Plains CO₂ Reduction Partnership Initiative to Accelerate Carbon Capture, Utilization, and Storage Deployment (FE0031838)

U.S. Department of Energy
National Energy Technology Laboratory
Carbon Management Project Review Meeting
August 15–19, 2022

Kevin C. Connors
PCOR Partnership Project Manager
REGIONAL CARBON SEQUESTRATION PARTNERSHIP PROGRAM

- Wisconsin, Iowa: Coordinating with Battelle.
- Montana: Coordinating with New Mexico Institute of Technology.
- Missouri: Coordinating with Battelle and the Southern States Energy Board.
PCOR Partnership

• 2003–2005: **Phase I** – Characterization
• 2005–2009: **Phase II** – Field Validation
• 2007–2018: **Phase III** – Demonstration
• 2019–2024: **Initiative** – Deployment

(PCOR region expanded to include AK + all of BC, WY, and MT)
The PCOR Partnership Initiative is addressing regional capture, transport, use, and storage challenges facing commercial CCUS deployment. The Initiative is focusing on:

- Strengthening the technical foundation for geologic CO₂ storage and enhanced oil recovery (EOR).
- Advancing capture technology.
- Improving application of monitoring technologies.
- Promoting integration between capture, transportation, use, and storage industries.
- Facilitating regulatory frameworks.
- Providing scientific support to policy makers.

Our Partners inform our priorities
New Partners – PCOR Partnership Initiative
2021 AND 2022 HIGHLIGHTS

• PCOR Partnership annual meetings held in Jackson, WY (106 participants) and Anchorage, AK (129 participants)
• Over 230 members; 55 new since 2019
• 2021 Regulatory Roundup held in Deadwood, SD; 2022 scheduled for September 2022 (expecting record attendance)
• TAB meetings held in Jackson, WY (2021), Houston, TX (2022), and Anchorage, AK (2022)
• Field effort initiated at the Red Trail Energy (RTE) CCS site
• Collaboration with UAF and UW
• New PCOR Partnership public and partner websites
• Several products (deliverables and white papers) published
• Numerous white papers in development
Active and Developing CCUS Projects in the PCOR Partnership Region

- **Active Capture**
- **Active Injection**
- **Developing Capture**
- **Developing Injection**
- **CO₂ Pipeline**
- **Proposed CO₂ Pipeline**
CO₂ Pressure Plume and Saturation Plume Monitoring

• Research Institute of Innovative Technology for the Earth (RITE)
• Red Trail Energy (RTE)
• Energy & Environmental Research Center (EERC)
• Plains CO₂ Reduction (PCOR) Partnership
• U.S. Department of Energy (DOE) National Energy Technology Laboratory (NETL)

The Challenge: Monitoring requirements for geologic CO₂ storage projects are substantial.

The Objective: Develop the next generation of cost-efficient long-term monitoring tools and validate them against established methods for monitoring carbon capture and storage (CCS). Develop an approach for more frequent data acquisition and processing while maintaining a reduced surface impact.

Desired result: New monitoring tools that are qualified with CCS regulatory and incentive programs and are available for use by CCS projects that can incorporate them into their monitoring strategies.
**Expanded Partnership Expertise**

- Infrastructure considerations

Available online to all partners at undeerc.org/PCORPartners

**Monitoring advancements**
Risk-based area of review estimation in overpressured reservoirs to support injection well storage facility permit requirements for CO₂ storage projects

Matthew E. Burton-Kelly, Nicholas A. Azzolina, Kevin C. Connors, Wesley D. Peck, David V. Nakles, Tao Jiang

First published: 18 June 2021 | https://doi.org/10.1002/ghg.2098
POLICY AND REGULATORY DEVELOPMENTS

- Pore space Law
- Long-term liability
- Class VI primacy
- Regulatory program implementation
- Pathways to permit approval
- Policy/Regulatory Barriers

Regulatory Roundup Meeting August 17–18, 2021
PRODUCTS COMING SOON

- Class VI wellbore construction and design using corrosion resistant alloys
- Class VI injection well pressure transient analysis
- Pore space leasing considerations
- Pressure interference
- Approaches to predicting plume stabilization
- CCUS and grid stability
- CO₂ purity specifications and compatibility with pipeline materials
- Repurposing existing carbon steel pipelines
- CCS Hydrogen Roadmap: Optimal integration of CCS and hydrogen
- Lessons learned from coring, wireline logging, and seismic surveys
PCOR PARTNERSHIP

• Building on over 19 years of applied research in CCUS.
• Active region developing commercial CCUS projects.
• Engaged and motivated partners.
• Engaged regulators.
• PCOR is a catalyst for CCUS projects in the region.
• Focused on infrastructure development strategies.
• Ethanol industry in the region accelerating CCUS.
• Expanding CO₂ EOR opportunities in the region.
WHAT’S NEXT?

• Enabling Sustainable Monitoring for CCUS
• Storage optimization and active reservoir management
• Pressure interference study
• Injectivity interference study
• ML-based classifications of aquifer salinity
• Pore space resource competition
• Storage hubs and blue hydrogen
• CO₂-EOR Business Case and Messaging
• Develop strategies to address broad carbon management goals of states/provinces/regions
• Public and industry outreach
PCQR Partnership
Celebrating 20 years of Partnership
THANK YOU

Critical Challenges. Practical Solutions.
ACKNOWLEDGMENT

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DISCLAIMER

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## Funding and Project Performance Dates

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Critical Challenges. Practical Solutions.
PCOR Partnership Organization Chart

Project Partners
- DOE
- University of Alaska
- University of Wyoming
- NDIC OGRP
- NDIC LEC

Lead Organization
- EERC

Principal Investigator
- K. Connors

Project Advisors
- C. Gorecki
- E. Steadman
- J. Harju

Industry, Governmental, and Research Resources
- PCOR Initiative Members
- Technical Advisory Board

Task 1
- Project Management
  - Lead: K. Connors

Task 2
- Technical Challenges
  - Lead: W. Peck

Task 3
- Data Collection, Sharing, and Analysis
  - Lead: N. Azzolina

Task 4
- Regional Infrastructure
  - Lead: K. Glazewski

Task 5
- Technology Transfer
  - Lead: K. Anagnost
### PCOR Partnership Gantt Chart

#### Task 1.0 – Project Management and Planning
- **Start Date:** 10/19/19
- **End Date:** 9/30/24

#### Task 2.0 – Technical Challenges

<table>
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<tr>
<th>Task</th>
<th>Start Date</th>
<th>End Date</th>
<th>Milestones (M)</th>
<th>Deliverables (D)</th>
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#### Task 3.0 – Data Collection, Sharing, and Analysis

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#### Task 5.0 – Technology Transfer

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<td>5.3 – Business Models</td>
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<td>5.4 – Pathways to CCUS Commercial Scaling and Deployment</td>
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#### Summary Task
- **Activity Bar**
- **Milestone (M)**
- **Deliverable (D)**
- **Critical Path**

**Definitization:** 1/23/20

**No Activity Prior to Definitization:** 9/4/20

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**Milestones (M):**
- M1 – Regulatory Roundup Scheduled (3/31/20)
- M2 – Initial Techno-Economic Framework Established (4/30/20)
- M3 – Annual Meeting Scheduled (3/31/21)
- M4 – Regulatory Roundup Scheduled (3/31/21)
- M5 – Data Shared with National Labs for NRAP Assessment (6/30/21)
- M6 – GHGT-16 Abstract Submitted (1/31/22)
- M7 – BP1 EDX Submitted (3/31/22)
- M8 – Draft Journal Article Completed (11/30/22)
- M9 – Regulatory Roundup Scheduled (3/31/23)
- M10 – GHGT-17 Abstract Submitted (1/31/24)
- M11 – Annual Meeting Scheduled (3/31/24)
- M12 – BP2 EDX Submitted (6/30/24)

**Deliverables (D):**
- D1 – Project Management Plan (2/21/20)
- D2 – Topical Report – Storage Optimization (4/30/21)
- D4 – Topical Report – Regional Business Model Assessment (12/31/21)
- D5 – Topical Report – Subsurface and Legacy Well Integrity (12/31/21)
- D6 – Topical Report – MVA Strategies (6/30/22)
- D7 – Topical Report – Evaluation of Risk Management (9/30/22)
- D8 – Topical Report – Regional Permitting Guidance (9/30/22)
- D9 – Topical Report – Infrastructure, Scale-Up, and Techno-Economic Assessments (12/31/22)
- D11 – Topical Report – Baseline Faulting and Stress State, Induced Seismicity (9/30/23)
- D12 – Topical Report – Regional Socioeconomic Assessments (9/30/23)
- D13 – Topical Report – Updated Regional Business Model Assessment (12/31/23)
- D14 – Topical Report – Risk-Based Area of Review (1/31/21)
- D15 – PCOR Partnership Atlas (6/30/21 and 3/31/23)
- D16 – Enabling Sustainable Monitoring for CCUS (6/30/24)
- D17 – PCOR Partnership Initiative Road Map (5/31/2024)