

Establishing an Early CO₂ Storage Complex in Kemper County, Mississippi: Project ECO₂S

DE-FE0031888

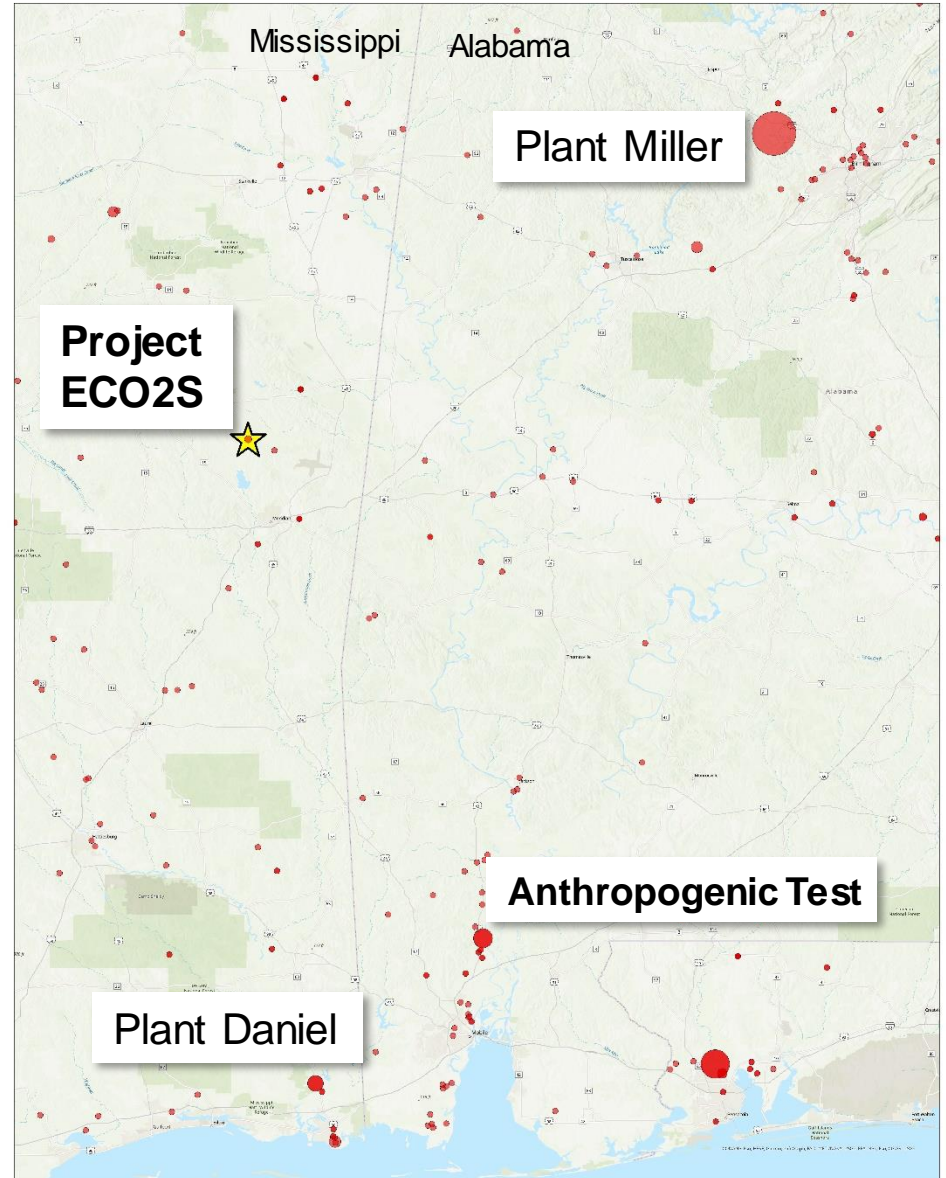
David Riestenberg, Advanced Resources International, Inc.

Richard Esposito, Southern Company

U.S. Department of Energy
National Energy Technology Laboratory
Carbon Management Project Review Meeting
August 15 - 19, 2022

Introduction

- Project ECO₂S is in Kemper County, Mississippi, near Mississippi Power Company's Plant Ratcliffe NGCC facility
- Potential regional CO₂ storage hub capable of storage CO₂ from multiple large sources
- Overall objectives are to:
 - Demonstrate that the subsurface at Kemper can safely and securely store commercial volumes of CO₂
 - Evaluate commercial prospects post combustion coal- and gas-fired capture, transportation and storage in the southeastern U.S.



ECO₂S Phase III Partners

RESEARCH PARTNERS



U.S. DEPARTMENT OF
ENERGY



NATIONAL
ENERGY
TECHNOLOGY
LABORATORY



Advanced Resources
International, Inc.

BATTELLE

Christensen
CCUS
Consult



Southern
Company



Enhanced Oil
Recovery Institute
UNIVERSITY OF WYOMING

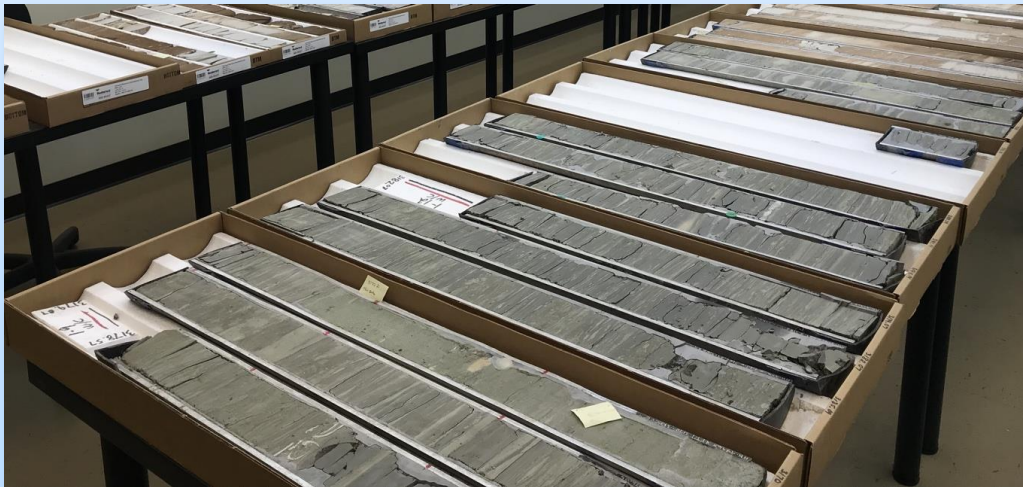


SPECIALIZED PARTNERS & VENDORS



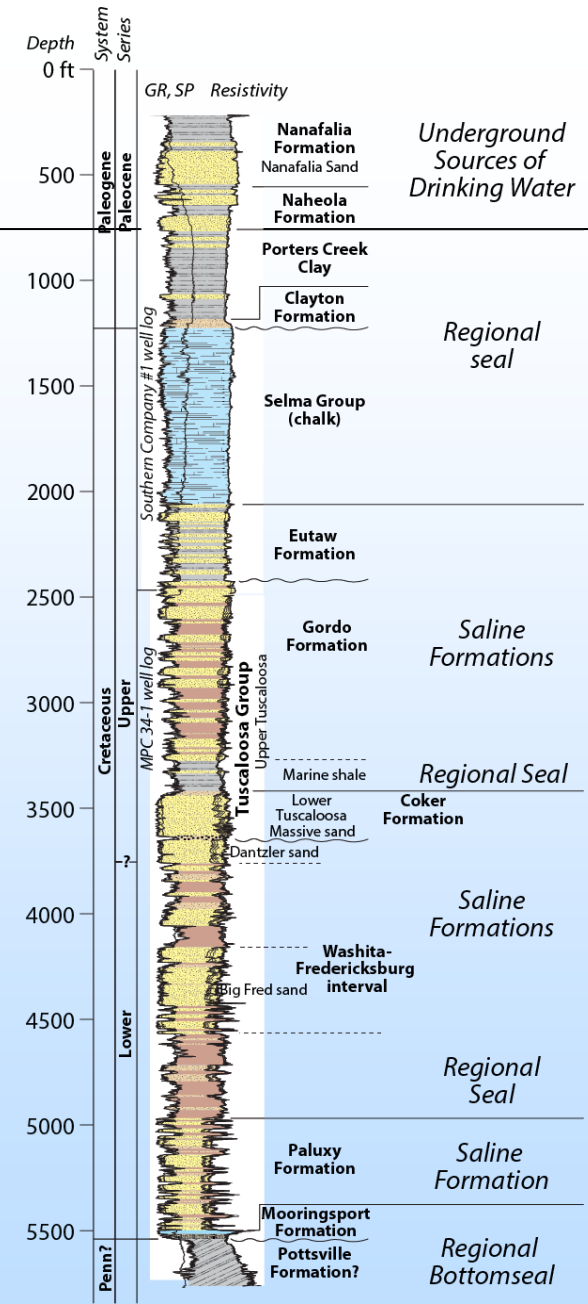
Technical Status – Data Acquisition

- Six characterization/monitoring wells drilled in Phase II and III to test and characterize geologic properties
- 290 ft of hole core from the Paluxy and Washita-Fredericksburg reservoirs, the Tuscaloosa Marine shale, and other secondary confining units
- Extensive well logging
- Reservoir fluid sampling and injection tests
- 92 line-miles of 2D seismic

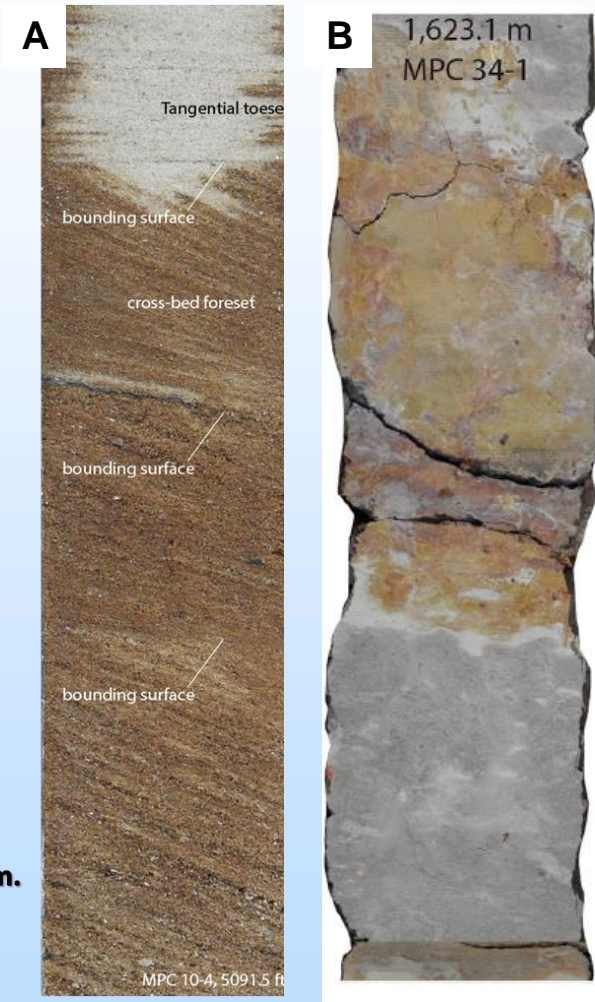
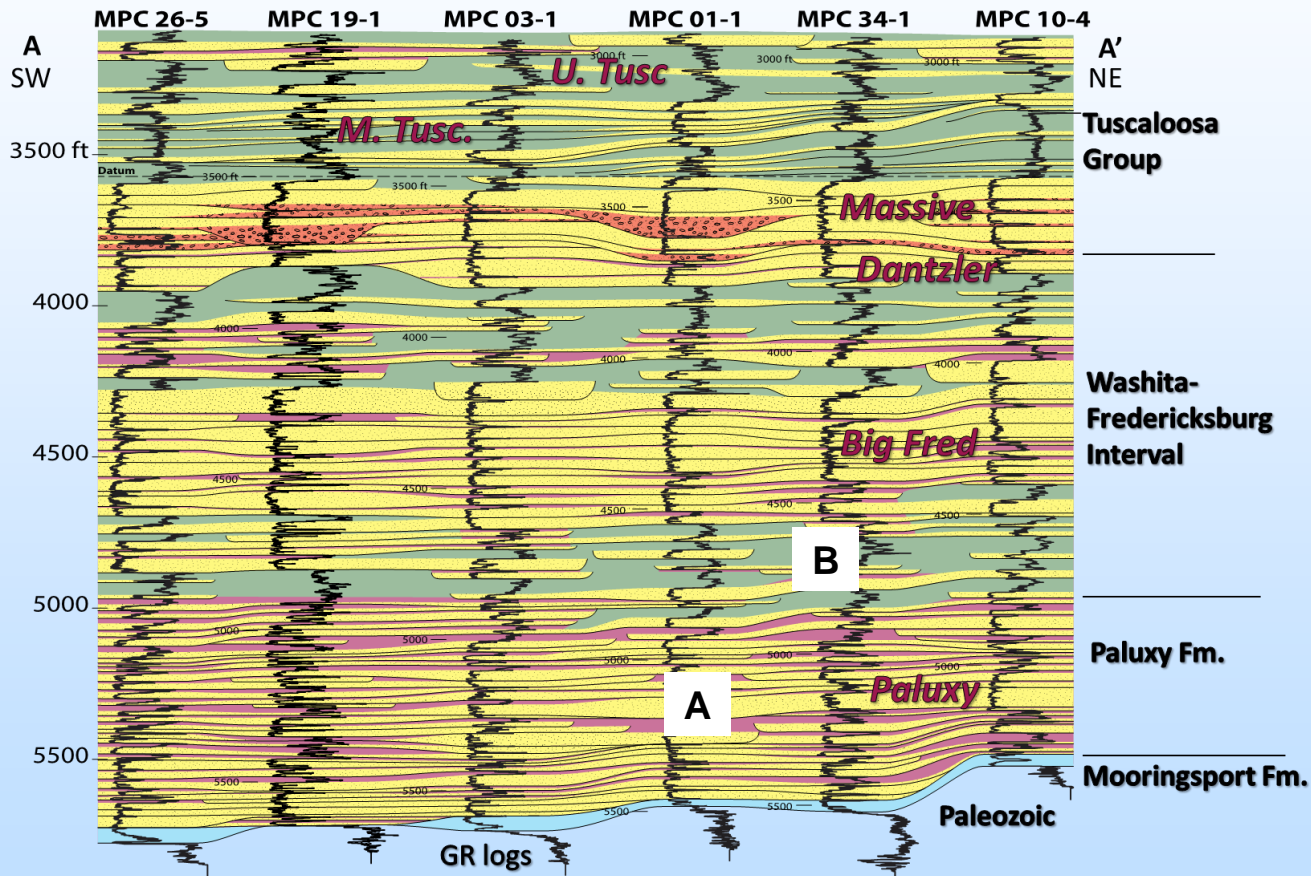


Technical Status - Geology

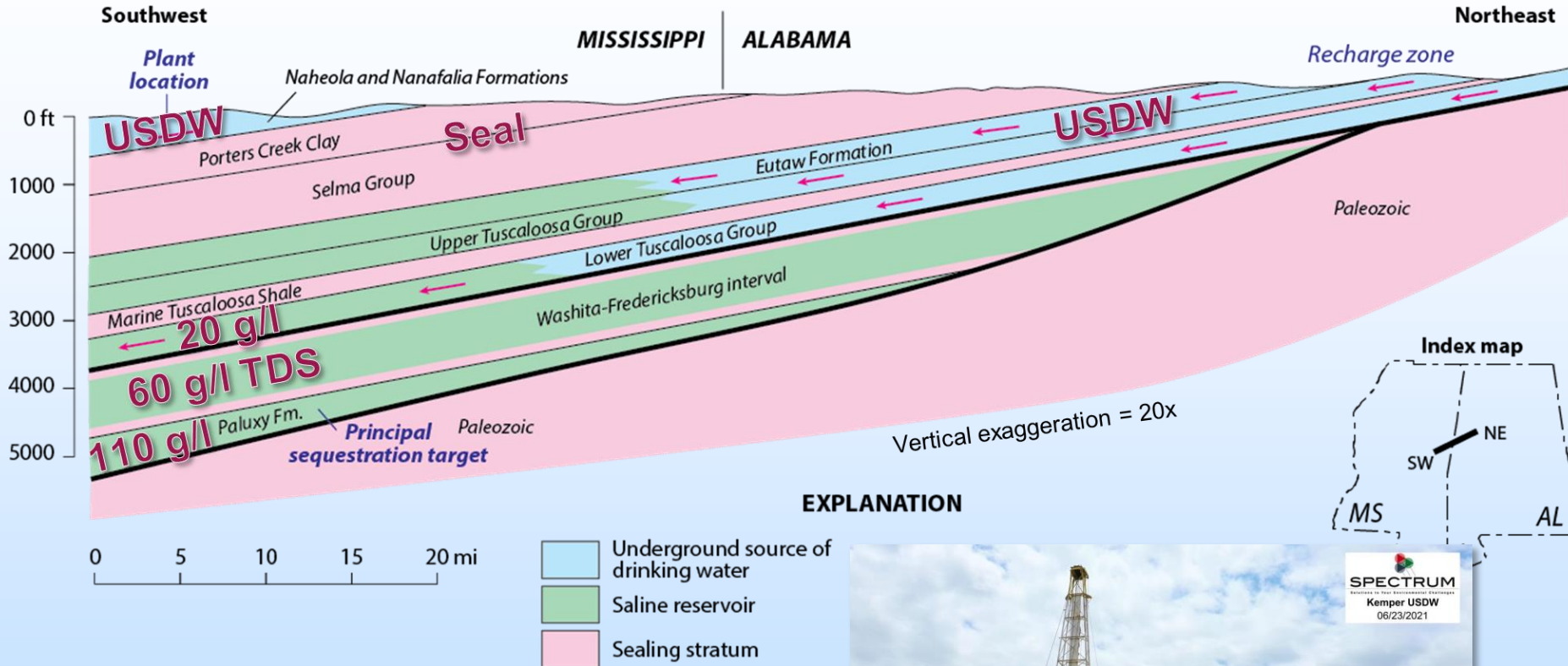
- Main reservoir rock interpreted as bedload-dominated fluvial sandstone; seals include mudrock and chalk
- Reservoirs occur between 3,500 ft and 5,500 ft bgs
- Porosity of sandstone in target zones averages 28.5%
- Reservoir permeability averages 3.6 D; maximum measured permeability is 16 D
- Mudstone confining units typically 1-64 nD
- Major stacked storage potential with >1,300 net feet of Cretaceous sandstone
- Static P₅₀ storage resource estimate: ~26 Mt/mi²; 1.4 Gt in 30,000 acre storage complex



Technical Status - Geology



Technical Status – USDW Characterization



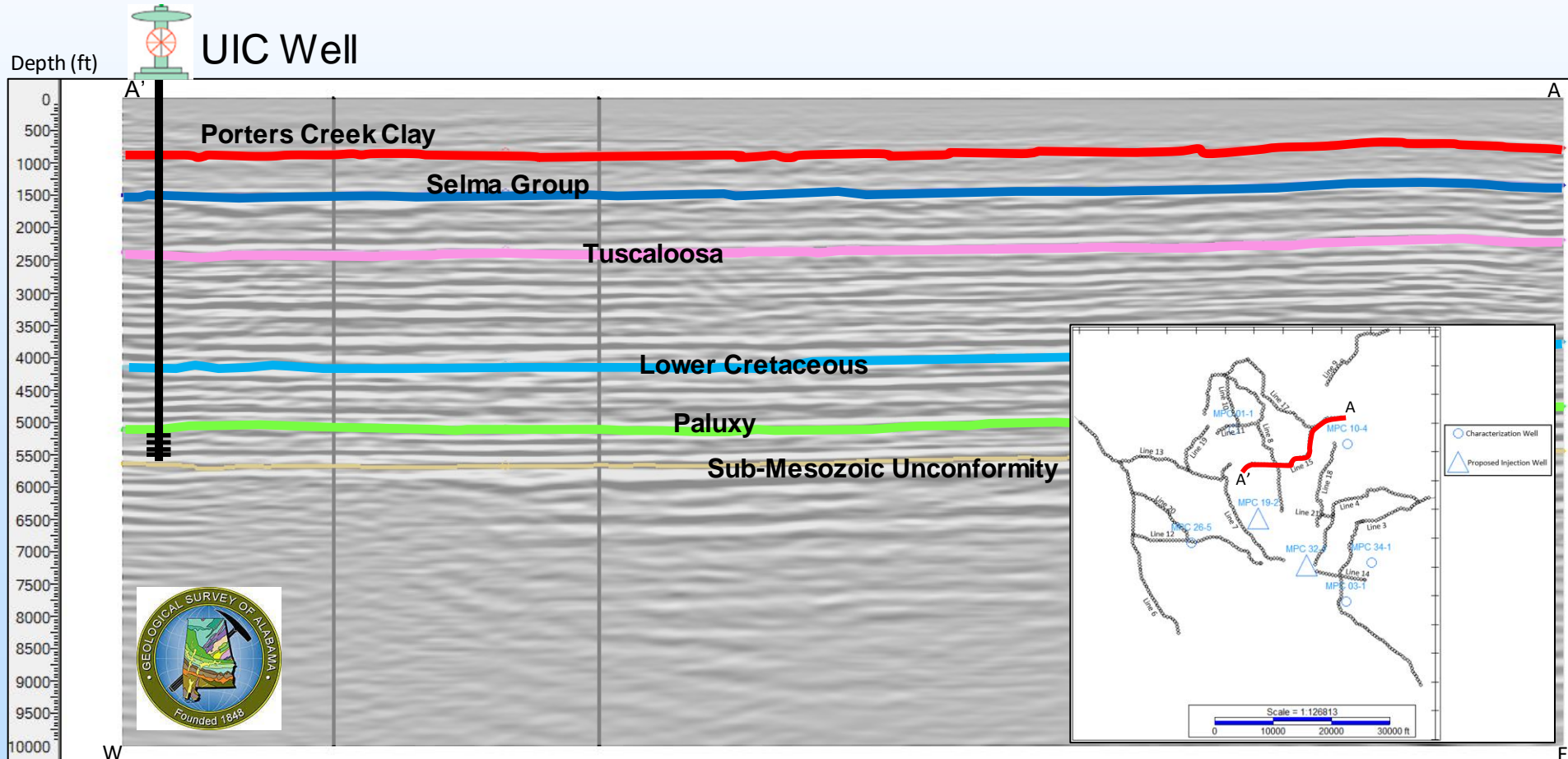
Pashin et al. (2008)

Aquifers below the Eutaw-McShan have TDS concentrations of > 10,000 mg/L



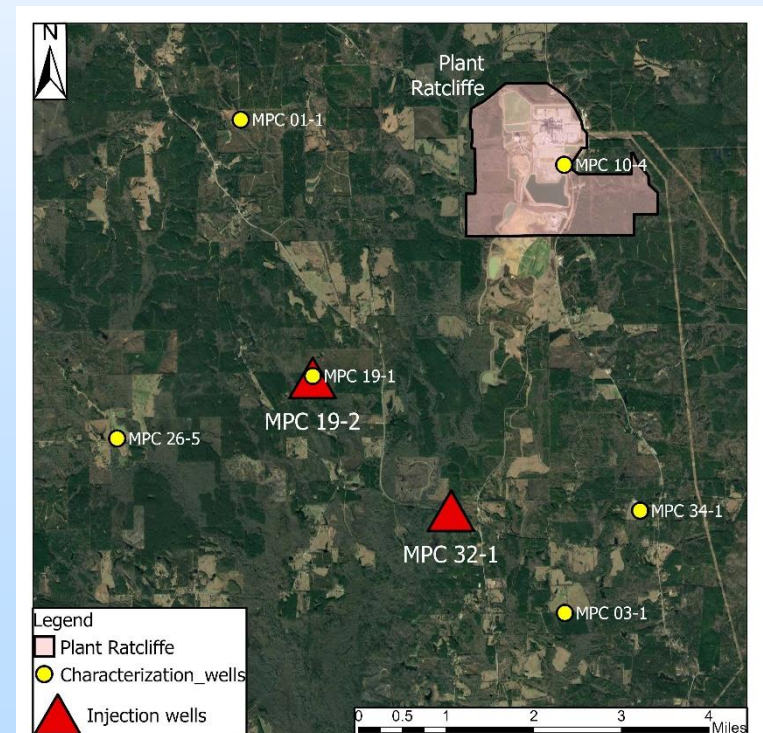
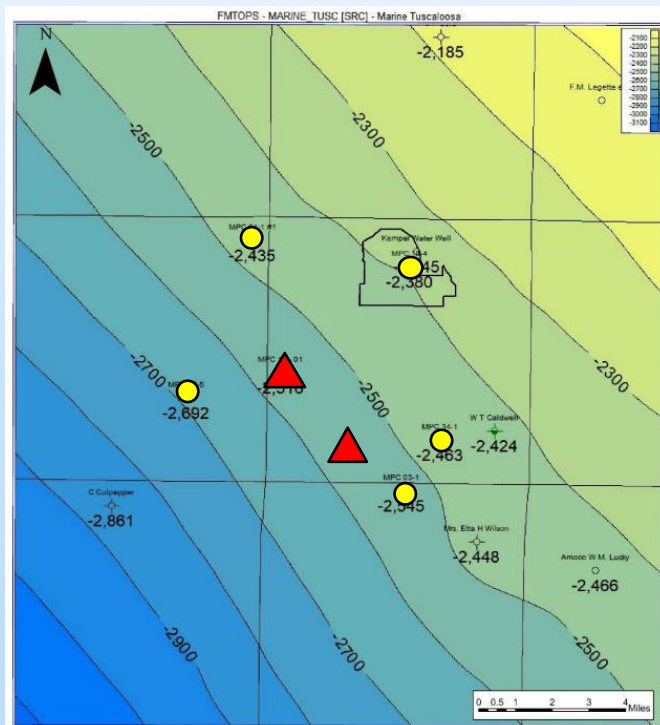
Technical Status 2D Seismic

The interpretation of the new 2D seismic shows near-horizontal formations above the Paleozoic unconformity with little internal heterogeneity. no cross-cutting faults or fractures



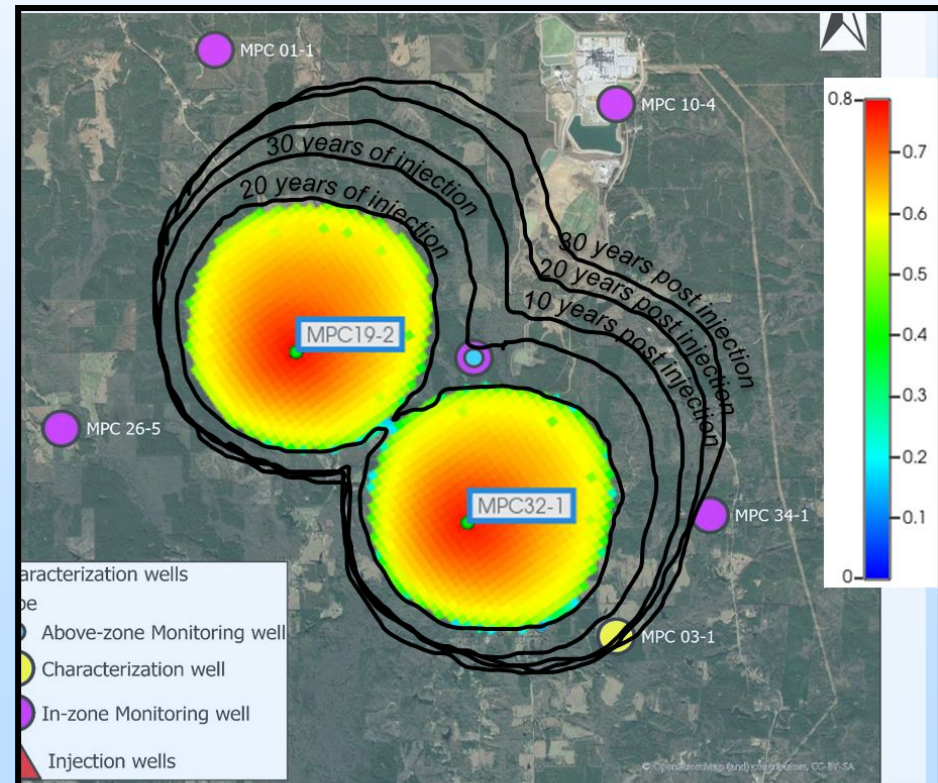
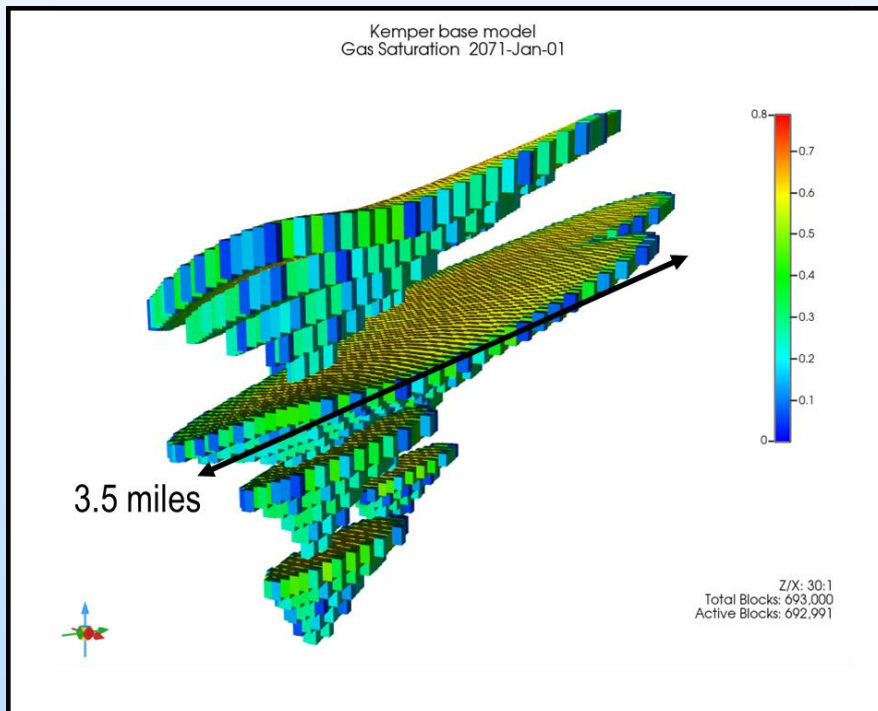
Technical Status – UIC Permitting

- CarbonSAFE Phase III scope requires Class VI well construction permits capable of 50MMt of storage in 30 years
- UIC program designed with two wells, each capable of 4,000 t/d (2.9 MMt/y)
 - Plant Ratcliffe’s annual CO₂ emissions are 1.7 to 2.2 MMt/y
- First permit application uploaded to GSDT site in August 2022



Technical Status – UIC Permitting

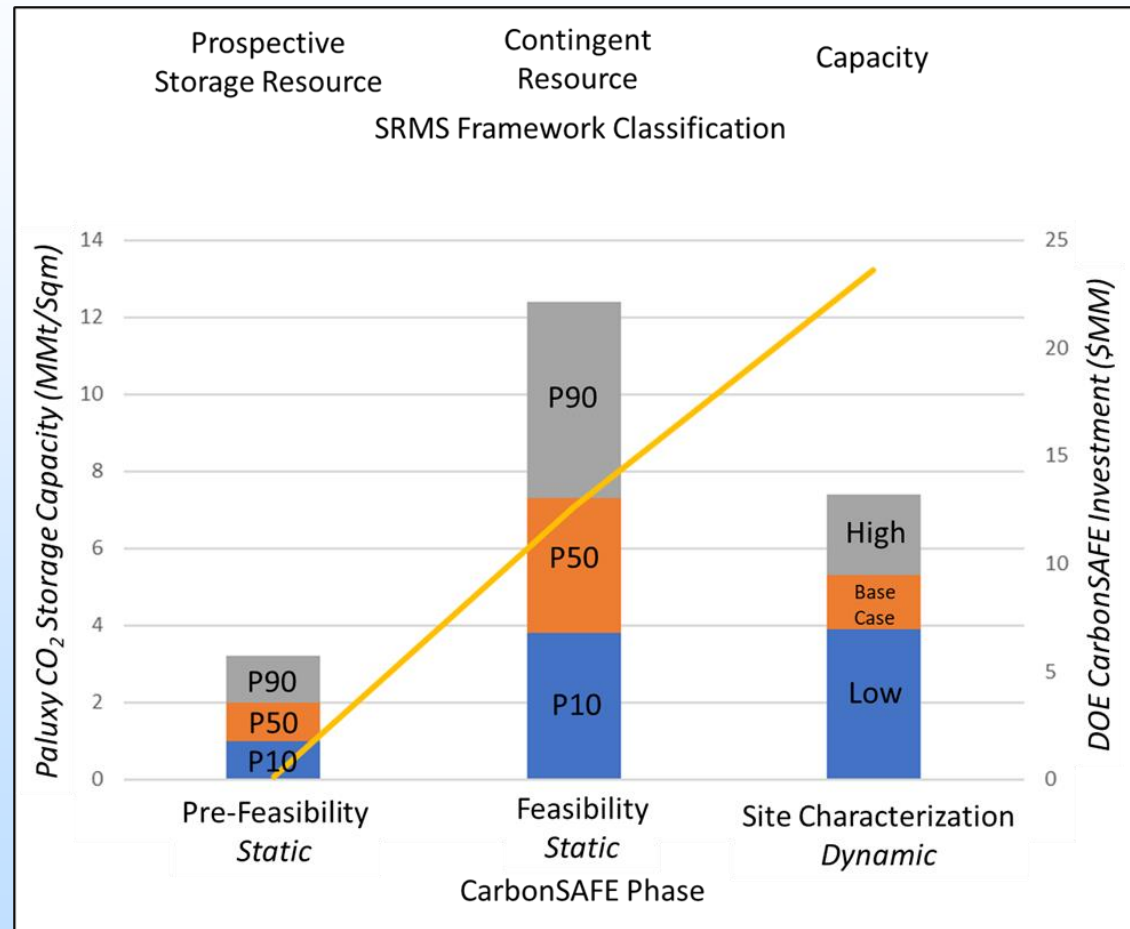
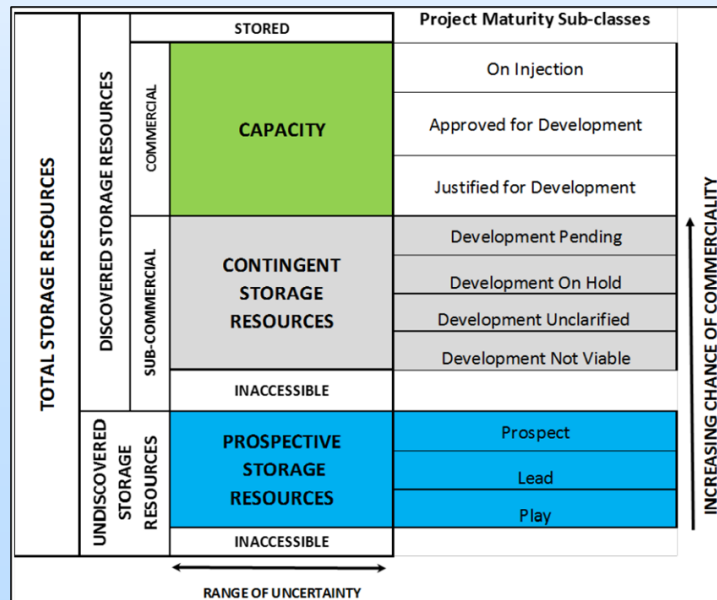
- CO₂ remains confined to the Paluxy formation
 - Internal baffles reduce vertical migration
- Plume growth is to the northeast (updip)
 - Essentially stabilized 20 years after injection stops



CO₂ plume is the projection of all the layers to show the maximum extent

Technical Status – Storage Resources Management System

- Paluxy reservoir at ECO₂S progresses from *Prospective Storage Resource* at the beginning of CarbonSAFE support to *Capacity* at the beginning of Phase IV

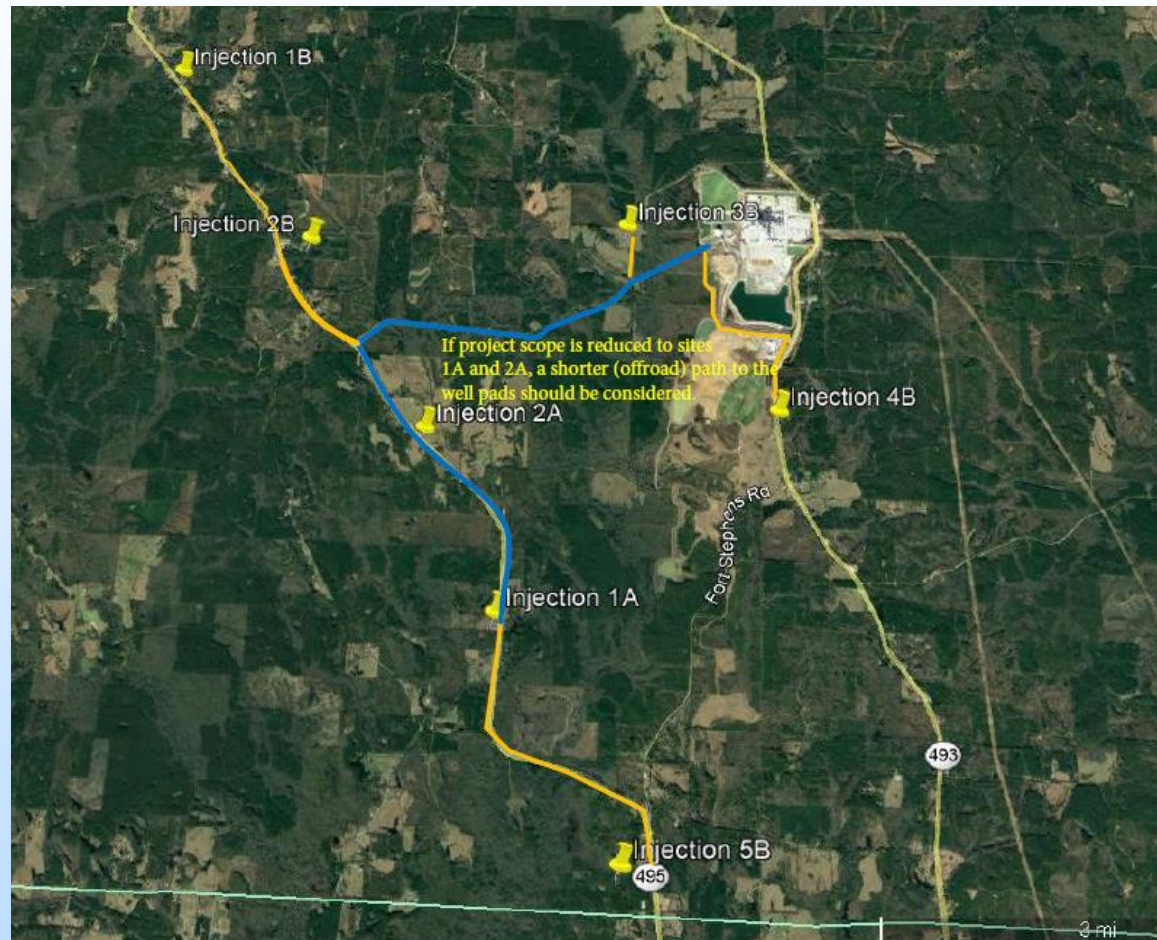


Technical Status – CO₂ Capture Assessments

- The project involves two CO₂ capture assessments, one at Plant Miller (coal) and one at Plant Ratcliffe (gas) with MHIA as the engineering contractor
 - The Plant Miller pre-feasibility assessment is being completed now. The capture technology developer completed the Inside Boundary Limit (ISBL) and CCSKC is completing the overall roll-up
 - The Plant Ratcliffe pre-feasibility assessment is being completed as well
- The Plant Daniel FEED under a separate DOE award (FE0031847) was completed in June 2022, and information will be available for the Ratcliffe assessment

Technical Status – Surface Facilities

- Pipeline network and injection facility designed to accommodate single source and multi-source hub options
- Preliminary hydraulic modeling by Trimeric estimates that without any booster stations, a 20-inch pipeline for Plant Daniel and a 36-inch pipeline for Plant Miller would be required



Other Accomplishments to Date

- Environmental Information Volume submitted in July 2021, revised in April 2022 — currently under evaluation for a single source (Ratcliffe) scope
- Risk workshop in May 2022, final risk report to be issued in August 2022
- UAB examining the NRAP Seal Flux and Open-IAM tools to evaluate caprock leakage risk

Building on the Project ECO₂S Experience for Future Development

The ECO₂S CarbonSAFE Phase III Project in Kemper County (Plant Ratcliffe) has provided significant value:

- Established a “world class” CO₂ storage hub that could serve additional CO₂ sources in the region.
- Built a foundation for continued positive community outreach and education.
- Provided improved understanding of carbon capture costs for NGCC at Plant Ratcliffe from adaptation of the FEED study conducted at Mississippi Power’s Plant Daniel and Alabama Power — Plant Barry for storage site development.
- Highlighted the importance of retaining access to pore space and surface easements in future property transactions.

Building on the Project ECO₂S Experience for Future Development (Cont'd)

Project ECO₂S has also contributed significantly to Southern Company's and Mississippi Power's plans for future CCUS development:

- Provided a catalyst for evaluating large-scale future Infrastructure Bill funded DOE/NETL projects such as Direct Air Capture (DAC), Hydrogen Hubs, and Integrated Capture and Storage Pilots and Demonstrations.
- Helped clarify future power generation and decarbonization strategies in the Southeast with CCUS related source-sink matching driven by regulatory/policy changes or enhanced 45Q tax credits.
- Motivated continued discussions with large landowners for access to pore space and surface property.
- Provided motivation for evaluating CarbonSAFE Phases 3.5 and 4 proposals for addressing internal (regulated power assets) and external (industrial) CO₂ sources.

Thank You



Southern Company



U.S. DEPARTMENT OF ENERGY



Appendix

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

Organization Chart

Contractual Organizational Chart

