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Critical Challenges. Practical Solutions.

Energy & Environmental Research Center (EERC)

PLAINS CO_2 REDUCTION PARTNERSHIP INITIATIVE TO ACCELERATE COMMERCIAL CCUS DEPLOYMENT

NDIC Oil and Gas Research Program

February 23, 2022

James Sorensen

Director of Subsurface R&D

PCOR PARTNERSHIP INITIATIVE

2003–2005 – PCOR Partnership: Characterization

2005–2008 – PCOR Partnership: Field Validation

2007–2019 – PCOR Partnership: Commercial Demonstration

2019–2024 – **PCOR Partnership Initiative:** Commercial Deployment

U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY

Institute of Northern Engineering
University of Alaska Fairbanks

UNIVERSITY OF WYOMING | School of Energy Resources

EERC | U.S. DEPARTMENT OF ENERGY | NATIONAL ENERGY TECHNOLOGY LABORATORY | PCOR Partnership

PCOR PARTNERSHIP INITIATIVE

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 CO_2 storage and enhanced oil recovery.
- Advancing capture technology.
- Improving application of monitoring technologies.
- Promoting integration between capture, transportation, use, and storage industries and development of infrastructure and large projects.
- Facilitating regulatory frameworks.
- Providing scientific support to policy makers.


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Steiner Oil & Gas, LLC
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WYOMING
ITC
WYOMING MINING ASSOCIATION
Wyoming Public Service Commission
Xcel Energy

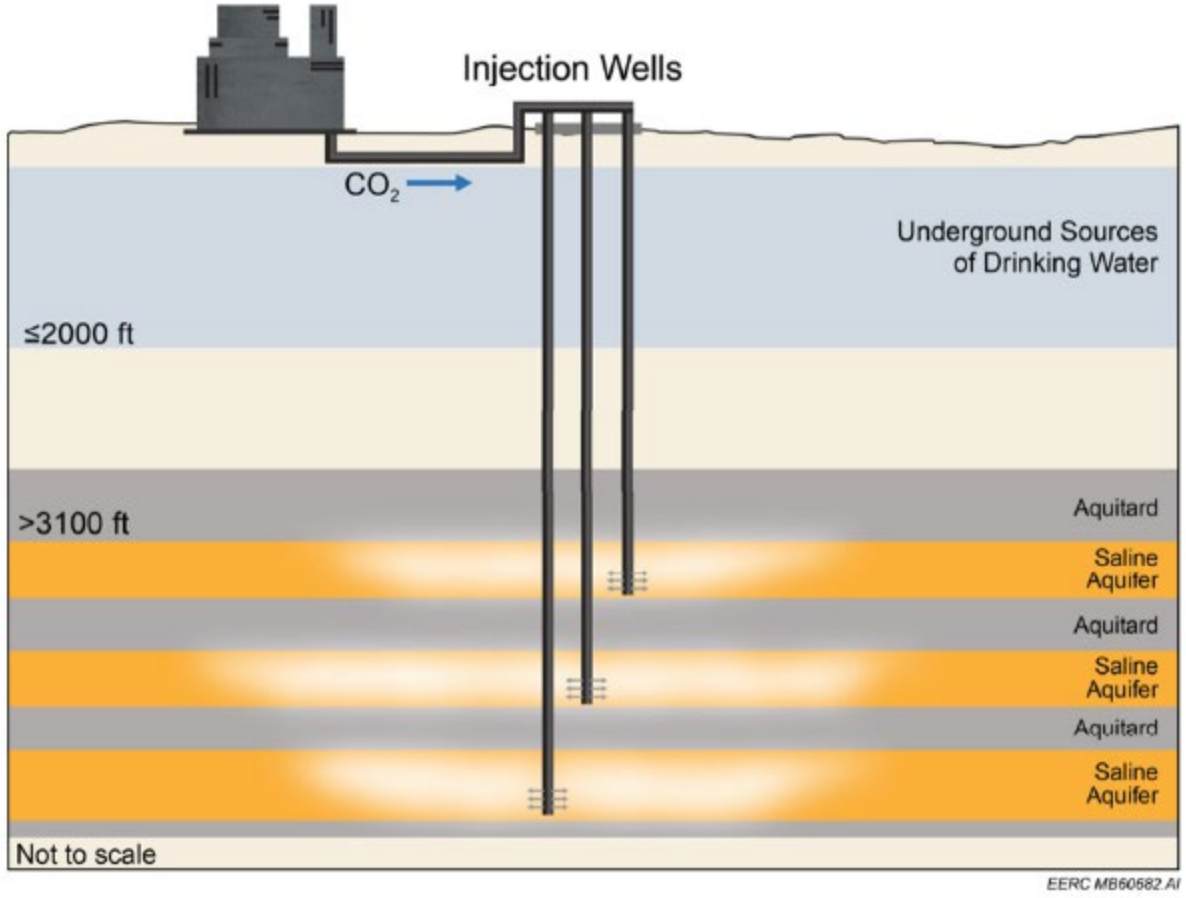
12/2021

2021 AND 2022 HIGHLIGHTS

- PCOR Partnership annual meeting held in Jackson, Wyoming, with 106 participants
- 217 members; 34 new since 2019
- Regulatory Roundup held in Deadwood, South Dakota
- TAB meeting held in Jackson, Wyoming
- Field effort initiated at the Red Trail Energy (RTE) CCS site
- New PCOR Partnership public and partner websites
- Several products published
- Numerous white papers in development

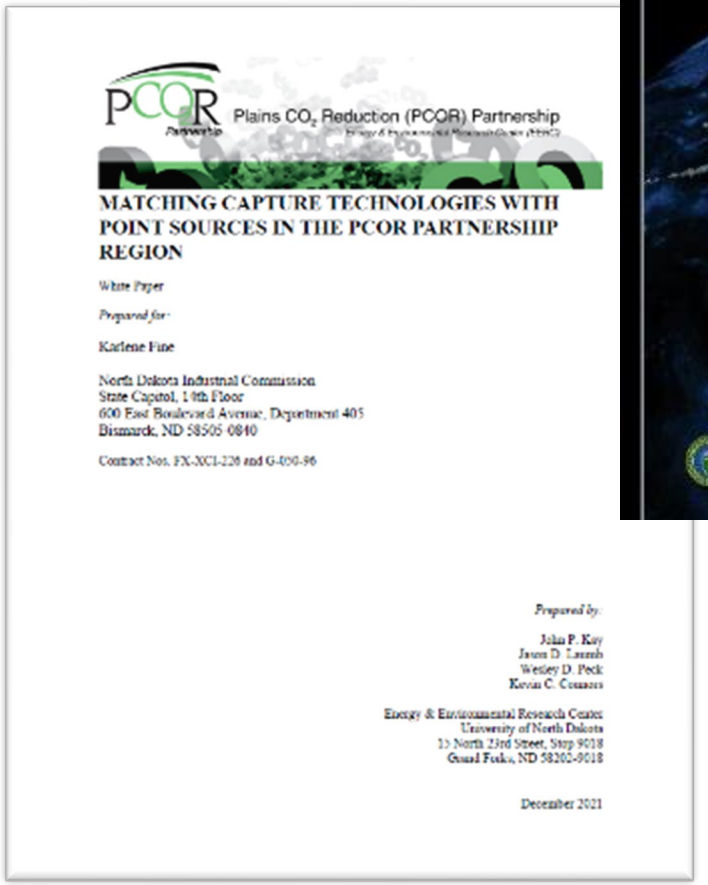
PUBLISHED PRODUCTS

- Carbon Dioxide Storage Optimization
- Technical Approaches to Stacked Storage
- Strategies for Storage Permanence: Well Integrity and Legacy Well Evaluations
- Risk-Based Area of Review (AOR) Estimation to Support Injection Well Storage Facility Permit Requirements for CO_2 Storage Projects
- National Risk Assessment Partnership (NRAP) Testing and Validation: Part 1 – NRAP Open-Source Integrated Assessment Model (Open-IAM)



PUBLISHED PRODUCTS (continued)

- PCOR Partnership Atlas, 6th Edition
- CCUS Business Models in the PCOR Partnership Region
- Matching Capture Technologies with Point Sources
- Journal Articles
  - Enhanced Oil Recovery Using CO_2 in Alaska (by UAF, in *Geosciences*)
  - Risk-Based Area of Review Estimation in Overpressured Reservoirs to Support Injection Well Storage Facility Permit Requirements for CO_2 Storage Projects (in *Greenhouse Gases: Science and Technology*)


Plains CO_2 Reduction (PCOR) Partnership

MATCHING CAPTURE TECHNOLOGIES WITH POINT SOURCES IN THE PCOR PARTNERSHIP REGION

White Paper

Prepared for:

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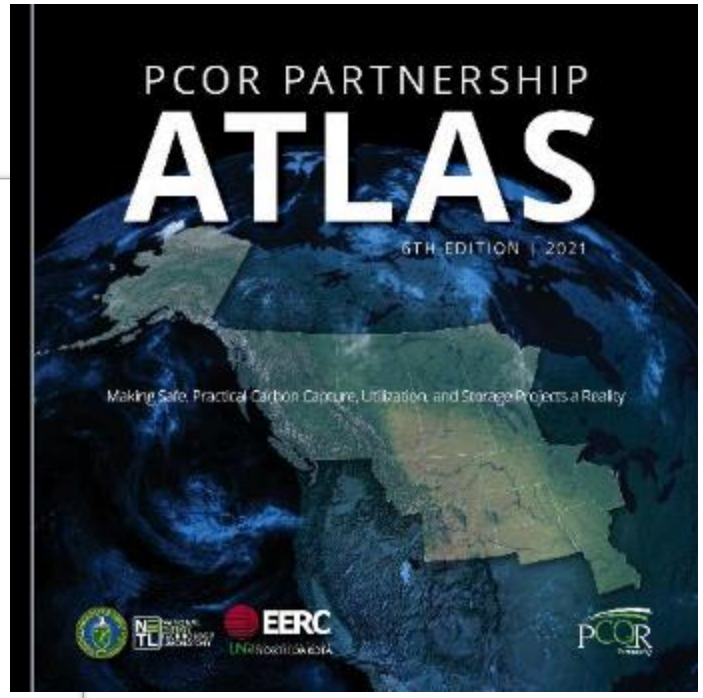


WHITE PAPER TOPICS

- Class VI wellbore construction and design
- Pore space leasing considerations
- Pressure interference
- Pipeline cost and CO_2 transport considerations
- Use of carbon steel pipelines for various CO_2/H_2S services
- Lessons learned from coring, wireline logging, and seismic surveys
- Machine learning-assisted approach to cement bond log (CBL) interpretation
- Lessons learned from EOR in Wyoming
- Activity to spur interest in CO_2 EOR and associated storage of CO_2

EXPANDED AND NEW TASKS UNDER RECENT FUNDING

Technical Challenges
- Geologic Characterization
- Technology Validation
- MVA Strategies – NEW subtask: Enabling Sustainable Monitoring for CCUS
- Risk Management

Data Collection, Sharing, and Analysis
- NRAP Validation
- Machine Learning (ML)
- Risk-Based Area of Review (AOR)

Regional Infrastructure
- Techno-Economic Analysis
- Promotion of Infrastructure and Scale-Up for Large Projects – added CO_2 purity specifications in pipelines, reclaimer waste disposal options, and looking for large-scale project opportunities
- Socioeconomic Impacts
- Public and Industry Outreach

Nontechnical Challenges
- Policy and Regulatory Challenges
- Business Models
- Pathways to CCUS Commercial Scaling and Deployment – changed series of road maps to an evolving road map with scale-up challenges included

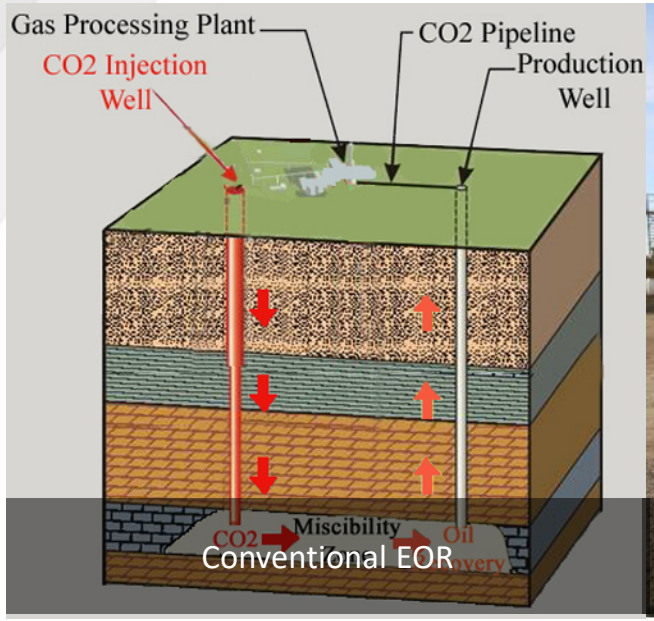
PCOR PARTNERSHIP INITIATIVE FUNDING

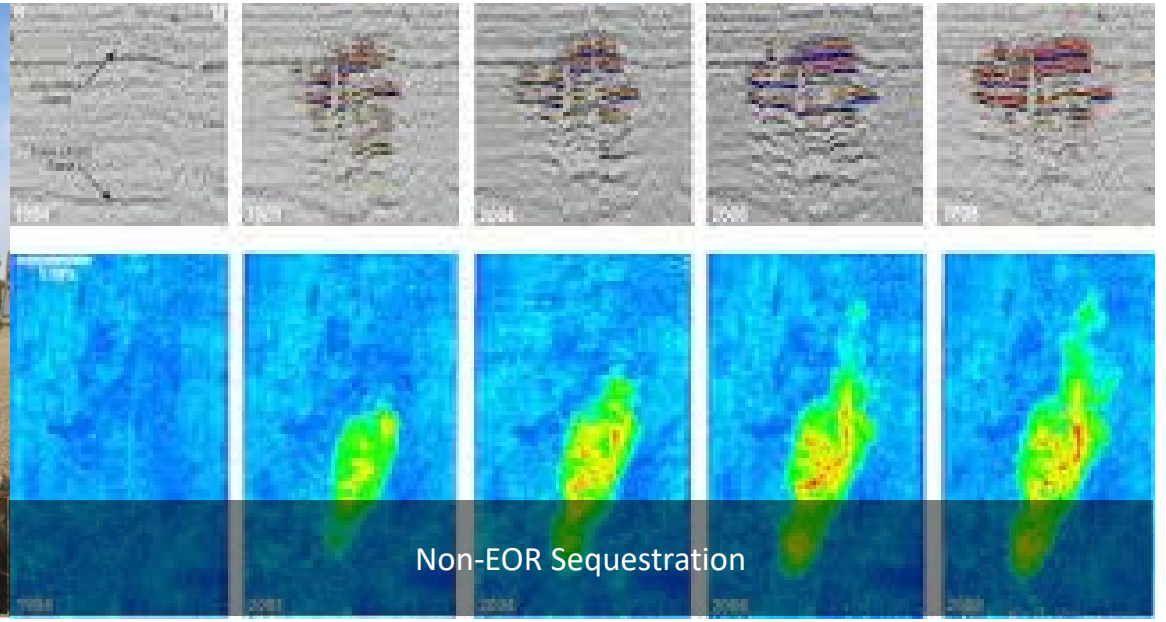
Funding Source	Original	1st Add-On	2nd Add-On	Project Total
NDIC – OGRP	$500,000	$500,000	$500,000 (pending)	$1,500,000
NDIC – LRP	$500,000	$500,000	$500,000 (pending)	$1,500,000
DOE	$5,000,000	$5,000,000	$5,000,000	$15,000,000
University of Wyoming	$128,823	$125,051	$123,550	$377,424
University of Alaska Fairbanks	$125,129	$125,345	$124,976	$375,450
Total	$6,253,952	$6,250,396	$6,248,526	$18,752,874

PCOR Partnership membership fees collected as of 2/8/2022: $570,000.

PCOR PARTNERSHIP REGIONAL ACTIVITY

THE SEQUESTRATION TRIAD – POTENTIAL FOR GEOGRAPHIC CONCENTRATION





Oil and gas producing basins present multiple opportunities in close proximity

- Often stacked
- Deeper basement, thicker sediment-rich section for storage
- Usually have associated sealing caprock formations
- Monitoring and operational synergies

ACTIVITY TO SPUR INTEREST IN CO_2 EOR

- White paper being written to generate interest in CO_2 EOR with an emphasis on:
  - Relationship between EOR economics and oil price cycles
  - 45Q tax credits and impact of expanded credits
  - Reversing incentive for low net CO_2 utilization to incentivizing maximum storage
  - Advanced/innovative CO flooding techniques to maximize oil recovery and storage
  - Non-GHG-related environmental advantages
    - Institute more responsible wellbore management and abandonment and reduce public exposure to well plugging costs.
    - Utilize surface lands that have already been disturbed rather than disturb new areas for the marginal oil production or marginal sequestration wells.

PCOR PARTNERSHIP INITIATIVE SUMMARY

Building on over 19 years of applied research in CCUS

Active region developing commercial CCUS projects

Engaged and motivated partners

Well-equipped project team

Catalyst for CCUS projects in the region

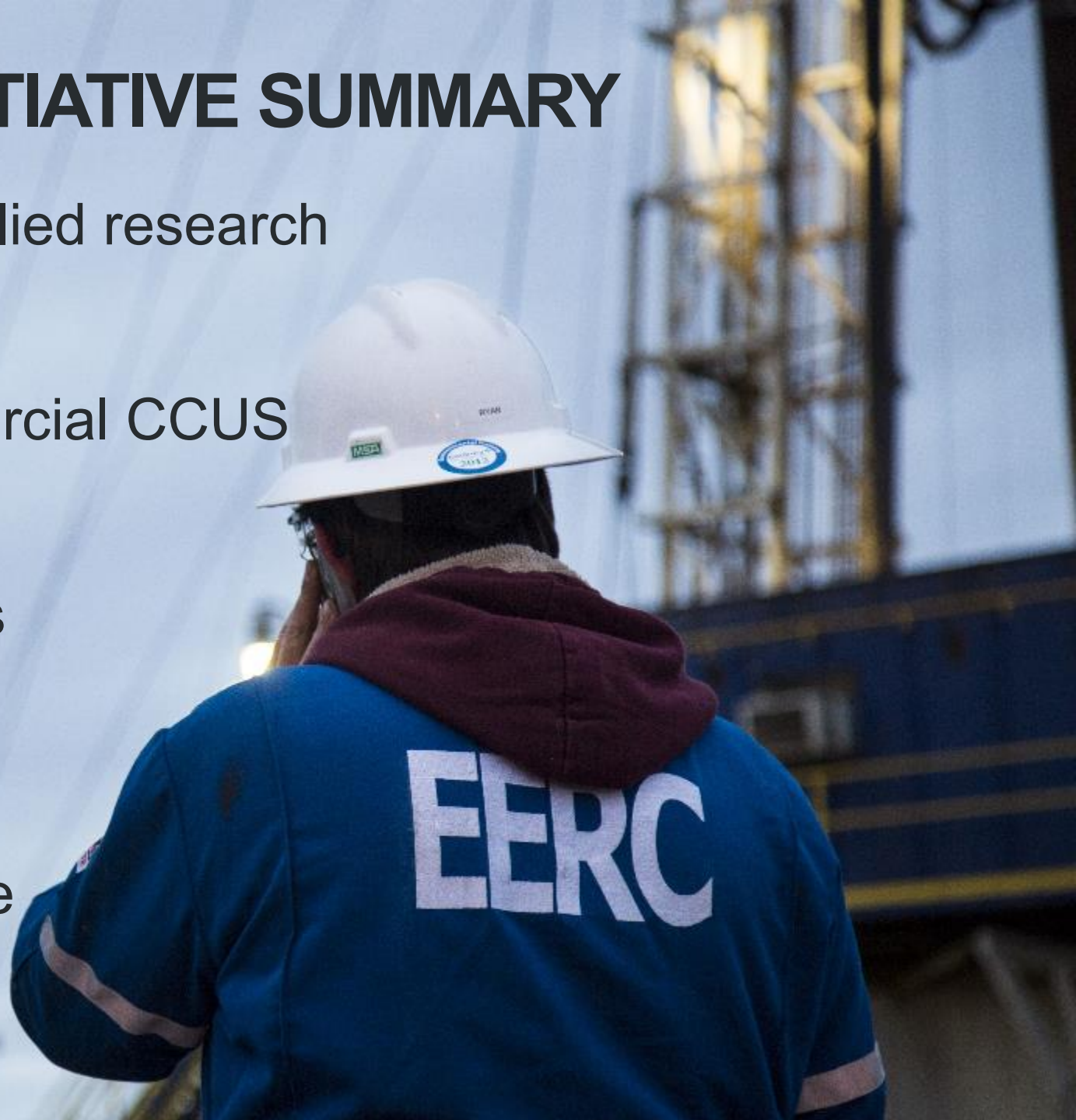


Image credit – EERC

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THANK YOU

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