Illinois Storage Corridor: Updates

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U.S. Department of Energy
National Energy Technology Laboratory
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ILLINOIS
Illinois State Geological Survey
PRAIRIE RESEARCH INSTITUTE

Presentation Outline

- Project objective and overview
- Prairie State Generating Company (PSGC) site updates
- One Earth Energy (OEE) site updates
- Key accomplishments to date
- Future tasks
- Lessons learned to-date
- Announcement

Project Objective

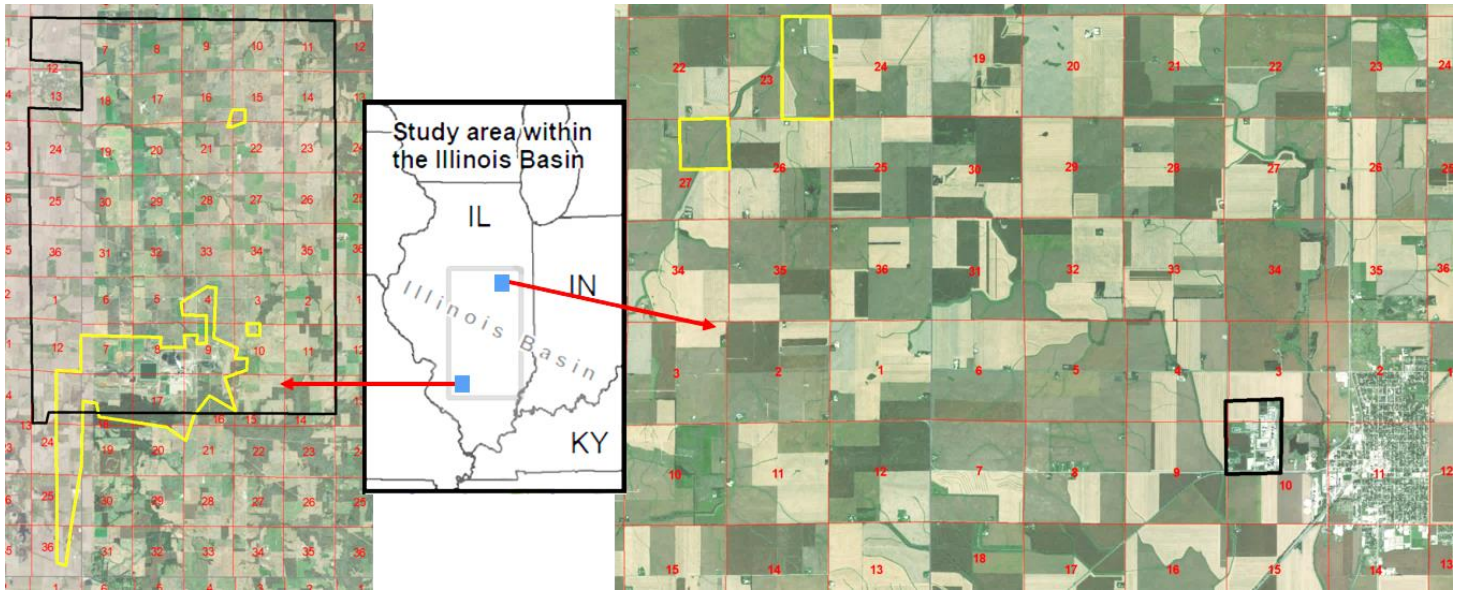
Accelerate commercial deployment of carbon capture utilization and storage (CCUS) within a region with proven geologic storage performance and with numerous industrial carbon sources.

Goals:

- Characterize two individual sites with committed industrial CO_2 sources for commercial-scale CO_2 storage
- Prepare Underground Injection Control (UIC) Class VI permits for construction at each site.

Project Sites

- Prairie State Generating Company site : Washington County, IL
- One Earth Energy site: Ford County, IL



Prairie State

One Earth Energy

Prairie State Generating Company site

Prairie State Generating Company (PSGC) site Updates

SYSTEM	GROUP	FORMATION	Storage Elements
Ordovician	Maquoketa	Brainard	Seal
		Ft. Atkinson	
		Scales	
	Galena	Kimmswick	
		Decorah	
	Platteville		
	Ancell	Joachim	
		St. Peter	Reservoir
	Knox	Shakopee	Reservoir/ Seal
		New Richmond	
		Oneota	
		Gunter	
Cambrian		Eminence	
		Potosi	Reservoir
		Franconia	
		Ironton-Galesville	
		Eau Claire	Seal
	Potsdam	Mt. Simon	Reservoir
Precambrian			

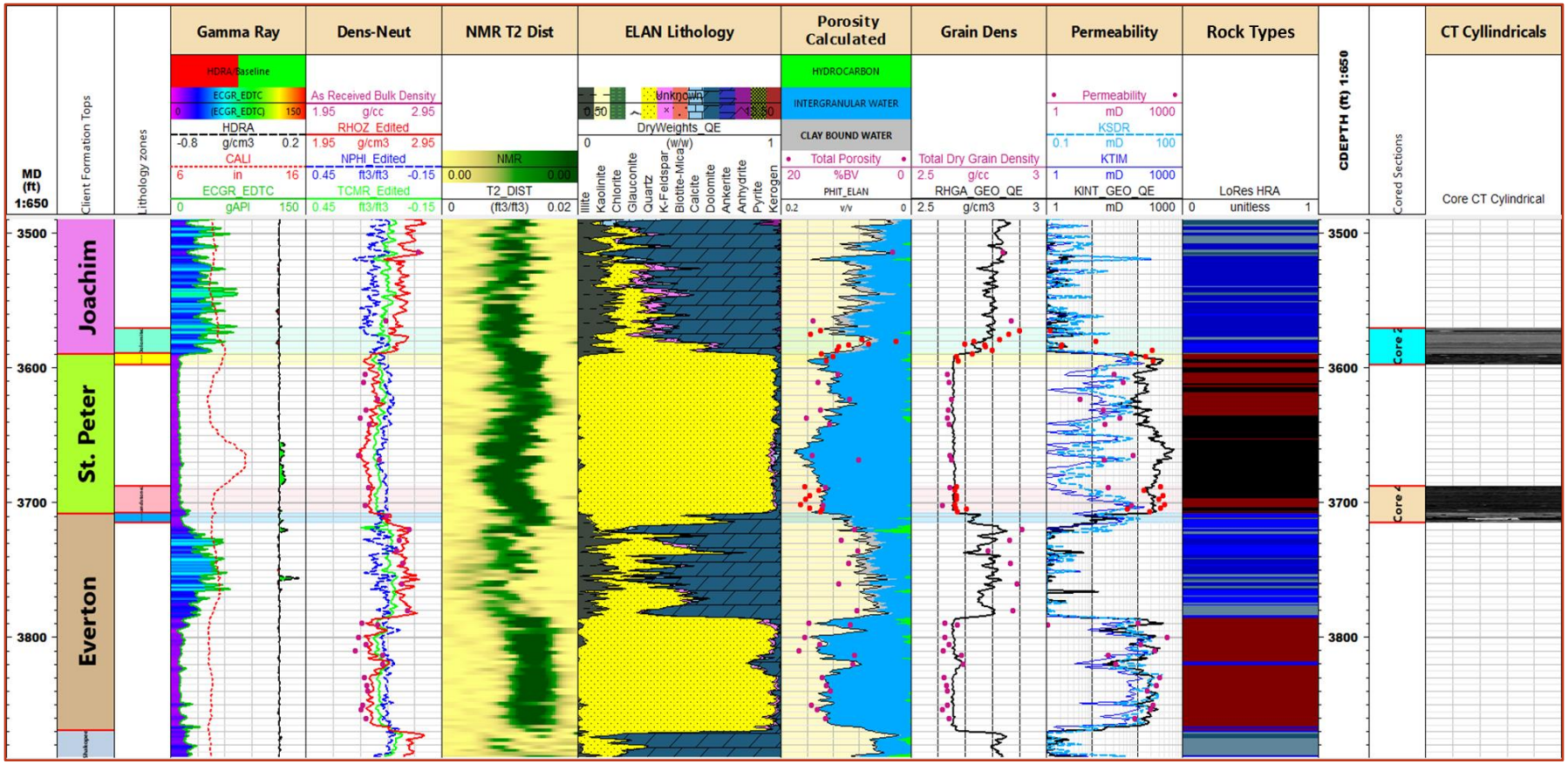
St. Peter-Knox Storage Complex

Mt. Simon Storage Complex

Cambro-Ordovician Storage Complex

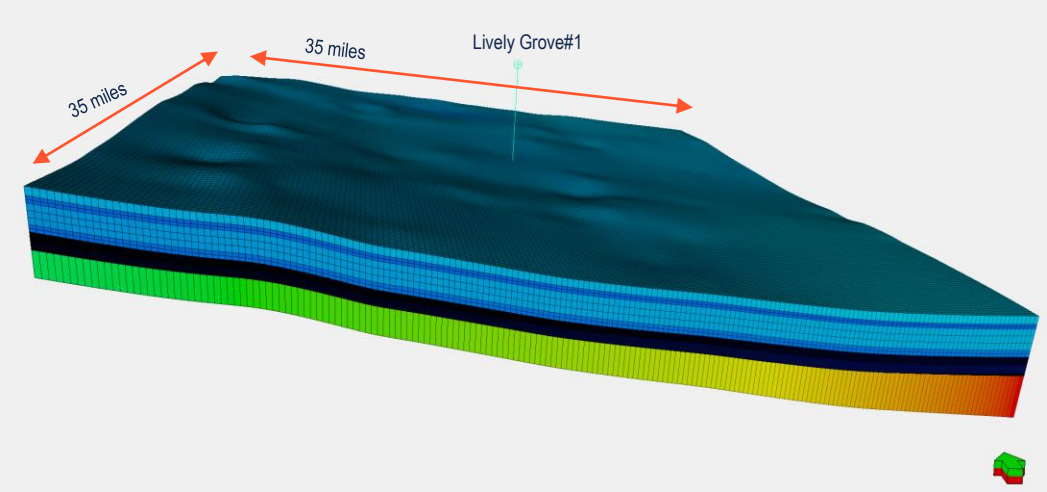
- Prairie State – coal fired power station commissioned 2012 1600 MW – 2 units
- St Peter-Everton Storage Complex (ca 8.125 MTPA CO_2 from 1 unit)
- Storage near site location
- Characterization well: Lively Grove #1 (LG #1)

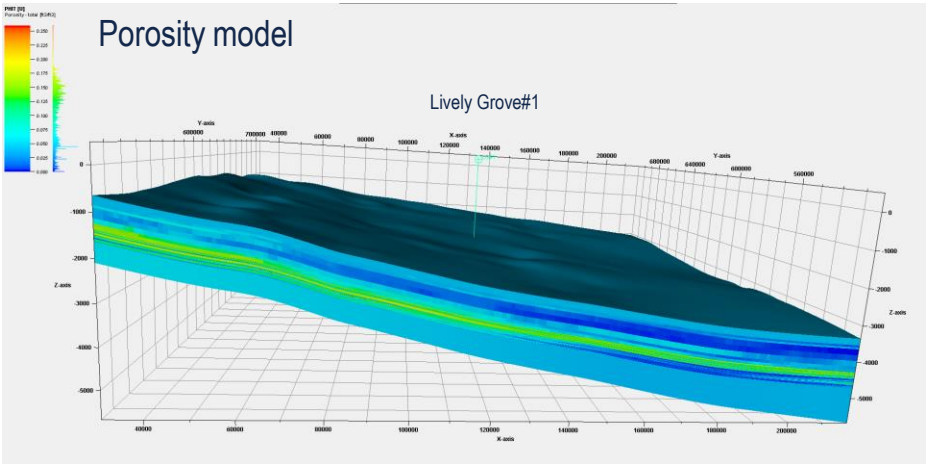
LIVELY GROVE #1: Integrated Petrophysical Analysis - Main Reservoir Section

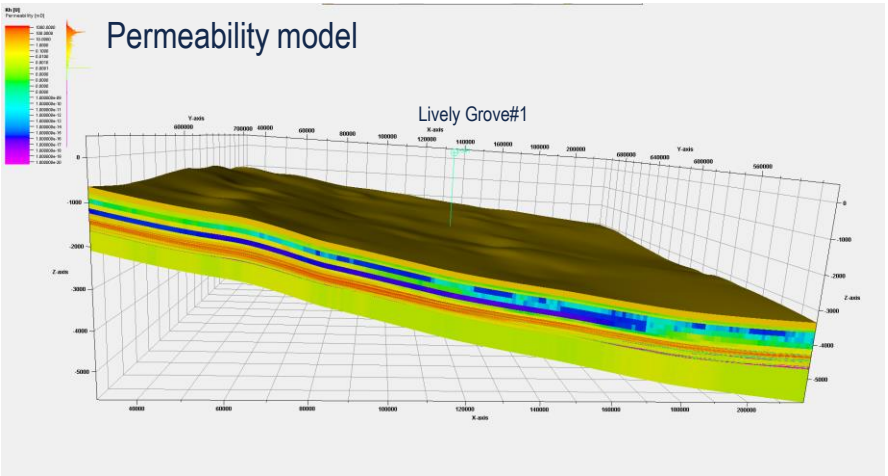


Lively Grove#1 geocellular Model

Grid dimensions(X and Y): 1000 by 1000 ft
Number of layers:149 layers
Number of grid cells: 5,154,804
Number of zones: 8
Including: Maquoketa Group, Trenton, Platteville, Joachim, St Peter Sandstone, Everton Dolomite, Everton Sandstone, and Shakopee

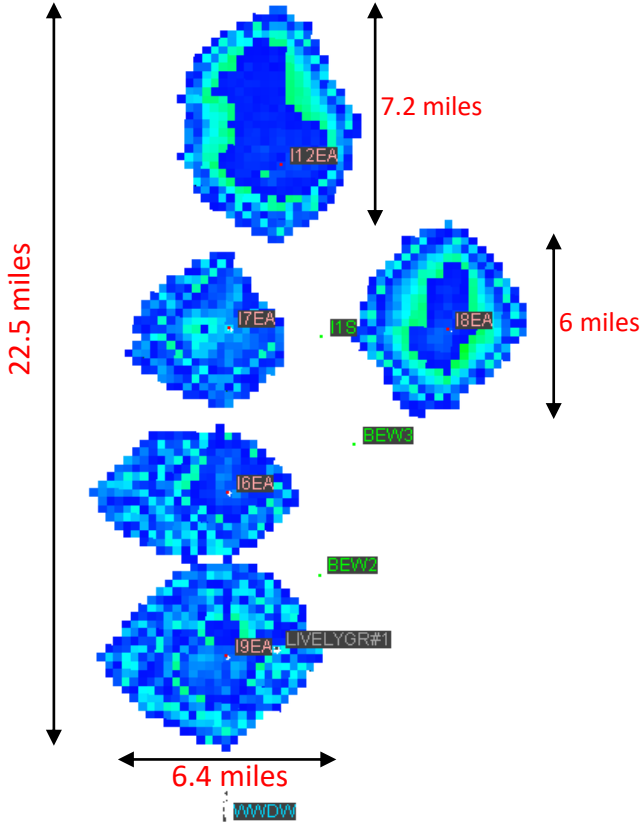


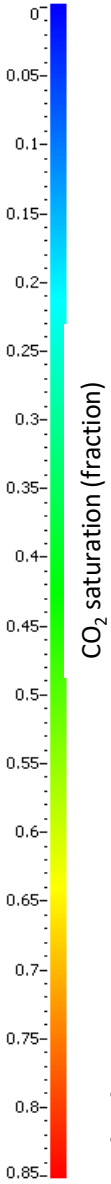




CO_2 Saturation after 20 years of Injection

CO2 saturation: 10 Slanted wells



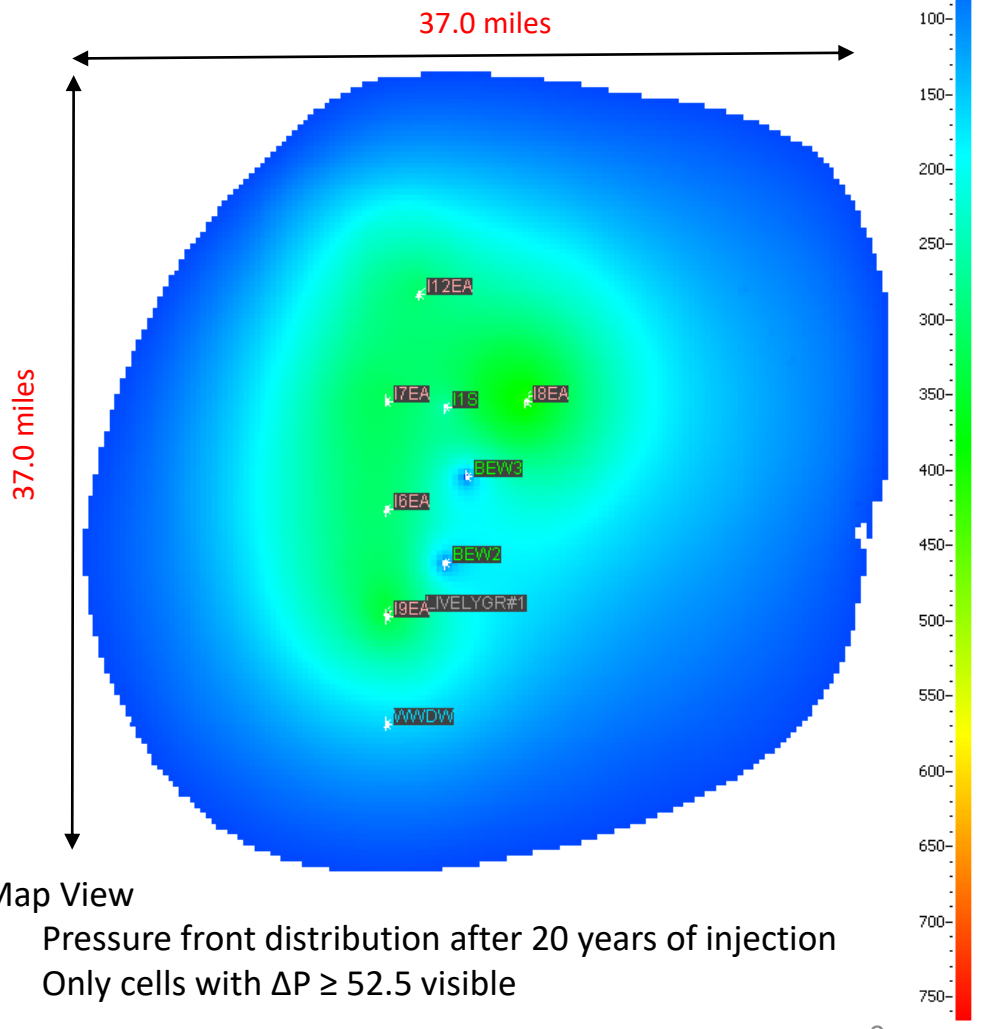


Map View

- Gas Saturation after 20 years at 8.125 Mta
- Only cells with Sg ≥ 1% visible

Pressure change (top of St Peter) : 10 Slanted wells

AoR : 1,369 square miles



Map View

- Pressure front distribution after 20 years of injection
- Only cells with ΔP ≥ 52.5 visible

PSGC site status

- Class VI permit documents prepared and submitted to PSGC
- PSGC will select third-party operator(s) to submit Class VI permit application
  - Negotiation ongoing
  - No pipeline FEED study was performed as a result
- Lively Grove #1 has been plugged.
- Storage field development plan ongoing
- Community Benefits Plans development ongoing
- Rigorous characterization of Knox Group ongoing

One Earth Energy (OEE) site

One Earth Energy (OEE) site Updates

SYSTEM	GROUP	FORMATION	Storage Elements
Ordovician	Maquoketa	Brainard	Seal
		Ft. Atkinson	
		Scales	
	Galena	Kimmswick	
		Decorah	
	Platteville		
	Ancell	Joachim	
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		New Richmond	
		Oneota	
		Gunter	
Cambrian		Eminence	
		Potosi	Reservoir
		Franconia	
		Ironton-Galesville	
		Eau Claire	Seal
	Potsdam	Mt. Simon	Reservoir
Precambrian			

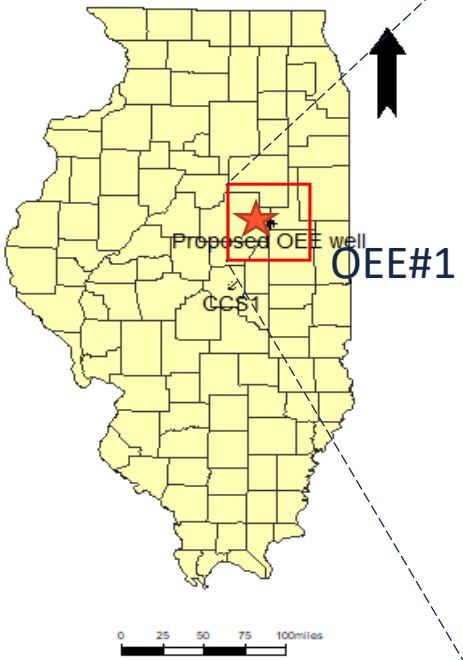
St. Peter-Knox Storage Complex

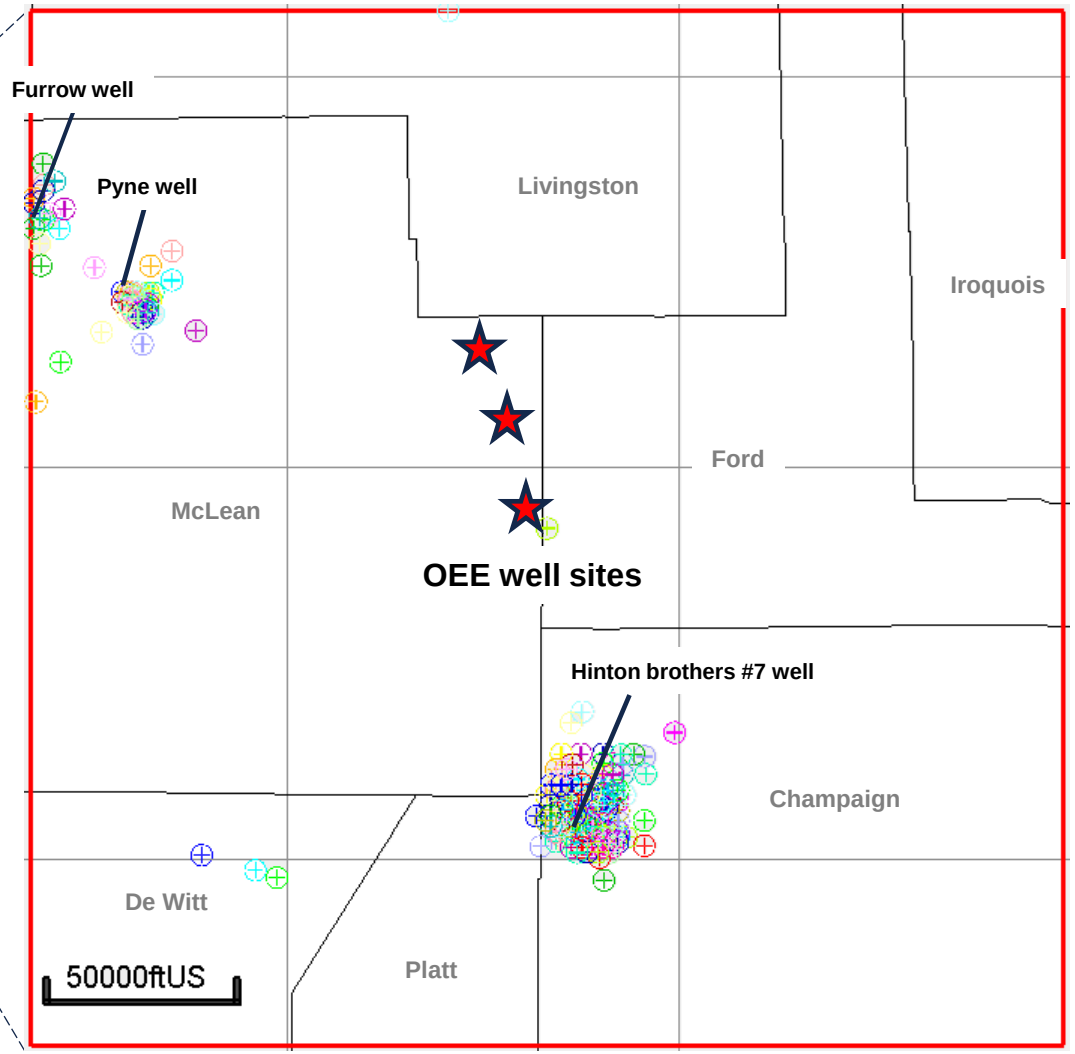
Mt. Simon Storage Complex

Cambro-Ordovician Storage Complex

- One Earth Energy – ethanol plant
- Mt Simon Storage Complex – Storage HUB (0.5 to 4.5 MTPA CO_2)
- Storage near site location
- Onshore Hub Storage facility
- Characterization well: OEE #1

Model area



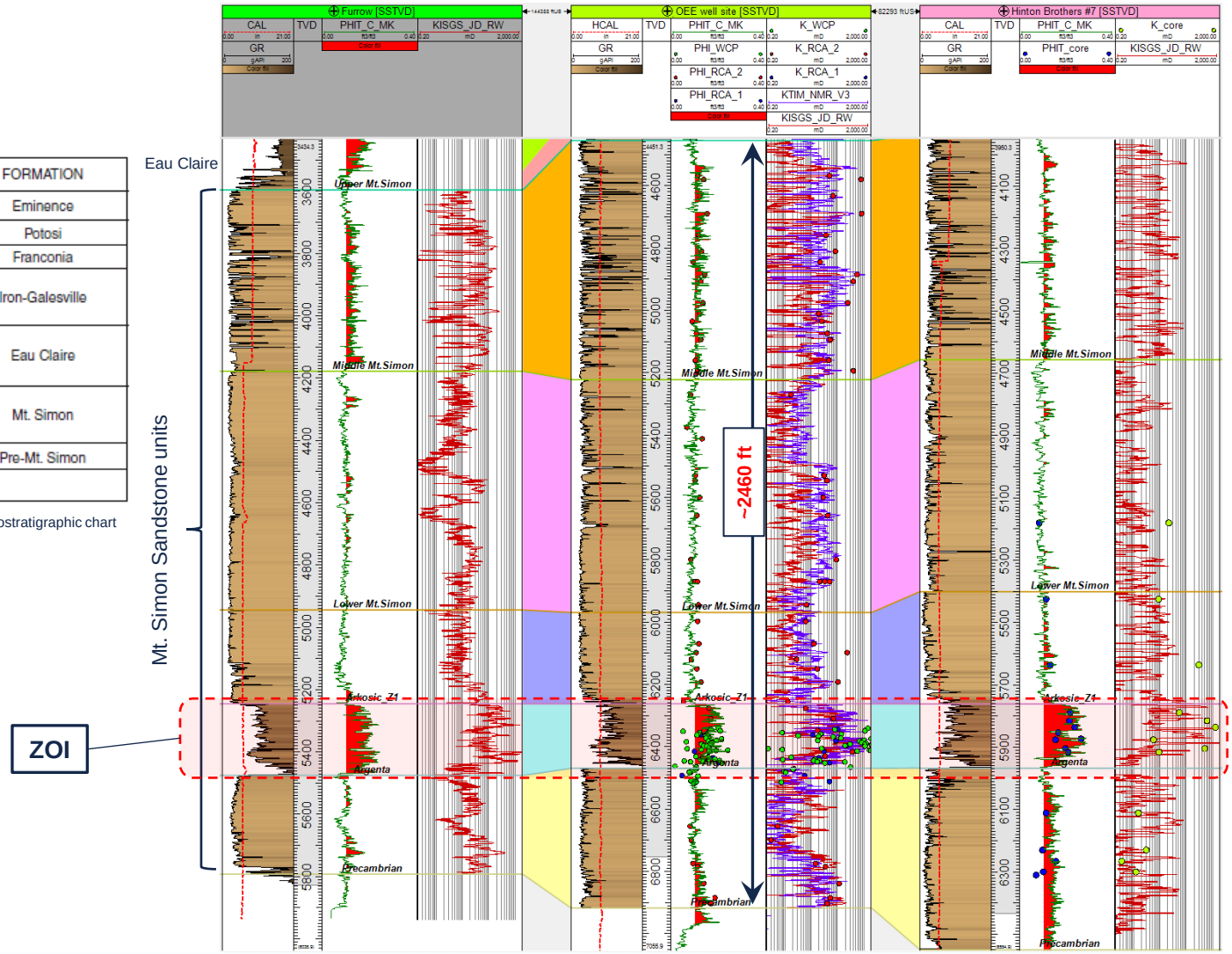


Iterative versions of the model were updated to include the newly acquired data at the One Earth CCS site

Lithostratigraphy/ Well log X-section

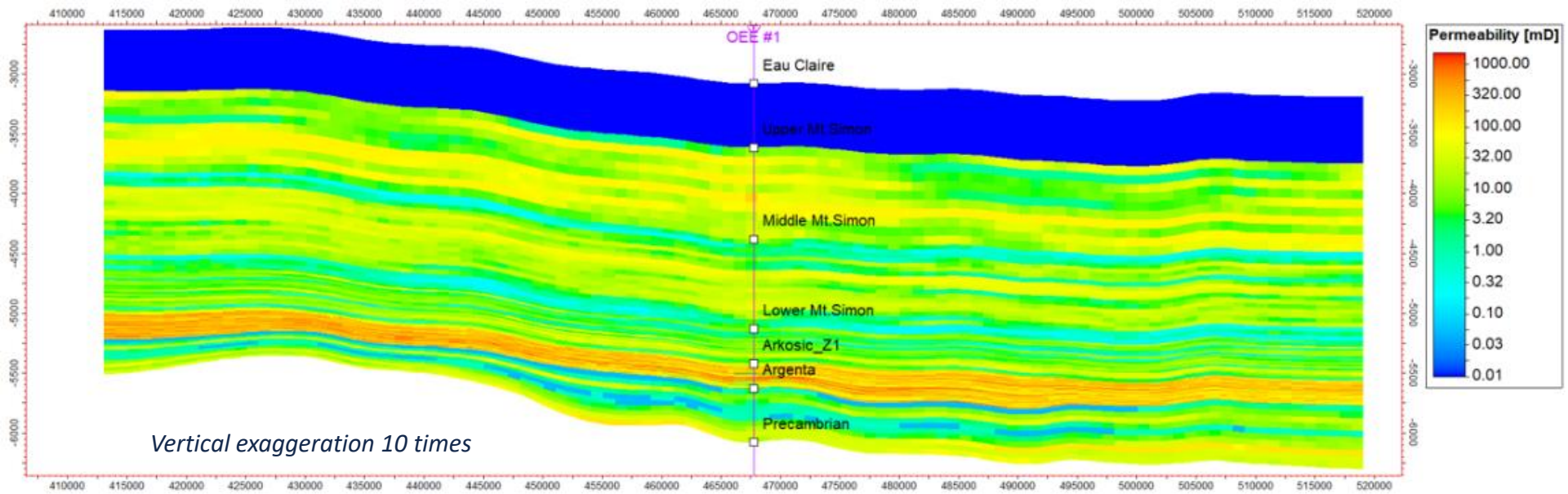
SYSTEM	GROUP	FORMATION
Cambrian	Knox	Eminence
		Potosi
		Franconia
		Iron-Galesville
		Eau Claire
		Mt. Simon
		Pre-Mt. Simon
Precambrian		

*Simplified lithostratigraphic chart



OEE geocellular model

Heterogeneous model, MS+ Argenta averaging 11%, 44 md



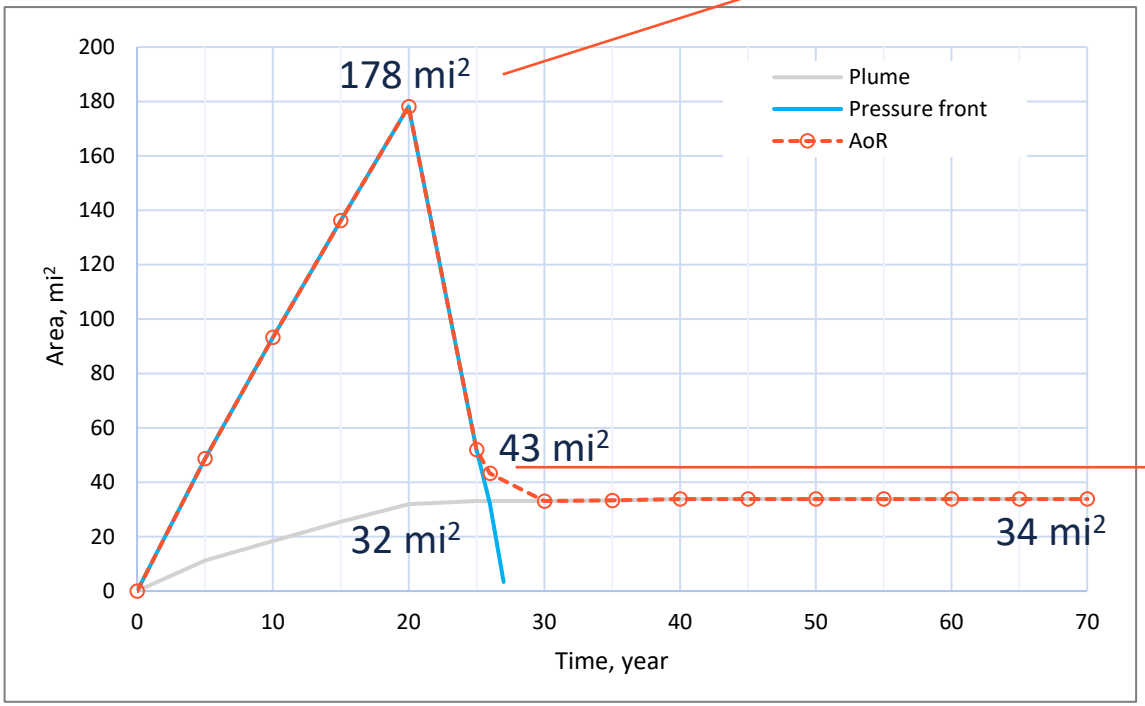
Average Cell size:

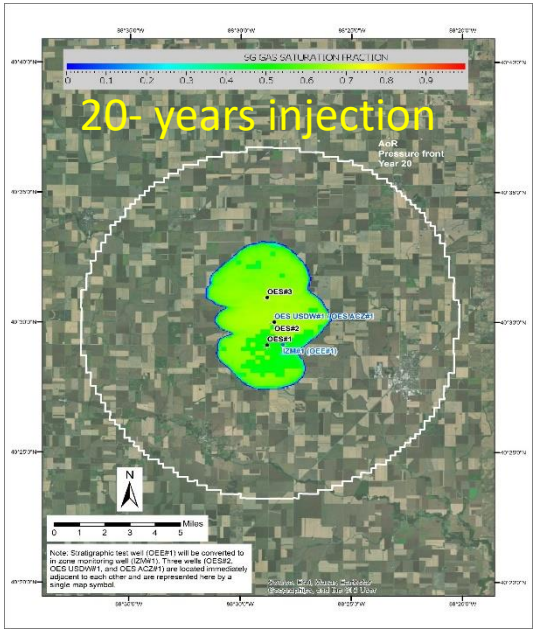
- 1000 ft x 1000 ft x 21 ft
- Around injection wells
  - 250 ft x 250 ft x 21 ft

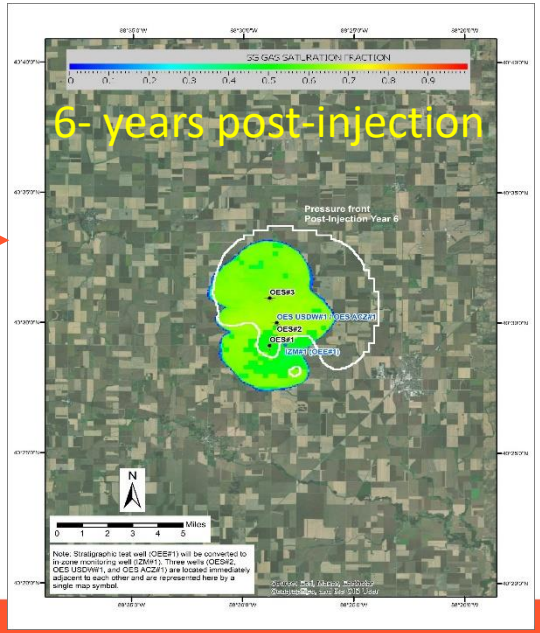
Unit	Thickness, ft	Porosity, %	Permeability, mD
Eau Claire	537	5	0.0001
Upper MS	720	11	31
Middle MS	740	9	15
Lower MS	320	9	12
LMS Arkose	200	16	308
Argenta	460	12	18

Area-of-Review (AoR)

- The larger between the plume area and pressure front.







UIC Class VI permit status

One Earth Sequestration site

- Three Class VI permit applications were submitted to the US EPA on October 28, 2022.
- US EPA comments (on different sections of the permit application)
  - First comments: May 31st, 2023. ➔ Narrative, Pre-Operational Testing Program, Quality Assurance and Surveillance Plan (QASP), Testing and Monitoring Plan (TM).
  - Second comments: April 25th, 2024. ➔ Heavy on computational modeling. Area of Review and Corrective Action, Emergency and Remedial Response Plan, QASP, TM, Narrative, Post-Injection Site Care and Site Closure Plan (PISC)
  - Third comments: July 3rd, 2024(EPA revised and resubmitted July 9th) ➔ Well Construction, PISC, Financial Assurance
- Responses to US EPA's comments have been submitted on time.

Community engagement

- Community engagement is on a continuous basis.
- Both positive and challenging community engagement
  - McLean County Zoning Board of Appeals – Injection well setback and CCS safety
    - Public hearings engaging with opposing advocacy group (Illinois Peoples Action), the public, and board members.
  - Emergency response agencies to develop the Emergency Response Plan
    - Meetings with McLean and Ford County Emergency Management Agencies
    - Met with local responders, including Gibson City, Sibley, Anchor, Saybrook/Arrowsmith, Colfax, and Cropsey Fire Departments
  - Gibson City Council public meeting to discuss results of atmospheric dispersion modeling, future of low-carbon ethanol, and sequestration project.
  - Ford County Board – Carbon transport and storage safety concerns
    - Public hearings engaging with opposing advocacy groups (Illinois People's Action and Eco-Justice Collaborative), the public, and board members

Community engagement

- Ford and Iroquois Farm Bureau meetings to discuss the project and future of low-carbon ethanol for Sustainable Aviation Fuel (SAF) production.
- Presentation to Federal, State and County government officials on ethanol production and the importance of CO_2 Sequestration.
  - Meeting called by Tom Bennett and Jason Bunting hosted at the One Earth facility.
  - Panel of discussion with representatives from PRI, ISGS, University of Illinois, One Earth, Rex America, Illinois State University, Projeo, Vault 44.01, state legislators, local businesses, and local officials.
- General outreach meetings through the Rotary and Lion's Clubs
- **Local landowner** public meeting to discuss development of the project.

Illinois Storage Corridor Project Status

Key accomplishments to date

1. Characterized both OEE and PSGC sites
2. Completed quantitative risk assessment for both sites
3. Plugged Lively Grove #1 well (PSGC site)
4. Prepared UIC Class VI permit documents for the PSGC site
5. Submitted three UIC Class VI permits for the OEE site
6. Completed CO_2 pipeline FEED studies for OEE site
7. NRAP study completed
8. Completed Statistical optimization approach for monitoring well placements (Machine Learning Approach).
9. Completed 15 technical reports and counting.

Future tasks

- Complete Environmental Assessment (EA) for OEE site
- Complete storage field development plans for PSGC site
- Complete community Benefit Plans (CBPs)
- Complete regional CO_2 point sources assessment and pipeline networks studies
- Research work:
  - Regional study of St. Peter Sandstone
  - Rigorous characterization of the Knox Group at PSGC site
    - Reservoir modeling
    - Potential additional storage resource

Lessons learned to date

1. Stakeholder engagement
2. Industrial partnerships
3. CO2 storage resource vs capture capacity
    1. Large storage resource vs small capture capacity
    2. Small storage resource vs large capture capacity
4. Regulations
    1. Permits: Class VI, pipeline
    2. State legislations

Announcement

ISC Project All-Hands Meeting

Dates: September 4 – 5, 2024
Location: Champaign, Illinois

Agenda

- Presentations
- Roundtable discussions
- Site visit to One Earth Sequestration/OEE site

Registration is still open
https://forms.illinois.edu/sec/465698360

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Project Team

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