations (see Table 1).
- Submit a revised data management plan to the DOE Program Manager (PM).
- Update and submit the PMP (D1) within 30 days of contract definitization.
- Continue annual membership meeting planning.
- Track progress on project deliverables and milestones (Ms) (see Tables 1 and 2).

Table 1. Project Deliverables

Deliverable (D) No. and Title	Planned Completion Date	Actual Completion Date	Verification Method	Comments
D1 – Project Management Plan	30 days after contract definitization		PMP file submitted to DOE PM	
D2 – Report – Storage Optimization	9/30/2020		Topical report submitted to DOE PM	
D3 – Report – Stacked Storage Opportunity Assessment	3/31/2021		Topical report submitted to DOE PM	
D4 – Report – Regional Business Case Assessment	3/31/2021		Topical report submitted to DOE PM	
D5 – Report – Subsurface and Legacy Well Integrity	12/31/2021		Topical report submitted to DOE PM	
D6 – Report – MVA Strategies	6/30/2022		Topical report submitted to DOE PM	
D7 – Report – Evaluation of Risk Management	9/30/2022		Topical report submitted to DOE PM	
D8 – Report – Regional Permitting Guidance	9/30/2022		Topical report submitted to DOE PM	
D9 – Report – Infrastructure, Scale-Up, and Techno-Economic Assessments	12/31/2022		Topical report submitted to DOE PM	
D10 – Report – NRAP Testing and Validation	3/31/2023		Topical report submitted to DOE PM	
D11 – Report – Basement Faulting and Stress State, Induced Seismicity	9/30/2023		Topical report submitted to DOE PM	
D12 – Report – Regional Socioeconomic Assessments	9/30/2023		Topical report submitted to DOE PM	
D13 – Report – Updated Regional Business Case Assessment	12/31/2023		Topical report submitted to DOE PM	

Table 2. Milestone Status Report

Milestone (M) No. and Title	Planned Completion Date	Actual Completion Date	Verification Method	Comments
M1 – Regulatory Roundup Scheduled	2/29/2020		Reported in subsequent quarterly report	
M2 – Initial Techno-Economic Framework Established	3/31/2020		Reported in subsequent quarterly report	
M3 – Annual Meeting Scheduled	3/31/2021		Reported in subsequent quarterly report	
M4 – Regulatory Roundup Scheduled	3/31/2021		Reported in subsequent quarterly report	
M5 – Data Share with National Lab for NRAP Assessment	6/30/2021		Reported in subsequent quarterly report	
M6 – GHGT-15 ¹ Abstract Submitted	11/30/2021		Reported in subsequent quarterly report	
M7 – BP1 EDX ² Submitted	3/31/2022		Reported in subsequent quarterly report	
M8 – Draft Journal Article Completed	11/30/2022		Reported in subsequent quarterly report	
M9 – Regulatory Roundup Scheduled	3/31/2023		Reported in subsequent quarterly report	
M10 – GHGT-16 Abstract Submitted	11/30/2023		Reported in subsequent quarterly report	
M11 – Annual Meeting Scheduled	3/31/2024		Reported in subsequent quarterly report	
M12 – BP2 EDX Submitted	6/30/2024		Reported in subsequent quarterly report	

¹ GHGT-15 = 15th International Conference on Greenhouse Gas Control Technologies

² EDX = Energy Data eXchange

Task 2.0 – Technical Challenges

In Task 2.0, the project team will support regional deployment of CCUS programs by focusing on key technical challenges in the PCOR Initiative region related to stacked storage opportunities; storage performance; monitoring, verification, and accounting (MVA) technology; and subsurface integrity. The EERC will collaborate with PCOR Initiative members to identify knowledge gaps and address regional challenges through targeted webinars, workshops, reports, and papers.

Task 2.0 is expected to begin when contracting is complete.

Task 3.0 – Data Collection, Sharing, and Analysis

In Task 3.0, the project team will collaborate with other DOE Fossil Energy (FE)-funded researchers to improve understanding of CO₂ injection and storage impacts. The project team will work with national labs to facilitate data sharing, support the development and validation of NRAP tools with site-specific data, and participate in development of ML-based tools/methods in a commercial setting.

Progress on Task 3.0, all under the preaward, is as follows:

- Attended the DOE SMART (Science-Informed Machine Learning for Accelerating Real Time Decisions in Subsurface Applications) Initiative Task 4 Kickoff Meeting held at DOE's Pacific Northwest National Laboratory (PNNL) in Richland, Washington, on November 6–7, 2019. The EERC is the lead organization for SMART Initiative Task 4 – Accurate, Timely Forecasts for Geologic Carbon Storage via Real-Time Measurements Integration.
- Supported near-term activities of the SMART Initiative, which are synergistic with PCOR Initiative Subtask 3.3 – Machine Learning activities. Specific activities during the reporting period included participation in several SMART Initiative meetings and webinars.

Next steps to accomplish the goals under Task 3.0 in the coming quarter include the following:

- Continue to track SMART Initiative activities to identify opportunities to leverage CO₂ storage project data sets for the validation and testing of ML-based approaches to modeling CO₂ and/or pressure in the subsurface.

Task 4.0 – Regional Infrastructure

The objective of Task 4.0 is to evaluate the regional needs, challenges, and potential economic impacts related to the development of safe and environmentally sound CO₂ transportation infrastructure to accelerate commercial CCUS project deployment. This evaluation will be accomplished by assessing existing infrastructure, scale-up challenges and needs, and techno-economic and socioeconomic impacts in the PCOR Initiative region and will be communicated through outreach activities.

Task 4.0 is expected to begin when contracting is complete.

Task 5.0 – Technology Transfer

Task 5.0 will inform and educate stakeholders about CCUS technologies. Nontechnical challenges to CCUS deployment in the PCOR Initiative region will be identified and assessed, with an emphasis on regulatory issues and solutions. Business case scenarios for CCUS projects will be identified, reviewed, and developed. Outcomes of this task will be transferred to stakeholders through meetings, presentations, and webinars. Developed materials will be shared with DOE to support its broader FE program goals.

Task 5.0 is expected to begin when contracting is complete.

SPECIAL REPORTING REQUIREMENTS

None.

APPENDIX A

**PCOR INITIATIVE TO ACCELERATE CCUS
DEPLOYMENT**



Energy & Environmental Research Center (EERC)

PCOR INITIATIVE TO ACCELERATE CCUS DEPLOYMENT

U.S. Department of Energy National Energy Technology Laboratory
Pittsburgh, Pennsylvania
November 13, 2019

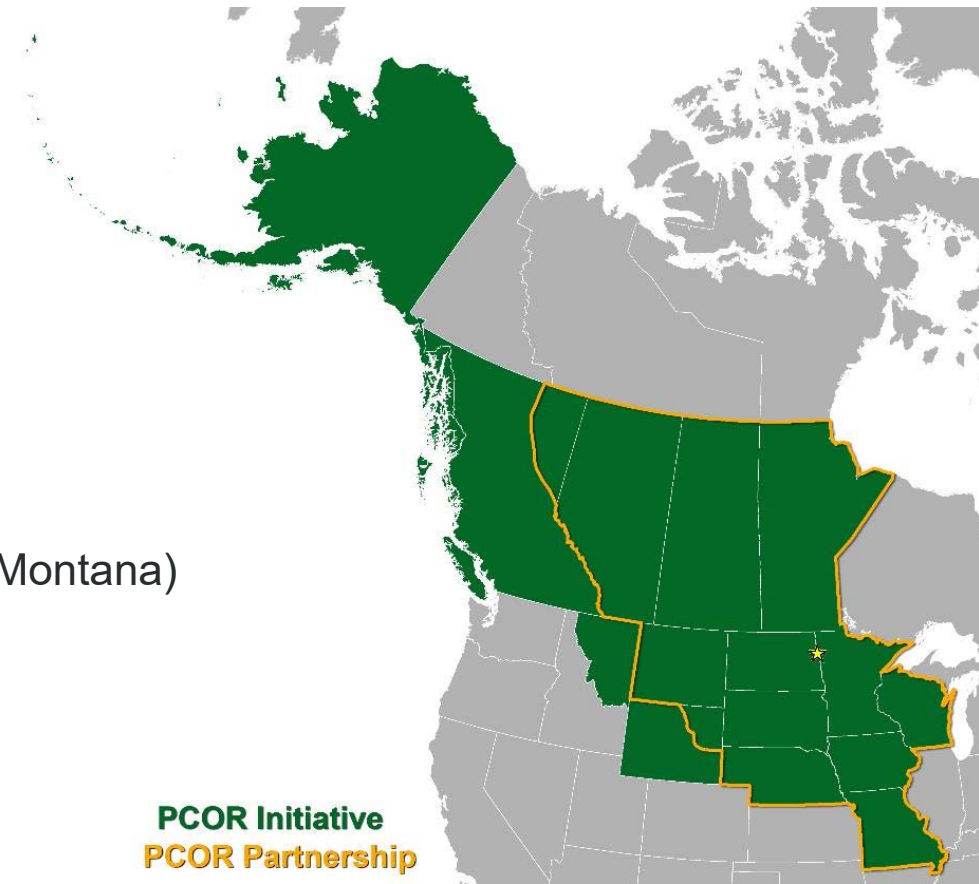
Neil Wildgust (PI)
Assistant Director for Geoscience and Engineering

PCOR PARTNERSHIP TIME LINE

2003–2005: PCOR Partnership Phase I
2005–2008: PCOR Partnership Phase II
2007–2019: PCOR Partnership Phase III

2019–2024: PCOR Initiative

(extended to include Alaska, Wyoming, and all of Montana)



PCOR Initiative
PCOR Partnership

ENGAGED PARTNERS



2019 PCOR PARTNERSHIP ANNUAL MEETING



REGIONAL POTENTIAL FOR CCUS DEPLOYMENT

The PCOR Partnership region opportunity to accelerate CCUS deployment:

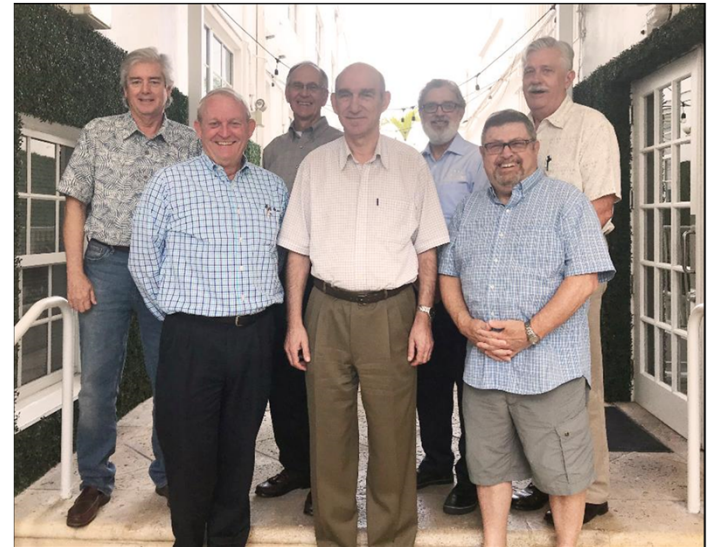
- Suitable geology
- Fossil fuel resources
- Industrial and energy base
- Existing projects



PCOR PARTNERSHIP PHASES I–III

Five key messages relate to:

1. Our engaged membership.
2. Outstanding regional CCUS potential.
3. CCUS works! We have demonstrated:
 - a) Low risks of storage.
 - b) Successful MVA.
4. Economic and environmental benefits.
5. Active public engagement and outreach.



PCOR INITIATIVE AWARD, 2019–2024

Goal:

Identify and address regional storage and transport challenges facing commercial CCUS deployment.

Vision:

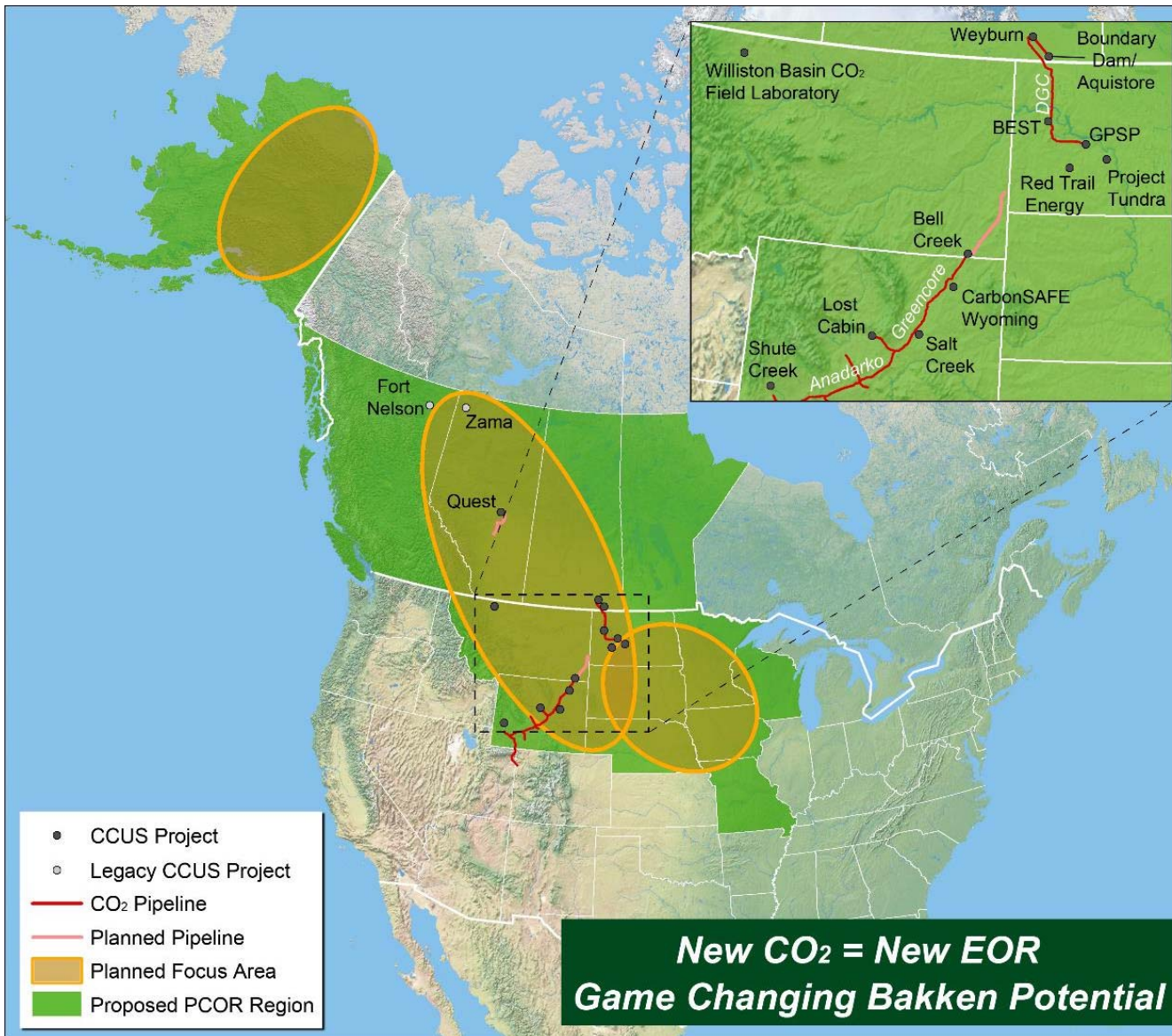
Provide the premier regional forum to promote CCUS infrastructure and accelerate CCUS deployment.



CCUS PORTFOLIO AT THE EERC

Primary Focus
Secondary Focus

Project	Focus					
	Capture	Transport	CO ₂ Storage		Techno-Economic	Regulatory
			Dedicated	Associated		
PCOR Partnership, <i>PCOR Initiative</i>	Secondary Focus	Primary Focus	Primary Focus	Primary Focus	Primary Focus	Primary Focus
CarbonSAFE North Dakota Phase II	Secondary Focus	Secondary Focus	Primary Focus	Secondary Focus	Secondary Focus	Primary Focus
CarbonSAFE Wyoming Phase I/II	Primary Focus	Secondary Focus	Primary Focus	Secondary Focus	Secondary Focus	Primary Focus
CarbonSAFE Nebraska Phase I	Primary Focus	Secondary Focus	Primary Focus	Secondary Focus	Primary Focus	Secondary Focus
Red Trail Energy	Secondary Focus	Secondary Focus	Primary Focus	Secondary Focus	Secondary Focus	Primary Focus
Williston Basin Field Lab				Primary Focus		
ND Techno-Economic	Secondary Focus	Primary Focus	Secondary Focus	Primary Focus	Primary Focus	Secondary Focus
BEST			Primary Focus	Secondary Focus		
SASSA			Primary Focus	Primary Focus		
IMS			Primary Focus	Secondary Focus		
Bakken CO ₂ Storage and EOR				Primary Focus		
Advanced Characterization				Primary Focus		
Tight Oil CO ₂ Project				Primary Focus		
Rich Gas for Conventional EOR				Primary Focus	Secondary Focus	
EOR Controllable Completions				Primary Focus	Secondary Focus	
Project Carbon	Primary Focus	Secondary Focus		Secondary Focus	Primary Focus	
Project Tundra FEED	Primary Focus				Primary Focus	
Aerosol Mitigation	Primary Focus				Primary Focus	

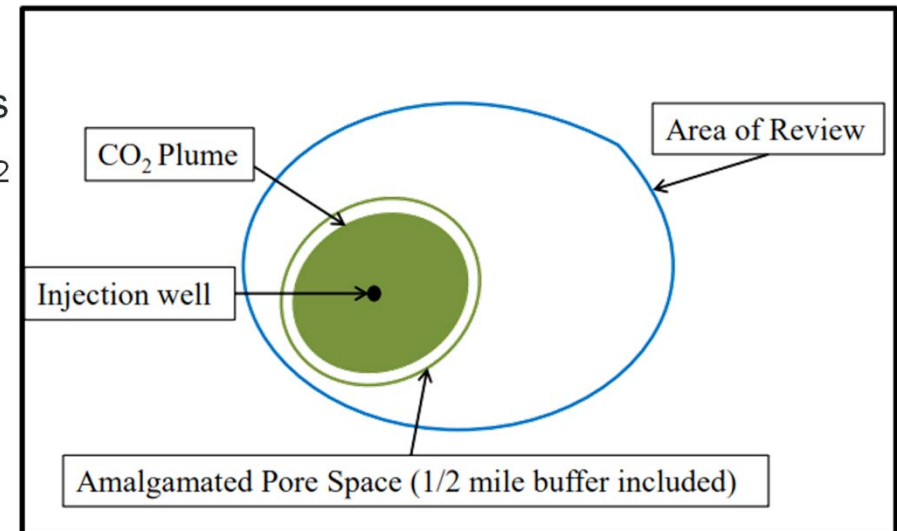


PCOR PARTNER ENGAGEMENT MOVING FORWARD



CLASS VI REGULATORY CONSIDERATIONS

1. Site Characterization
2. Computational Modeling – Area of Review and Corrective Action
3. Baseline Data (atmospheric, soil gas sampling, groundwater sampling, formation coring, logging and testing)
4. Emergency and Remedial Response Plan
5. Financial Assurance – Endangerment of USDWs
6. Wellbore construction – material resistant to CO₂
7. Well Completion
8. Injection Operations and Monitoring
9. Mechanical Integrity Testing
10. Reporting Requirements
11. Site Closure (i.e., Site Decommissioning)
12. Postinjection Monitoring





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A wide-angle photograph of a university campus. In the foreground, there's a green lawn. In the middle ground, there are several large, multi-story brick buildings. The background shows more buildings and trees with yellow autumn leaves. The sun is low on the horizon, creating a warm glow.

THANK YOU

Critical Challenges. Practical Solutions.