Illinois Storage Corridor
DE-FE0031892

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University of Illinois

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National Energy Technology Laboratory
2021 Carbon Management and Oil and Gas Research Project Review Meeting
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Presentation Outline

• Project Overview
• Environmental Impact Volume
• Risk Assessment
• Site Characterization
• Drilling
• Modeling
• UIC Class VI Permitting
• Carbon Capture Assessment
• Summary
Illinois Storage Corridor is a region with significant previous CCS-related activity.

Project builds upon IBDP, CarbonSAFE Phases 1 and 2 and many other studies.

2 separate sites will be investigated in different storage complexes:
- Ethanol source: Mt Simon Storage Complex – Storage HUB (0.5 to 1.7 MTPA CO₂)
- Coal-fired power source: FEED study for capture +6 million tons CO₂ per year
Storage Development

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Prairie State – coal fired power station commissioned 2012 1600 MW – 2 units
St Peter Storage Complex (ca 6 MTPA CO₂ from 1 unit)
Storage near site location

One Earth Energy – ethanol plant
Mt Simon Storage Complex – Storage HUB (0.45 to 1.7 MTPA CO₂)
Storage near site location
Lower Mt Simon Complex

Sim CCS Gateway

Estimates created using the Sequestration of CO₂ Tool (SCO₂T) CarbonSAFE Macon County DE-FE0029381

Lower Mt Simon Sandstone net thickness (10% porosity cutoff)
Static Model Framework

50 x 50 sq mi

Furrow well
Pyne well
OEE well site
Hinton brothers #7 well

Livingston
Iroquois
Ford
McLean
Champaign
De Witt
Platt

Furrow
Well API: 1211322942

Hinton Brothers #7
Well API: 1201923996

VW2
Well API: 121152355200

50000 ft US

Field Notes

OEE well site

Ford
Livingston
Iroquois
De Witt
Platt

50 x 50 sq mi

Furrow well
Pyne well
OEE well site
Hinton brothers #7 well

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Furrow
Well API: 1211322942

Hinton Brothers #7
Well API: 1201923996

VW2
Well API: 121152355200

50000 ft US

Field Notes
Legacy Well Identification and Evaluation

Well configuration considered to be Level 2 Risk

**Legend**
- Casing
- Cement
- Open Hole
- Seal
- Storage

**Surface Casing:** Assumed to be cemented to surface if TOC is not specified.

**Intermediate Casing details:**
- TOC estimated
- May or may not be cemented to surface.
- The primary seal below the intermediate casing depth.

**Production Casing details:**
- Cased & cemented below the seal.

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Early One Earth Geocellular model

Homogeneous model based on Hinton #7

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<th>Permeability, mD</th>
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Assuming $k_v/k_h=0.1$

$CO_2$ plume at 5 years:

- 0.46 Mt/yr: 2000 ft (0.38 mi) in radius, 560 ft in height
- 2 Mt/yr: 3500 ft (0.66 mi) in radius, 761 ft in height
Evaluation of DAS for plume imaging

Ray tracing

Successive filtering of rays based on reflection and intersecting angles
2D Seismic Surveys

~25 miles 2D at each location using Stryde nodal receiver system
Prairie State Storage Site

- Capture FEED study
- 6MTPA CO₂
- Rural Setting
- Lively Grove #1 test well site ~ 6 miles north of plant
Prairie State Characterization
St Peter TDS
Regional Stratigraphic Framework

St Peter

Maquoketa

Potosi

Knox Group
Lively Grove #1
First Contact: St Peter
Potosi Dolostone (2ry target)

Thickness and porosity range

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<th>Well</th>
<th>Formation</th>
<th>Gross (ft)</th>
<th>Net (ft)</th>
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Shaglee Unit
CO\textsubscript{2} Capture Assessment

- OEE produces ethanol and approximately 450,000 tons/yr of relatively pure CO\textsubscript{2} byproduct.
- An engineering Pre-FEED study for capture at OEE is being conducted with site specific design considerations.
- Trimeric and AECOM are leading this effort.

- The PSGC plant was commissioned in 2012 and uses pulverized coal and super critical technology to run at high temperatures and pressures.

- Two 800-megawatt power units produce over 12 million tons of CO\textsubscript{2} annually.

- Capture of this CO\textsubscript{2} will be based on the KM CDR Process\textsuperscript{TM} CO\textsubscript{2} capture technology from Mitsubishi Heavy Industries (MHI).
Class VI submittals

- Site Characterization data:
- Area of Review (AoR) and Corrective Action Plan:
- Injection Well Construction Plan:
- Plans for Pre-Operational Testing:
- Proposed Injection Well Operations Plan:
- Proposed Monitoring Plan:
- Proposed Mechanical Integrity Testing (MIT) Plan:
- Proposed Injection Well Plugging Plan:
- Post-Injection Site Care, and Site Closure Plan (PISC):
- Emergency and Remedial Response Plan (ERRP):
Accomplishments to Date

- Submitted EIV and are addressing comments
- Pre-drilling site characterization
- Legacy well risk database and identification
- Drilling well: Lively Grove #1
- Submitted permit to Illinois DNR for well at One Earth
- 2D seismic surveys permitted (to start August 16)
- Static models being developed
- Class VI permit writing in progress
- Process documents for capture at One Earth Energy being developed
- Coordinating with FEED study at Prairie State
Synergy Opportunities

- DE-FE0031841 is conducting a FEED study for capture at the Prairie State Generating Station that directly links with the CarbonSAFE Illinois Storage Corridor project.
- Work performed under CarbonSAFE projects FE0029831 (Macon County) and FE0031626 (Wabash) are providing contributions to geological and infrastructure knowledge.
Project Summary

- Pre-Drilling Site Characterization conducted
- Environmental Impact Volumes in revision
- Lively Grove #1 being drilled for characterization data
- One Earth #1 being permitted
- 2D Seismic surveys permitted and will start in mid-August
- Modeling in early stages
- Risk Assessment iterative
- Capture Assessment at One Earth in progress
- Data being compiled and integrated into Class VI permit templates
Project Team
Appendix

- These slides will not be discussed during the presentation, but are mandatory.
Benefit to the Program

• CarbonSAFE Program goals being addressed:
  – Identify & characterize geological storage complexes to store > 50 million tonnes CO₂ within 30 years, and;
  – accelerate deployment of CCUS at commercial scale including understanding of how to safely, efficiently and cost effectively characterize and permit project sites.

• Project benefits.
  – Characterization will establish storage resources at 2 specific sites and have broader regional implications
  – Provide basis for development of storage hub(s)
  – Work will provide leadership for other industrial/energy sources and initiate further development in the region and elsewhere
  – Linkage with capture program
Project Overview

Goals and Objectives

• Illinois Storage Corridor Objectives
  – Mature and prove CCS at commercial scale by performing subsurface characterization and related work to enable submission of 2 Class VI permit applications, and gain approval for construction of CO$_2$ injection wells at 2 sites in different storage complexes.

• CarbonSAFE Phase III program objectives:
  – acquisition, analysis and development of information to characterize a storage complex and demonstrate storage resources for commercial volumes of CO$_2$.
  – identification of a storage site(s) within the storage complex,
  – preparation and submission of an Underground Injection Control (UIC) Class VI permit to construct
• Provide a simple Gantt chart showing project lifetime in years on the horizontal axis and major tasks along the vertical axis. Use symbols to indicate major and minor milestones. Use shaded lines or the like to indicate duration of each task and the amount of work completed to date.
Table 6: Gantt Chart with Team Responsibilities by Task. Letters refers to milestones in Table 3.

Start: 10/01/2020
End: 09/30/2023

2020
Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4 Q1 Q2 Q3 Q4

2021

2022

2023

Budget Period 1

Budget Period 2

ISGS
UIUC
PNNL
BYU
Projeo
Geostock
Hekla
CO2 CRC
Stanford
Trimeric
Texas Tech
IGWS
Industrial Economics
Cornerpost
Van Ness
Feldman
Table 6. Gantt Chart with Team Responsibilities by Task. Letters refers to milestones in Table 3.

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Table 2020

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Bibliography

– No peer reviewed publications generated from the project to date.