CarbonSAFE – Illinois Basin Update

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2022 MRCI Partners and Stakeholders Meeting

Slides adapted from: https://netl.doe.gov/sites/default/files/netl-file/22CM_CTS16_Whittaker.pdf

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Illinois State Geological Survey
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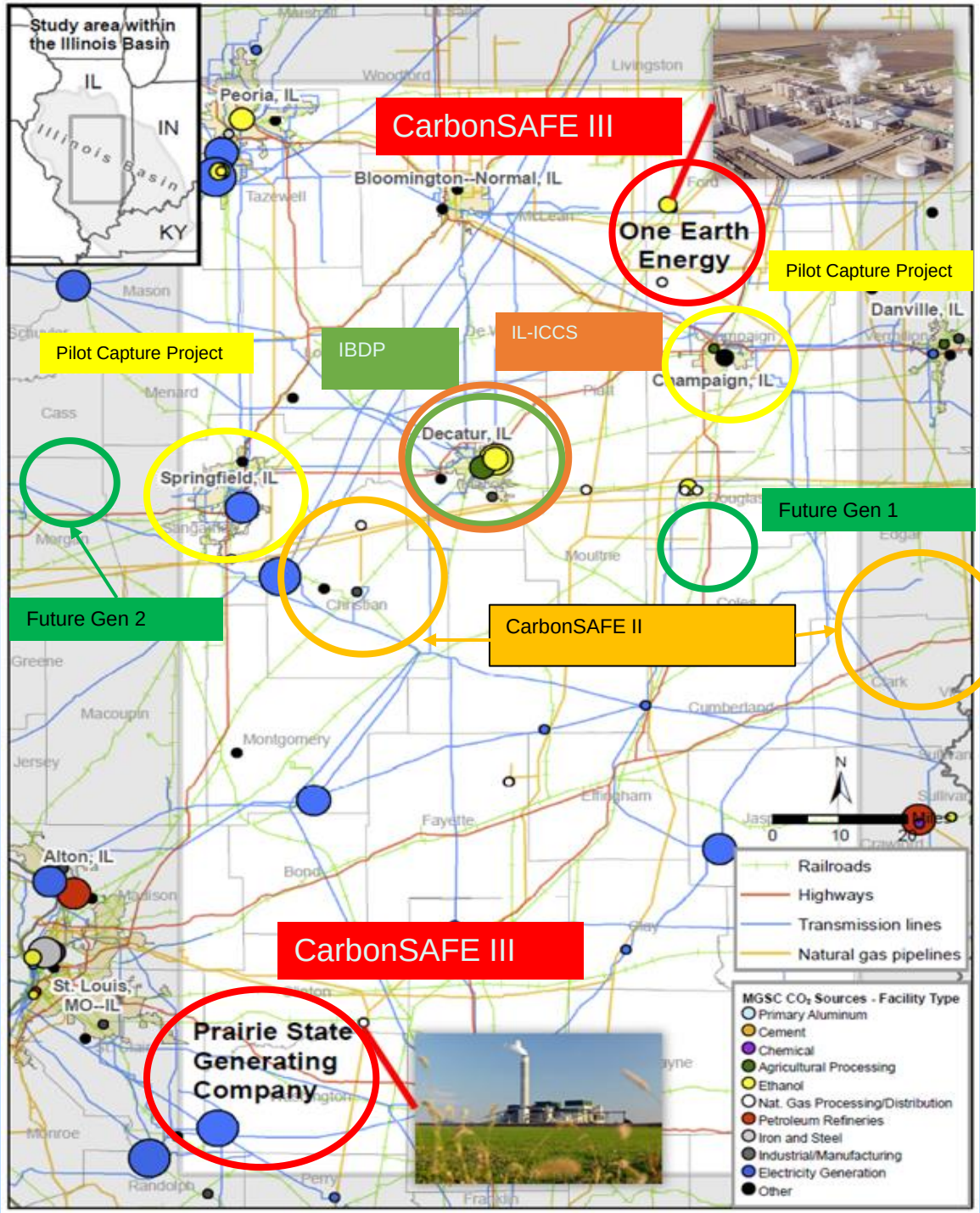
Illinois Basin

- Central Illinois Basin is a region with significant previous CCS-related activity
- Current work builds upon IBDP, CarbonSAFE Phases 1 and 2, and many other studies.
- **Recent completions: CarbonSAFE Phase 2**

Available from June 30, 2022:

Data (EDX) & Technical Reports (OSTI)
for two projects (in Indiana and Illinois)

- Well information (logs, sample analyses, etc.)
- Seismic interpretations
- Static & dynamic models



Map from Illinois Storage Corridor (CarbonSAFE III)

Wabash CarbonSAFE (DE-FE0031626)

Geological characterization at WVR gasification plant near Terre Haute, IN

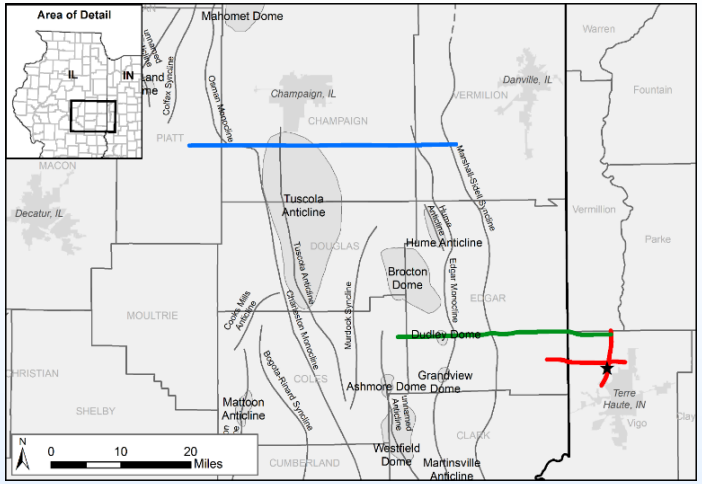
Wabash #1 stratigraphic test well and local/regional 2D seismic data:

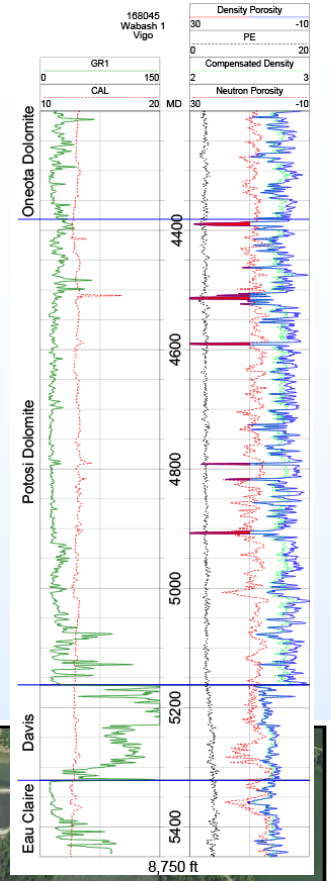
- Mt. Simon porosity/permeability lower than expected; regional insight
- **Potosi Dolomite** appears to have excellent storage reservoir potential
- Modeling shows Potosi can accept required CO_2 amount;
  no adverse pressure buildup
- Potosi-Maquoketa storage complex has economic potential

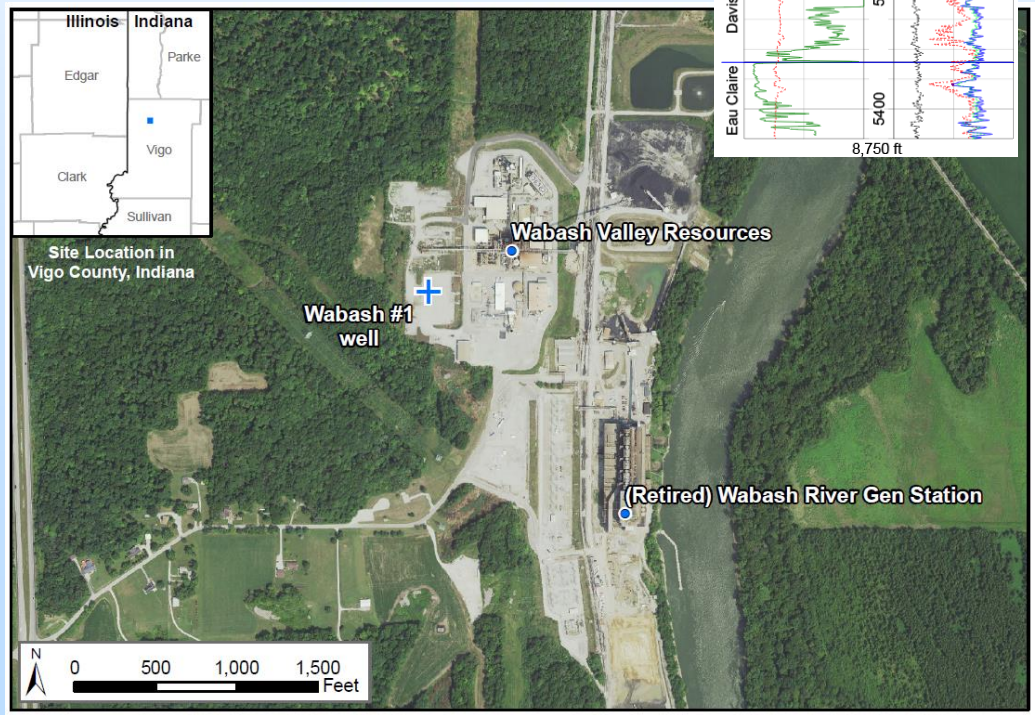
→ WVR industrial project continuing under DOE Coal FIRST (DE-FE0031994)

Data from Wabash #1 has led WVR to develop Class VI permit material and continue with site characterization and development

2D Seismic Data Acquisitions







CarbonSAFE Illinois – Macon County (DE-FE0029381)

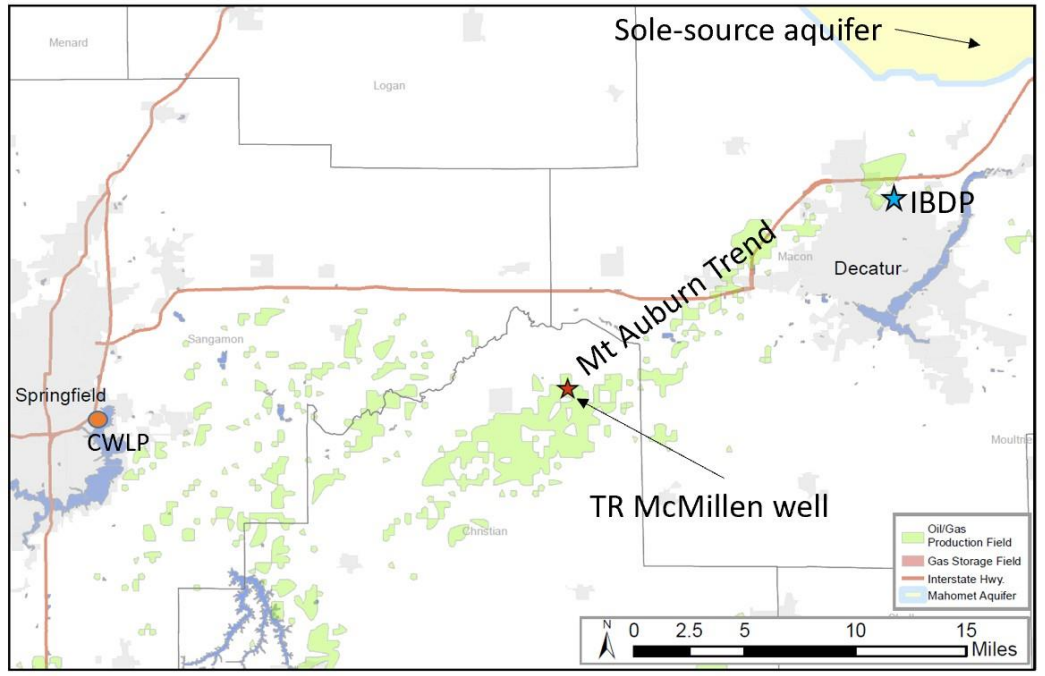
TR McMillen #2 well (~15 mi SW of Decatur, IL)
Well testing, 2D seismic, VSP, static and dynamic modeling

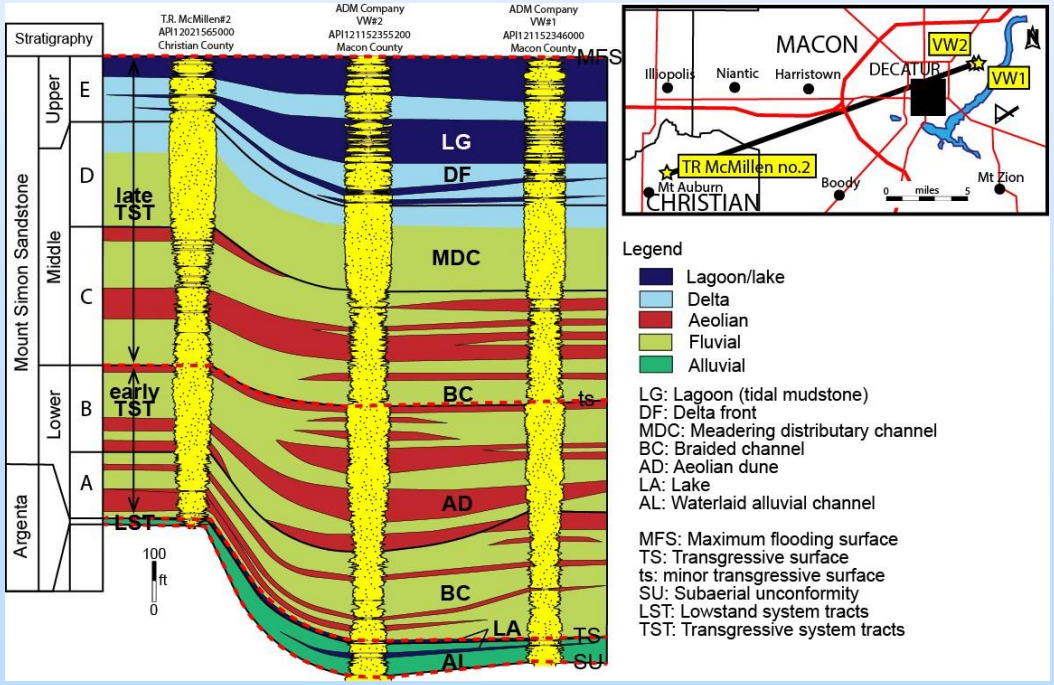
The **Mt Simon Storage Complex** of the Central Illinois Basin has excellent geological characteristics for CO_2 storage

- It is highly feasible for storage of 50 Mt CO_2 injected over 30 years
- Project has generated data that expands regional understanding of reservoir and seal characteristics
- The region is highly suitable for commercial development of CCS
- Commercial development projects are leveraging the Macon County data

→ CarbonSAFE Phase 3: Illinois Storage Corridor (DE-FE0031892)

Characterize 2 sites for commercial-scale CO_2 storage and develop Class VI permit applications for each





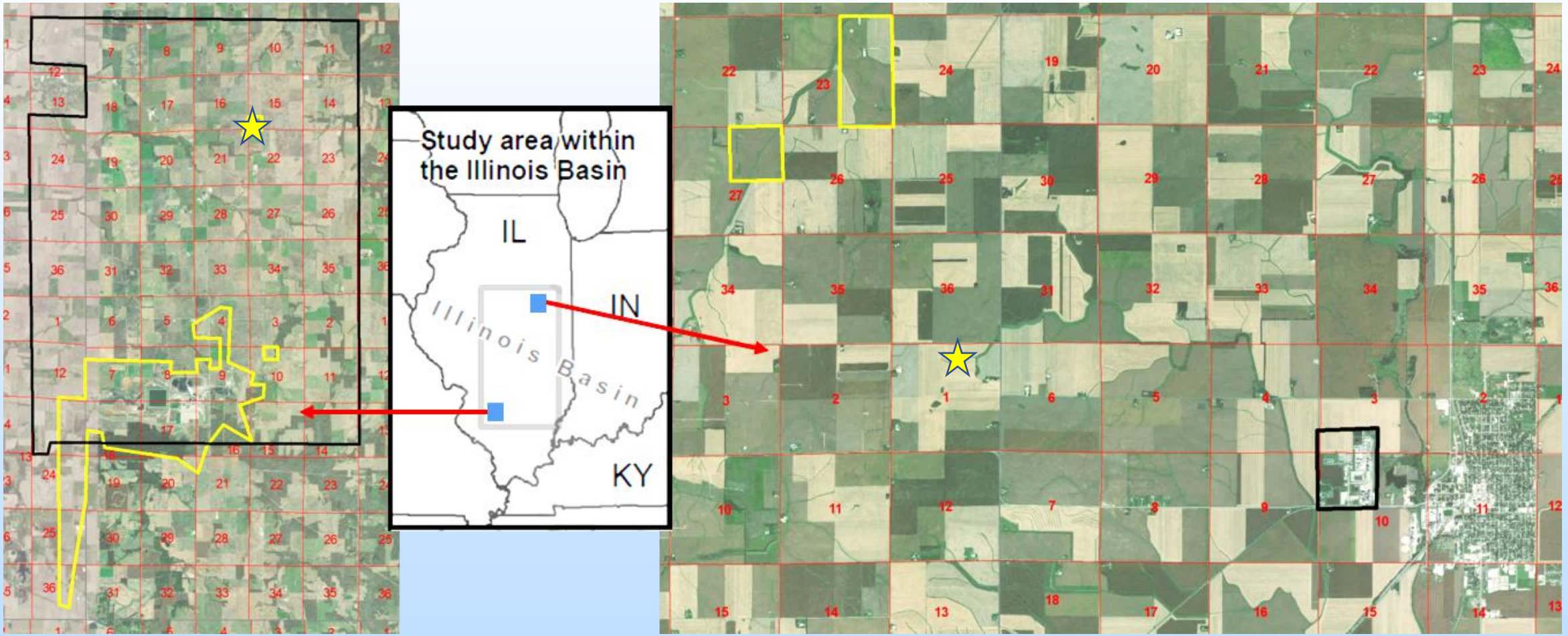
Prairie State Generating Company Site

Coal-fired power source: FEED study completed

Capture +8 million tons CO_2 per year

One Earth Energy Site

Ethanol source: Mt Simon Storage Complex – Possible Storage Hub



Site #2

Site #1

★ = characterization well

One Earth CCS – Target Mt. Simon injection (~50 mi NNE of Decatur, IL)

Data collection and analysis

Seismic:

- 2D: 3 lines (33 mi) collected 2021
- 3D seismic survey, early 2022

  20,000 receivers: 7 mi^2, over 40TB data

  Processed results delivered mid-September

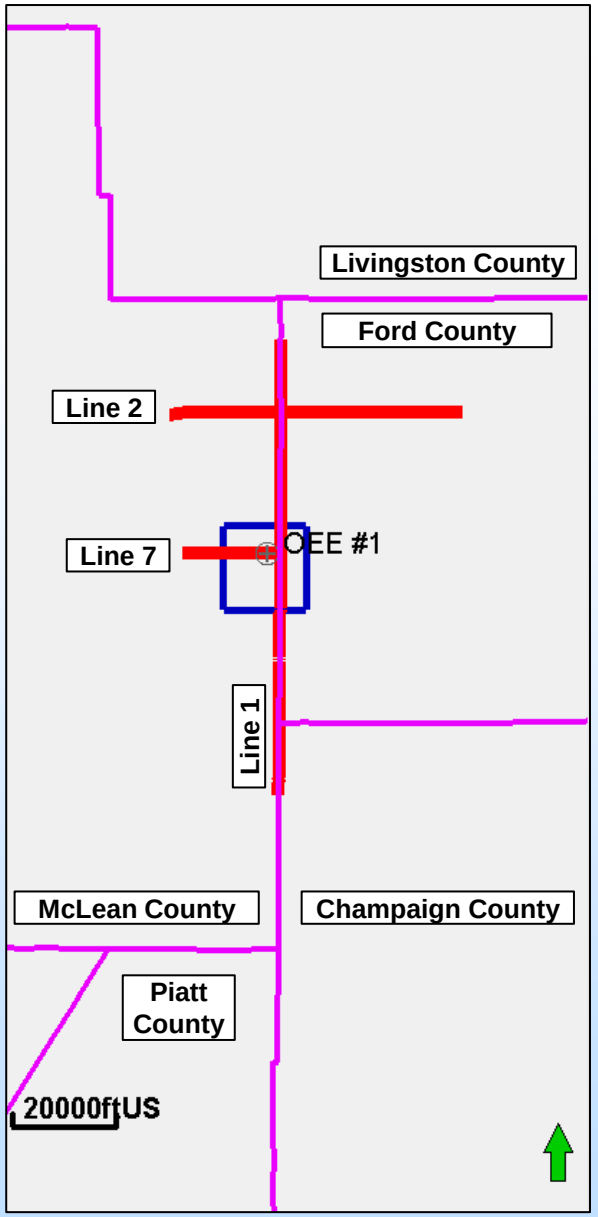
Stratigraphic well:

- OEE#1 well completed early 2022
- Full suite of logs; whole core + RSWC samples/analyses
- Well testing

  Upper Mt. Simon and lower Mt. Simon (Arkose)

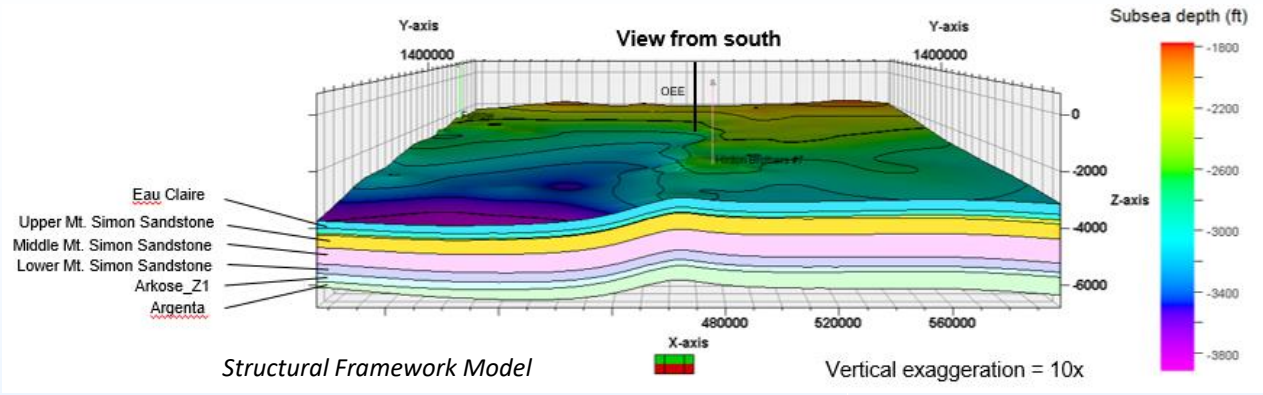
Core analyses + well testing show favorable reservoir in Mt. Simon

Core in lower Mt. Simon (Arkose)



Seismic data acquired: 2D (red lines)
3D (within blue box)

One Earth CCS – Target Mt. Simon injection



Structural Framework Model

Progress and Plans

Modeling:

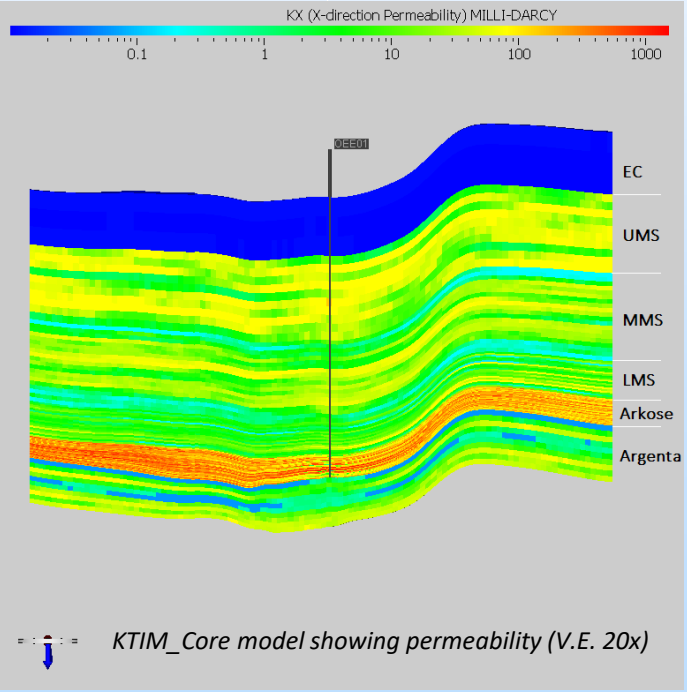
- Heterogeneous geocellular model
- 3 new inj. wells: 1.5 Mt/yr each for 20 yr;
  perforate in Arkose zone (200 ft)

One Earth CCS Class VI Permit Application: ~July-Sept primary development

- AoR based on St. Peter Sandstone LUSDW
- OEE#1 -> planned conversion to in-zone monitoring well IZM#1
- Final checks, submittal to EPA (3 permits)

Upcoming:

- 3D seismic: additional characterization & interpretation
- 3D VSP (LBNL; test new equipment)
- EA development ongoing
- Additional char. & reporting for DOE



KTIM_Core model showing permeability (V.E. 20x)

Prairie State Generating Company – Target St. Peter & Everton Sandstone injection (Southwest IL)

Data collection and analysis

Seismic:

- 2D initial collection in 2021 (25 mi)
- Additional ~77 mi, July 2022;

  Expand subsurface char. for injection well placement

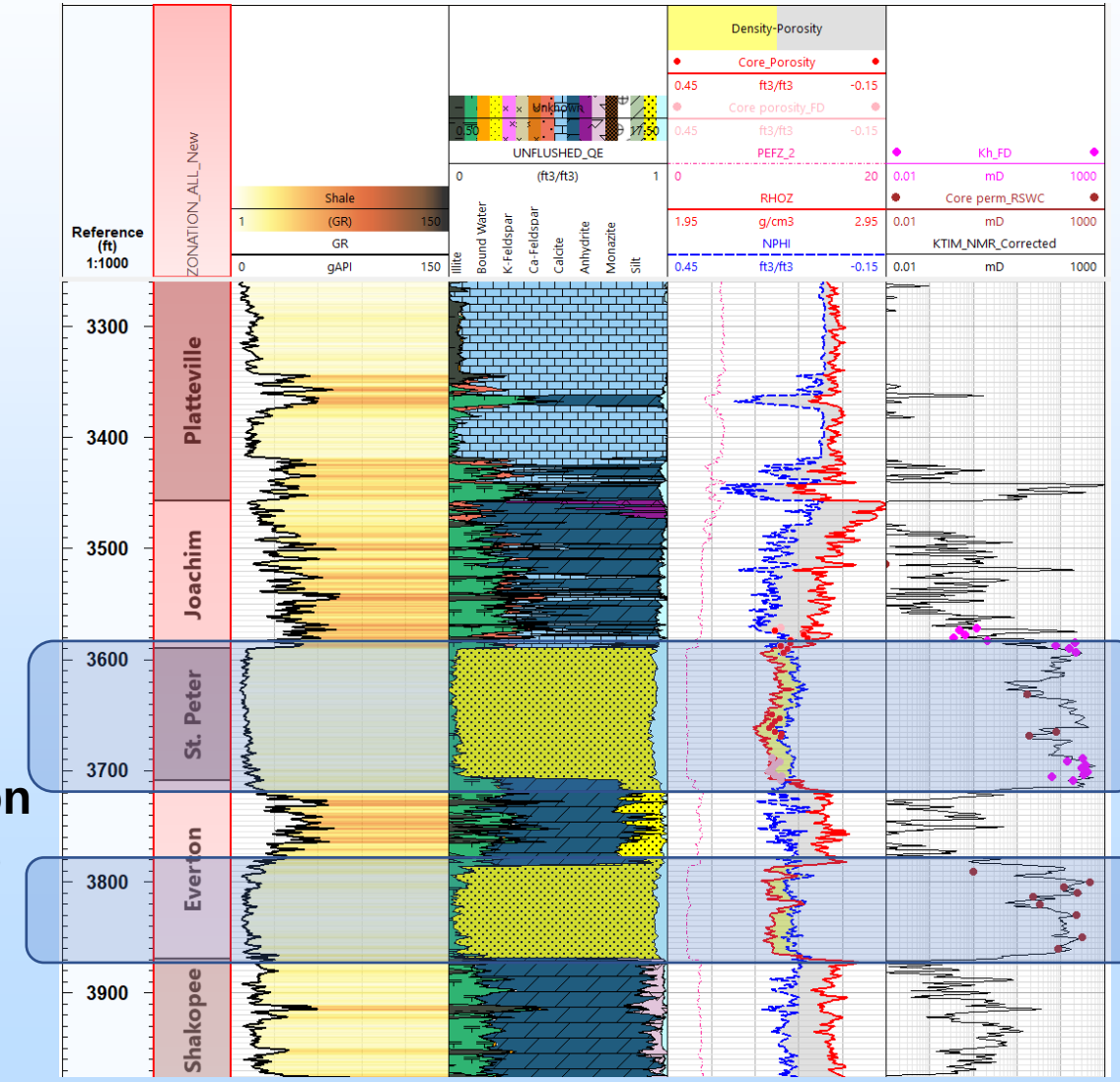
Stratigraphic well:

- Lively Grove #1 well drilled July-Aug 2021

  Mt.Simon absent in SW Illinois…

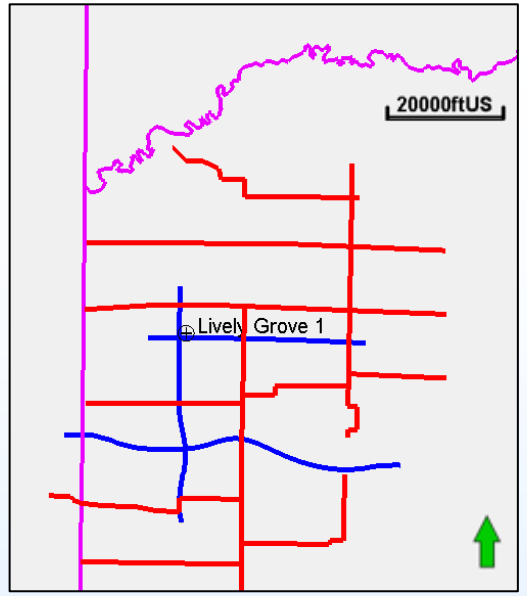
  - [Maquoketa shale]
  - St. Peter Sandstone
  - Everton Sandstone
  - Potosi Dolomite (Knox Gp.): thin vuggy intervals
- Logs, whole core + RSWC analyses, well testing

Injection reservoir in St. Peter and Everton Sandstones



Injection zones

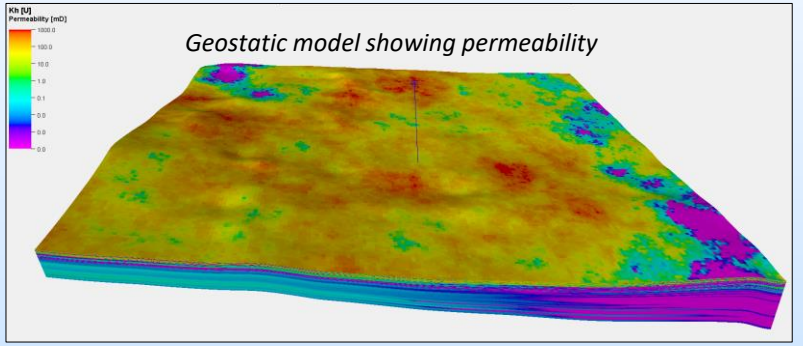
Prairie State Generating Company – Target St. Peter & Everton Sandstone injection



Progress and Plans

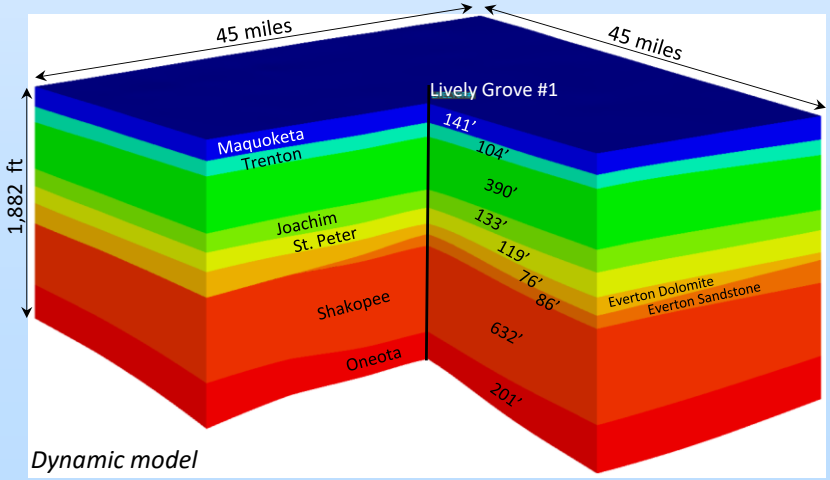
Modeling:

- Modeling of multiple injection wells, ongoing
- 8 Mt/yr challenging
- Simulations of various well placement scenarios; Plume/AoR management
- Integration of 2D new seismic (processing delivered early October)



Permit Application Development, in progress:

- Multiple injection wells
- Staged development
- Oil/gas development in area; legacy wells assessed within AoR



ISGS contacted by many parties; much interest in the Basin

→ Opportunities for new projects!

IL Storage Corridor Project Team