

Illinois Storage Corridor

DE-FE0031892

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Illinois State Geological Survey

U.S. Department of Energy

National Energy Technology Laboratory

**Carbon Capture Front End Engineering Design Studies and CarbonSafe
2020 Integrated Review Webinar**

August-17-19 2020

Program Overview

– Funding

- Federal Share: \$17,777,513
- Non-Federal Share \$8,110,159
- Total: \$25,887,672

– Overall Project Performance Dates

- BP1 (August 1 2020 – July 31 2022)
- BP2 (August 1 2022 – July 31 2023)

– Overall Project Objectives

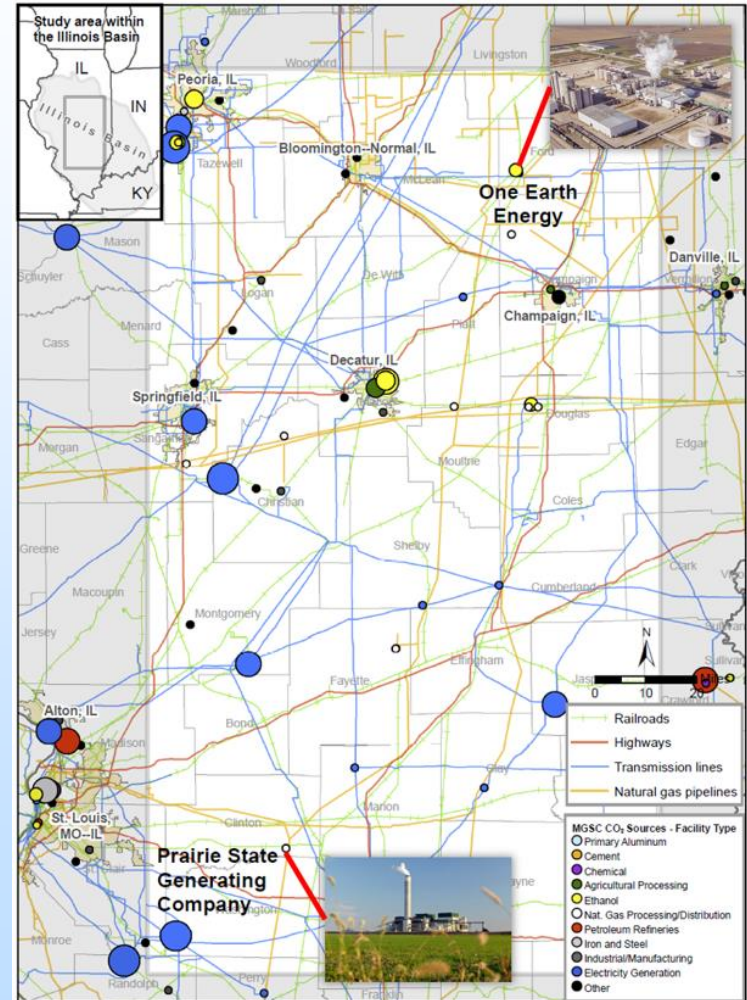
- Perform subsurface and related work to enable submission of 2 Class VI permit applications, and gain approval for construction of CO₂ injection wells at 2 sites.

Illinois Storage Corridor Team



Technology Section

- Site Selection
- 2 locations
 - One Earth Energy LLC
 - Ethanol
 - ~ 450,000 t/y
 - Prairie State GC
 - Coal-fired power
 - ~ 6Mt/y

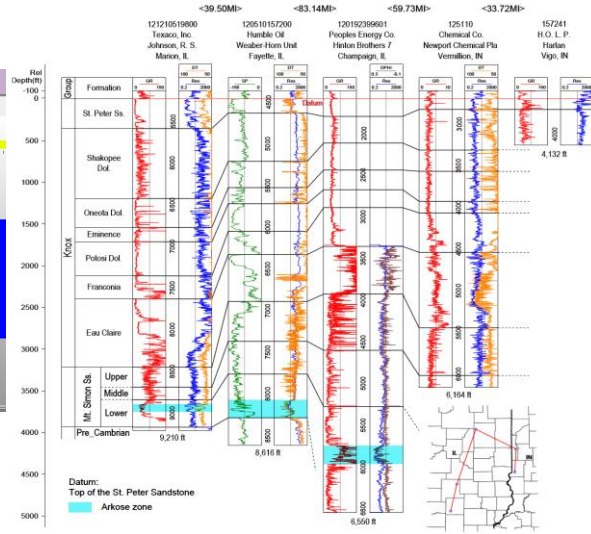
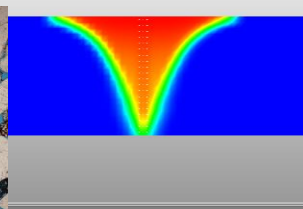
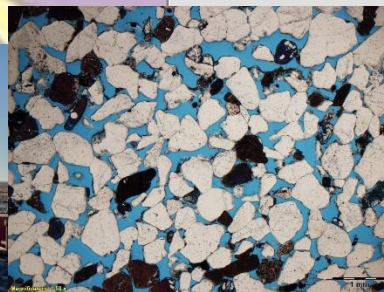
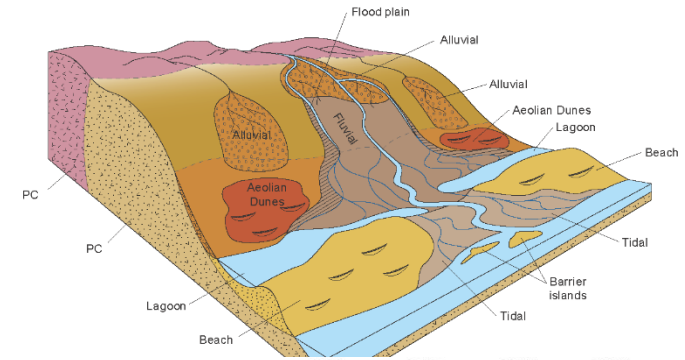
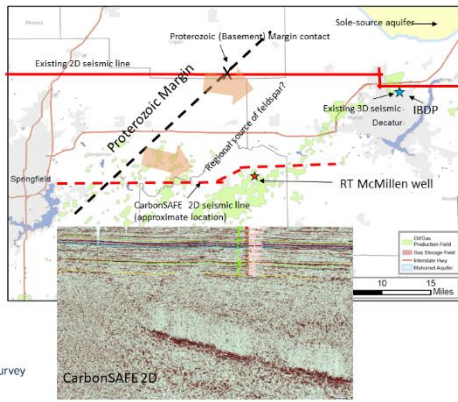


Technology Section

- Site Characterization efforts prior to current project
 - Builds on IBDP, IL-ICCS, CarbonSAFE's 1 and 2



Geological Controls over Storage Complex Distribution



Technology Section

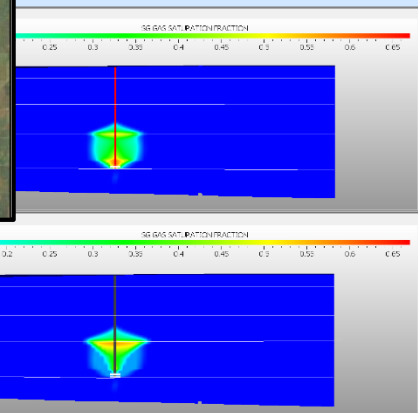
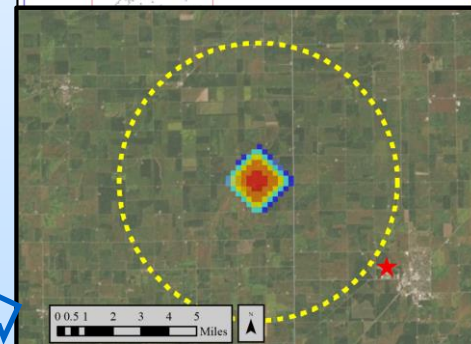
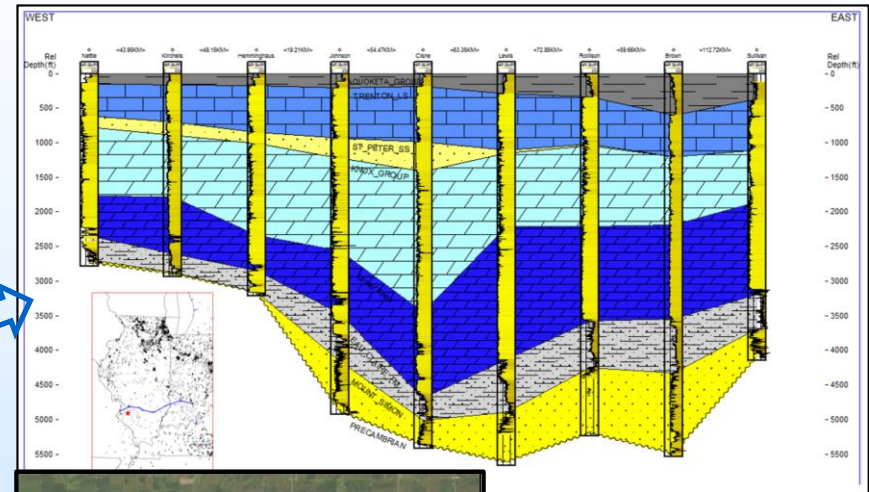
Prairie State

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

St. Peter-Knox Storage Complex

Cambro-Ordovician Storage Complex

Mt. Simon Storage Complex



One Earth

Technical Approach/Project Scope

A. Technical Approach/Project Scope

- PMP update – 30 days
- NEPA Documentation - 12 months
- Application for Underground Injection Class VI Permit to Construct – end BP1
- CO₂ Capture Feasibility Assessment – end BP1
- Quantitative Risk Assessment – 30 months
- Permit Underground Injection Class VI to Construct

Technical Approach/Project Scope

B. Project success criteria

- Execute data acquisition - analyses program:
- Submit applications for Underground Injection Class VI Permit to Construct
- Receive Permit Underground Injection Class VI to Construct

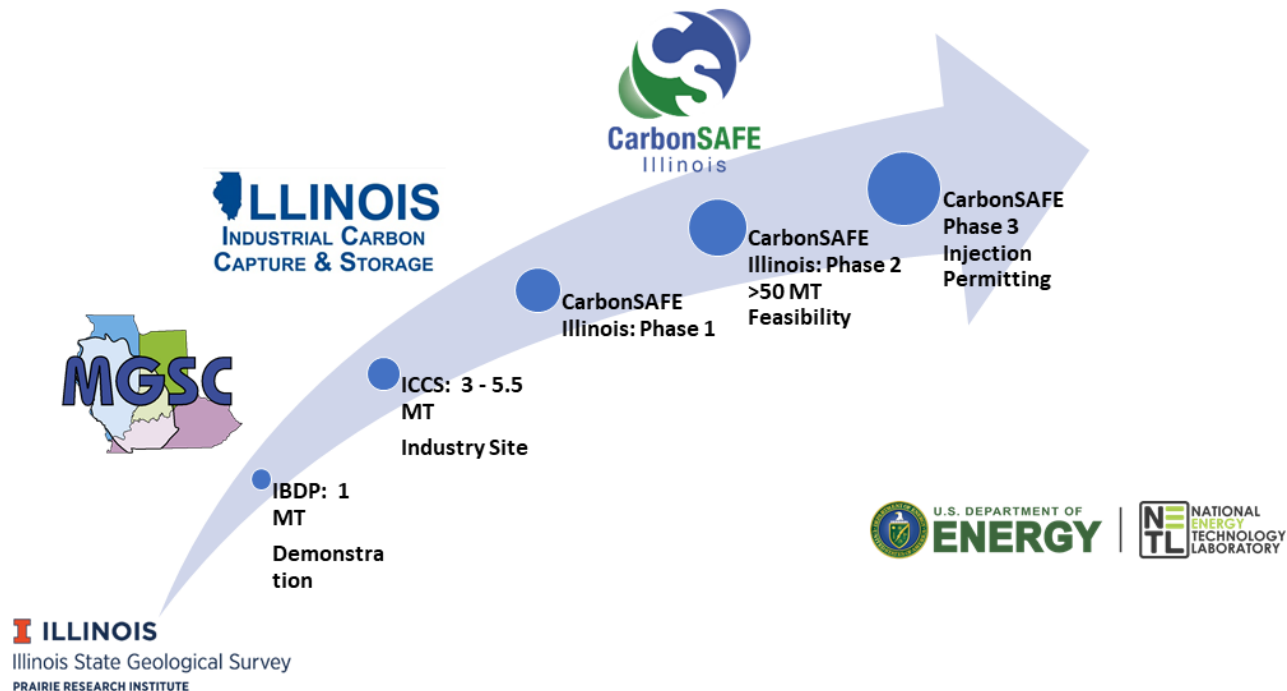
C. Significant project risks and mitigation strategies

- Primary geology unsuitable – secondary storage zones exist
- Negative public response – develop early engagement strategy
- Project cost over runs – monitor costs esp during drilling

Progress and Current Status

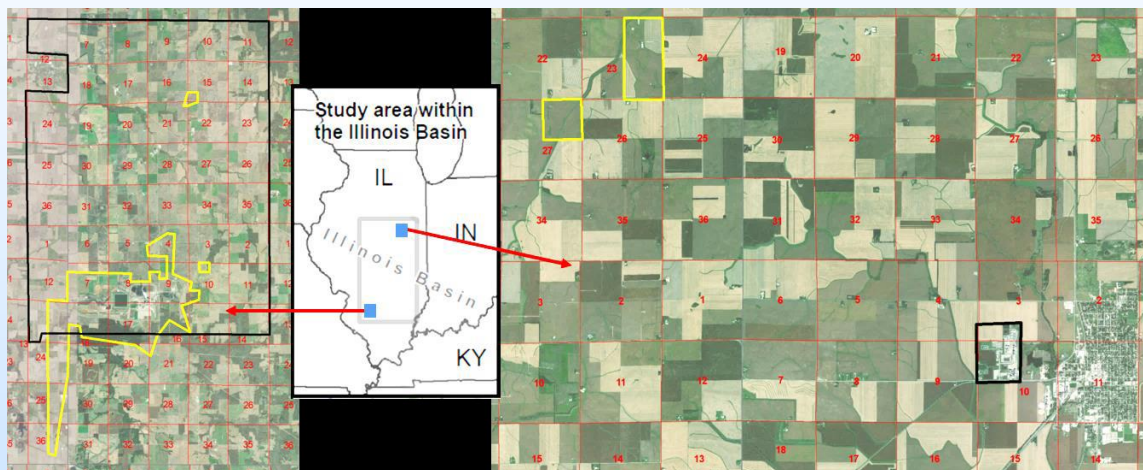
- a. Recent significant accomplishments and how they tie to the site/technology/design/commercialization challenges

CCS Progression in Illinois Basin



Progress and Current Status

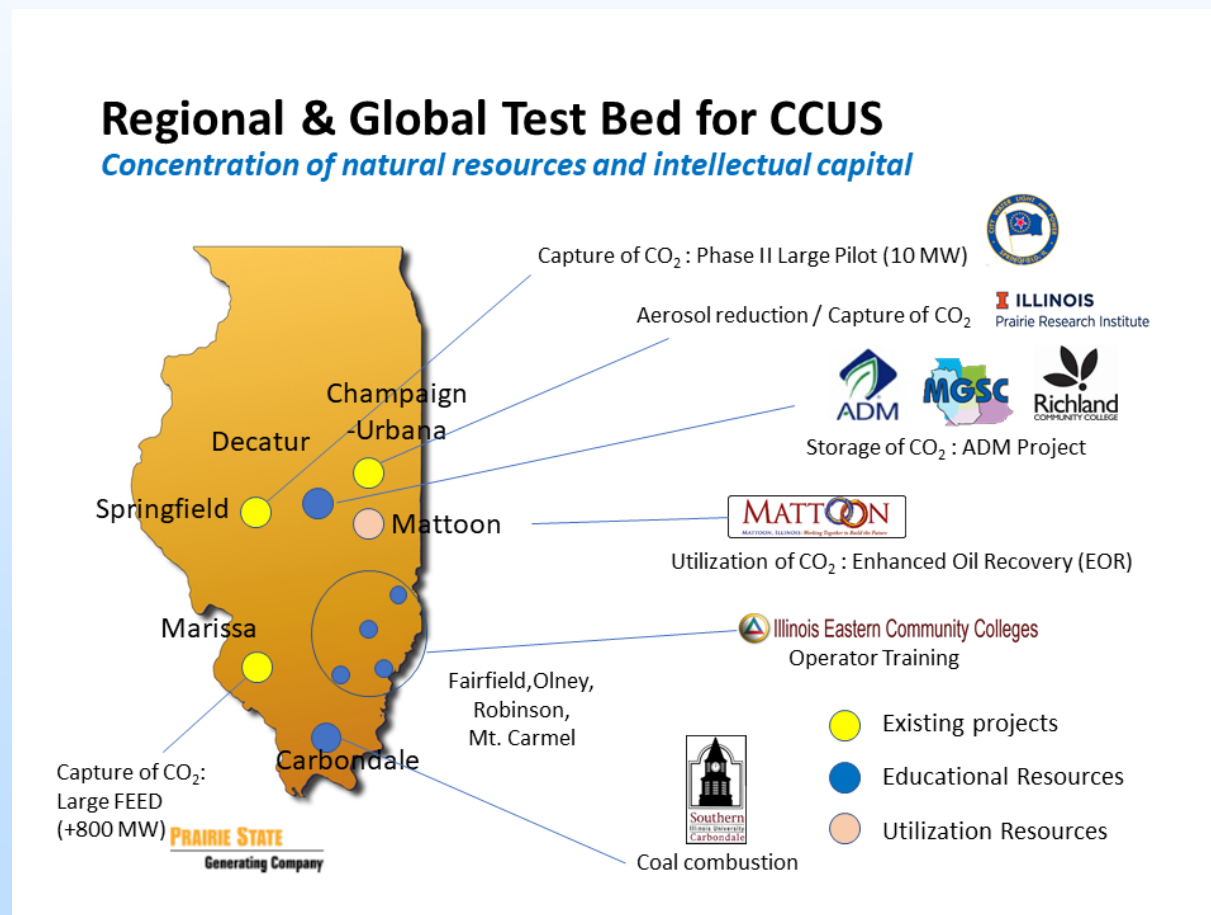
b. Status for host site selection/access



- Both sites are rural
- Each site has land available for geological development
- Locations of seismic surveys to be finalized
- Access for drilling is on land owned by source site

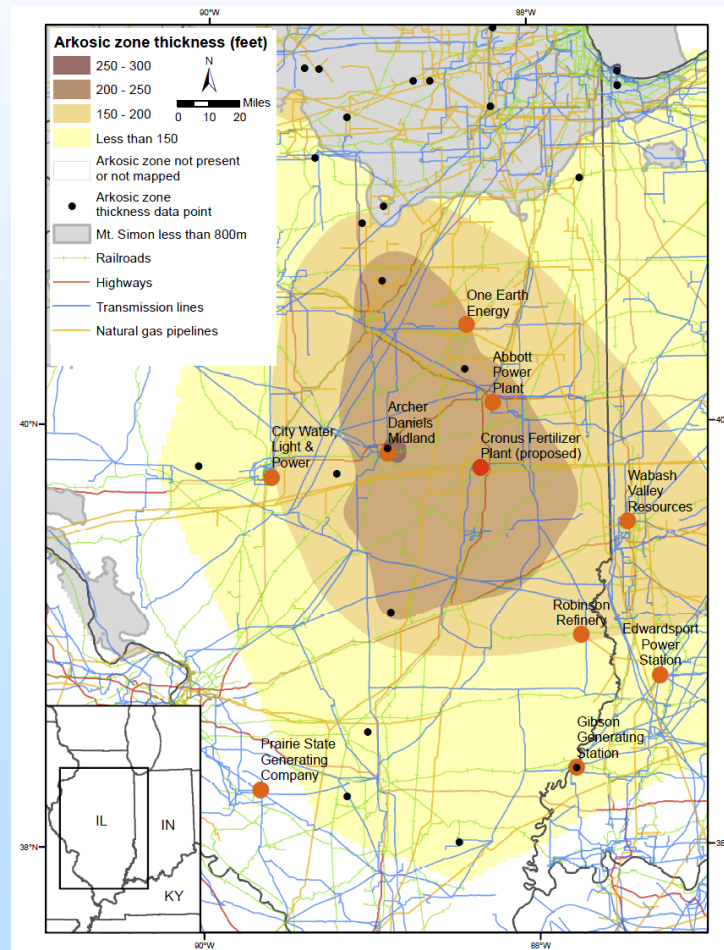
Progress and Current Status

c. Regional integration of CO₂ Capture



Progress and Current Status

c. Regional integration of transport and storage/utilization



Progress and Current Status

- d. Gaps/Challenges/Hurdles: technology, design, supply chain, regulatory, access, site characteristics
 - Time to conduct field activities and generate Class VI permits will be a challenge
 - State regulatory uncertainty regarding storage
 - Federal regulatory uncertainty regarding time required for EPA to review Class VI submission
 - Uncertainty around FN involvement

Progress and Current Status

e. Synergy opportunities

Full-Scale FEED Study For a 816 MWe Capture Plant at the Prairie State Generating Company Using Mitsubishi Heavy Industries of America Technology



DE-FE0031841 / Pittsburgh, PA / November 13, 2019

Kevin C OBrien

Director, Illinois Sustainable Technology Center and Illinois State Water Survey



Summary Slide

A. Conduct geological evaluation at 2 sites for the storage of CO₂ and generation of Class VI permit submissions.

- Acquire 2D and 3D seismic data
- Drill 2 characterization wells
- Perform modeling and simulation of injection performance
- Conduct quantitative risk assessments
- Perform pre-feasibility of capture at ethanol plant
- Prepare 2 Class VI permit applications,
- Attain approval for construction of CO₂ injection wells at 2 sites.

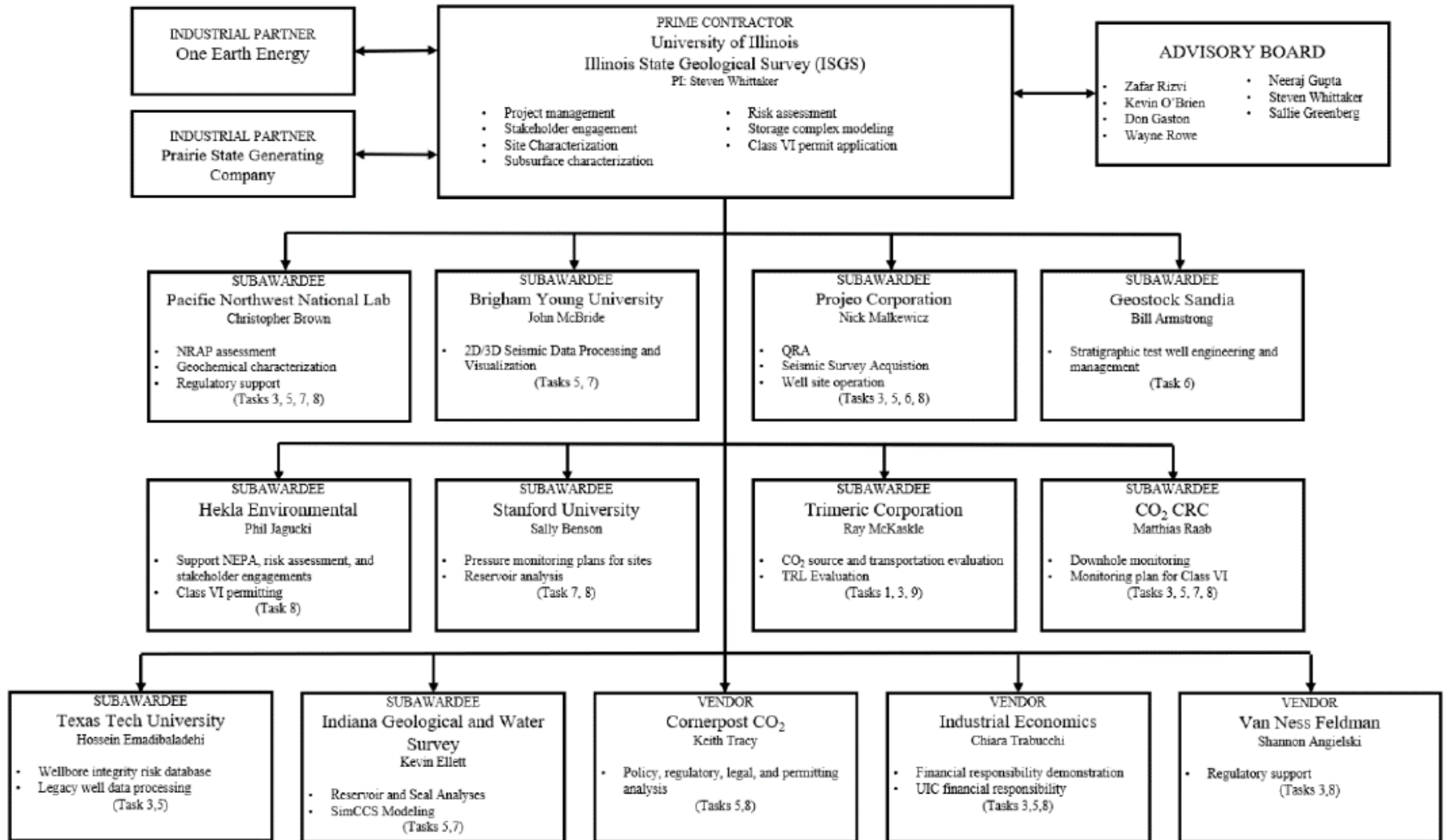
B. Start Project!

a. Update PMP

Appendix

- These slides will not be discussed during the presentation, **but are mandatory.**

Organization Chart



Gantt Chart

| Table 6. Gantt Chart with Team Responsibilities by Task. Letters refers to milestones in Table 3. | | | | Budget Period 1 | | | | | | | | | | | | Budget Period 2 | | | | Subawardees | | | | | | | | | | | | Vendors | | | |
|---|---|---------|---------|-----------------|----|------|----|----|----|------|----|----|----|------|----|-----------------|------|------|-----|-------------|----------|-------|---------|----------|----------|------------|------|----------------------|------------|----------|---------|---------|--|--|--|
| | | | | 2020 | | 2021 | | | | 2022 | | | | 2023 | | | | | | | | | | | | | | | | | | | | | |
| # | Task Name | Start | End | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | ISGS | UIUC | PNNL | BYU | Projeo | Geostock | Hella | CO2 CRC | Stanford | Trimeric | Texas Tech | IGWS | Industrial Economics | Cornerpost | Van Ness | Feldman | | | | |
| 1.0 Project Management and Planning | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.1 | Project Management Plan | Q1 2020 | End BP2 | A | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| 1.2 | Data Management Plan | Q1 2020 | End BP2 | | | | | | | | | | | | | X | | | | | | | | | X | | | | | | | | | | |
| 1.3 | Technology Maturation Plan | Q1 2020 | Q4 2021 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1.4 | Manage All Project Activities, Objectives, and Milestones | Q1 2020 | End BP2 | B | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| 1.5 | Knowledge Sharing | Q1 2020 | End BP2 | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| 1.6 | Communications | Q1 2020 | End BP2 | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| 2.0 National Environmental Protection Act (NEPA) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2.1 | Preparation and Submission of an Environmental Information Volume (EIV) | Q1 2020 | Q2 2020 | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | |
| 2.2 | Preparation and Submission of NEPA Documentation | Q1 2020 | Q4 2020 | | | | | | | | | | | | | | | | | X | | | | | | | | | | | | | | | |
| 3.0 Risk Assessment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3.1 | Quantitative Risk Assessment | Q1 2020 | End BP2 | | | | | | | | | | | | | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | | | |
| 3.2 | NRAP Toolkit Assessment | Q1 2020 | Q2 2022 | | | | | | | | | | | | | X | | X | | | | | | X | | | | | | | | | | | |
| 4.0 Stakeholder Engagement and Public Outreach | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4.1 | Stakeholder Analysis and Engagement Plan | Q1 2020 | Q4 2021 | | | | C | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| 4.2 | Conduct Stakeholder Engagement and Public Outreach | Q4 2021 | End BP2 | | | | | | | | | | | | | X | | | | | | | | | | | | | | | | | | | |
| 5.0 Site Characterization | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5.1 | Pre-Drilling Site Assessment | Q1 2020 | Q2 2020 | | D | | | | | | | | | | | X | | | X | X | | | | | | | X | | | | | | | | |
| 5.2 | Obtain Permits for Field-based Characterization Activities | Q1 2020 | Q3 2021 | | | E | | | | | | | | | | X | | | | X | X | | | | | | | | | | | | | | |
| 5.3 | 2S and 3D Seismic Surveys | Q1 2020 | Q2 2021 | | | | F | | | | | | | | | X | | | X | X | | | | | | | | | | | | | | | |
| 5.4 | Analyses of Site Data for Class VI Permit Requirements | Q1 2020 | End BP1 | | | | | | | | | | | | | X | X | X | X | X | | | X | X | | X | | | | | | | | | |
| 5.5 | Policy, Regulatory, Legal, and Permitting Characteristics | Q1 2020 | End BP1 | | | | | | | | | | | | | X | | | | | | | | | | | | X | X | X | | | | | |

Gantt Chart (cont.)

| Table 6. Gantt Chart with Team Responsibilities by Task. Letters refers to milestones in Table 3. | | | | Budget Period 1 | | | | | | | | Budget Period 2 | | | | | | | | | | | | | | | | | | | | |
|---|--|---------|---------|-----------------|----|------|----|----|----|------|----|-----------------|----|------|----|-------------|------|------|-----|--------|----------|-------|---------|----------|----------|------------|------|----------------------|------------|----------|---------|--|
| | | | | 2020 | | 2021 | | | | 2022 | | | | 2023 | | Subawardees | | | | | | | | | | | | Vendors | | | | |
| # | Task Name | Start | End | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | Q1 | Q2 | Q3 | Q4 | ISGS | UIUC | PNNL | BYU | Projeo | Geostock | Hekla | CO2 CRC | Stanford | Trimeric | Texas Tech | IGWS | Industrial Economics | Cornerpost | Van Ness | Feldman | |
| 6.0 | Drilling and Well Testing | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.1 | Design Well Drilling Program | Q1 2020 | Q3 2021 | | | | | | | | | | | | | X | | | | X | X | | | | | | | | | | | |
| 6.2 | Drill and Construct Stratigraphic Test Well | Q4 2021 | Q2 2021 | | | | | G | | | | | | | | | | | | X | X | | | | | | | | | | | |
| 6.3 | Well Testing and Data Collection | Q1 2021 | End BP1 | | | | | | | | | | | | | X | X | | | X | X | | | | | | | | | | | |
| 7.0 | Storage Site Modeling | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 7.1 | Development of Conceptual and Static Model | Q2 2020 | End BP1 | | | H | | | | | | | | | | X | | X | | | | | | X | | | X | | | | | |
| 7.2 | Development of Dynamic Reservoir Model | Q3 2021 | End BP1 | | | | | | | | | | | | | X | X | X | | | | | X | X | | | X | | | | | |
| 7.3 | Development of Geomechanical Model | Q3 2021 | End BP1 | | | | | | | | | | | | | X | X | X | | | | | X | | | | X | | | | | |
| 7.4 | Model Calibration and Updating | Q2 2021 | End BP1 | | | | | | | | | | | | | X | X | X | | | | | X | | | | | | | | | |
| 8.0 | UIC Class VI Permitting | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 8.1 | Pre-Permitting Activities | Q1 2020 | Q3 2021 | | | | | | | | | | | | | X | | | | | | X | | | | | X | X | X | X | | |
| 8.2 | UIC Class VI Permit Application | Q3 2021 | End BP1 | | | | | | | | | | I | | | X | | | | X | | | | | | | X | X | X | X | | |
| 8.3 | Permit Application Revisions | Q1 2022 | End BP2 | | | | | | | | | | | | | X | | | | | | X | | | | | X | X | X | X | | |
| 9.0 | Carbon Capture Assessment | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 9.1 | Identification of CO2 Sources and Capture Technology | Q1 2020 | Q2 2020 | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | |
| 9.2 | Conduct Pre-Feasibility Study of Capture System | Q3 2021 | End BP1 | | | | | | | | | | | | | | | | | | | | | | X | | | | | | | |