SOUTHERN STATES ENERGY BOARD

Transcending Boundaries

Establishing an Early Carbon Dioxide Storage Complex in Kemper County, Mississippi: Project ECO$_2$S

MGSC Carbon Sequestration Science Conference

Presented by: Jerry Hill, Senior Technical Advisor, Southern States Energy Board
Co-PI: Kimberly Gray, Managing Director, Southern States Energy Board

Champaign, Illinois ~ September 20, 2017

Disclaimer

This presentation is based upon work supported by the Department of Energy National Energy Technology Laboratory under DE-FE0029465 and was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

U.S. DEPARTMENT OF ENERGY

NATIONAL ENERGY TECHNOLOGY LABORATORY

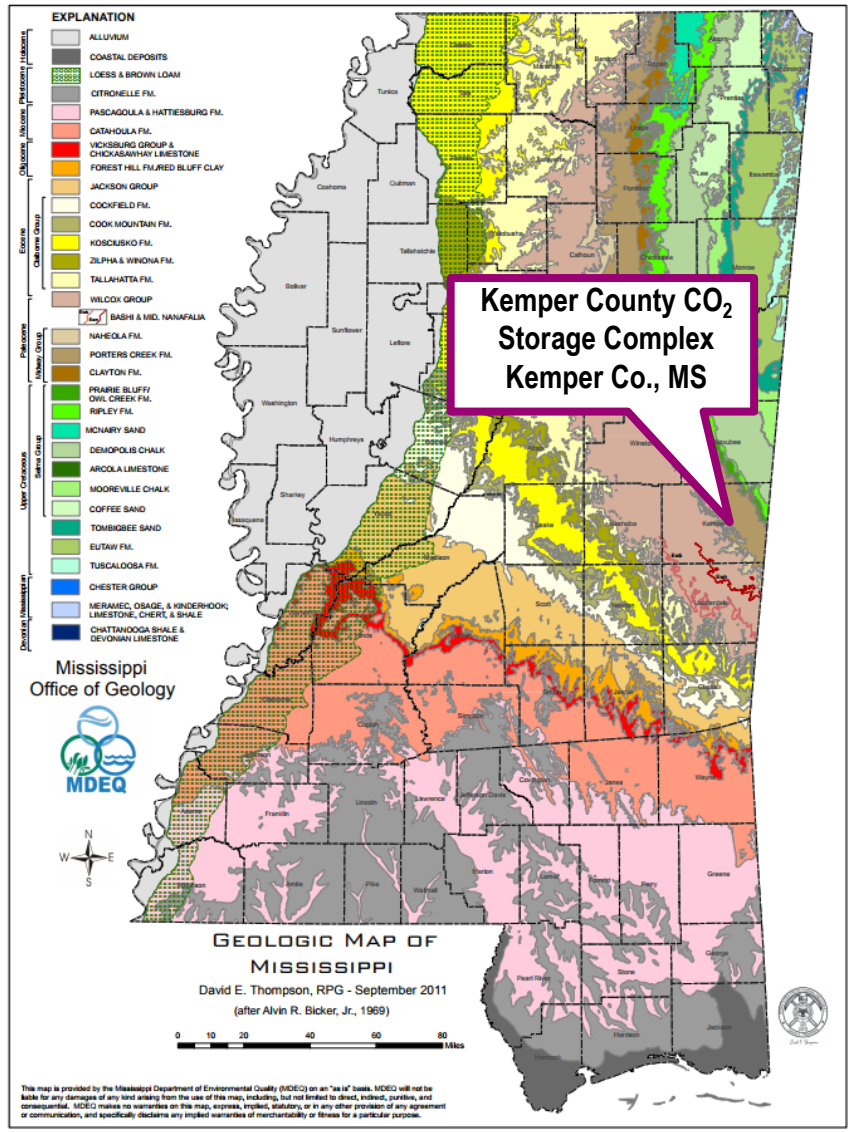
SOUTHERN COMPANY
Energy to Serve Your World℠

SOUTHERN STATES ENERGY BOARD

Advanced Resources International, Inc.

Outline

1. Organization & Communications Plan
2. Pre-Feasibility Study (Phase I Equivalent)
3. Phase II Objectives & Approach
4. Current Site Activities
5. Conclusions



U.S. DEPARTMENT OF ENERGY

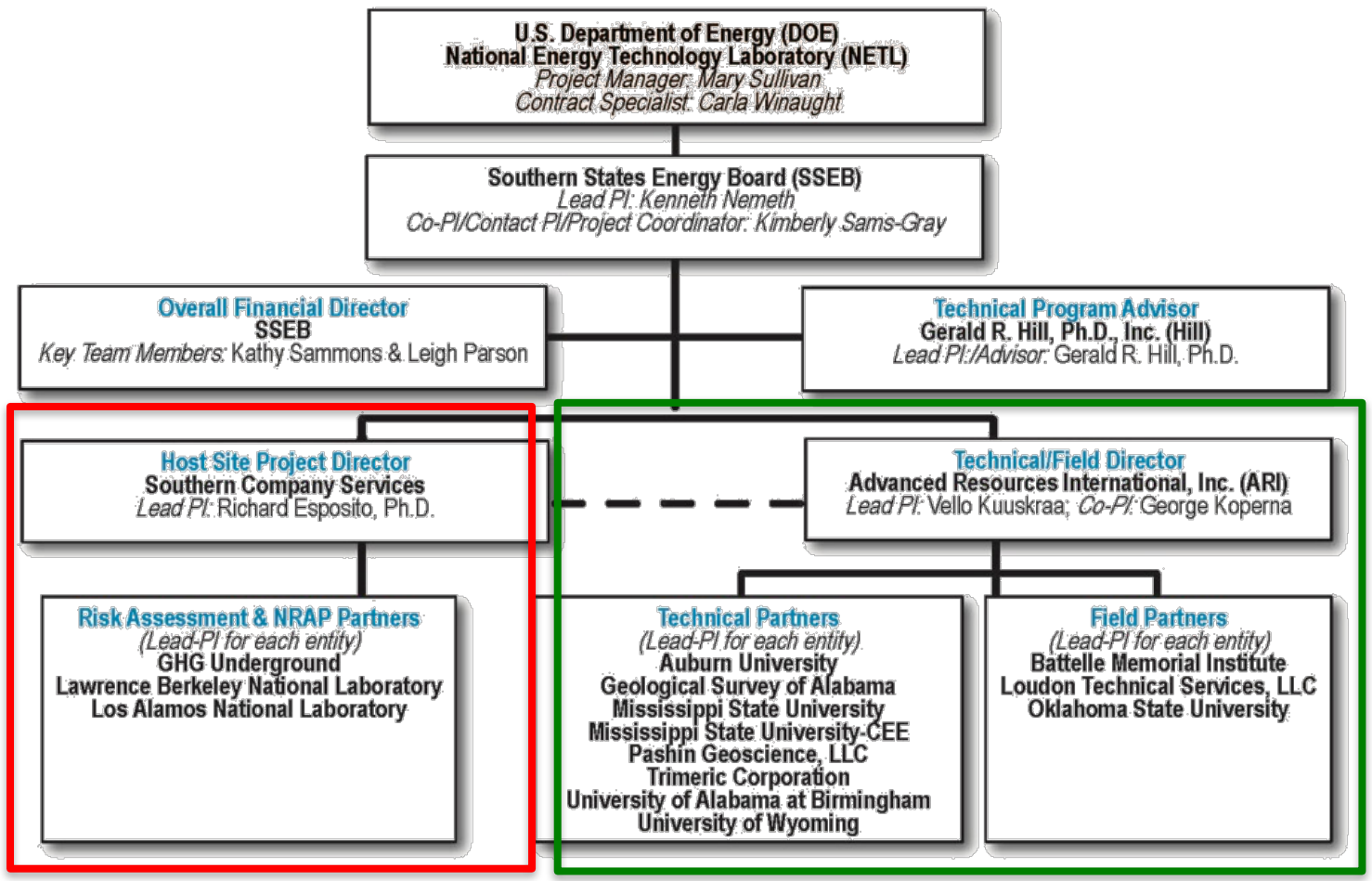
NATIONAL ENERGY TECHNOLOGY LABORATORY

SOUTHERN COMPANY
Energy to Serve Your World℠

SOUTHERN STATES ENERGY BOARD

Advanced Resources International, Inc.

Organization & Communications Plan



- Includes Southern Company Services as Host Site Project Director – will oversee **Risk Assessment & NRAP Partners**
- ARI manages **technical and field work** and works closely with Southern Company Services to ensure all activities are acceptable to Mississippi Power Company

Background: Pre-feasibility Study

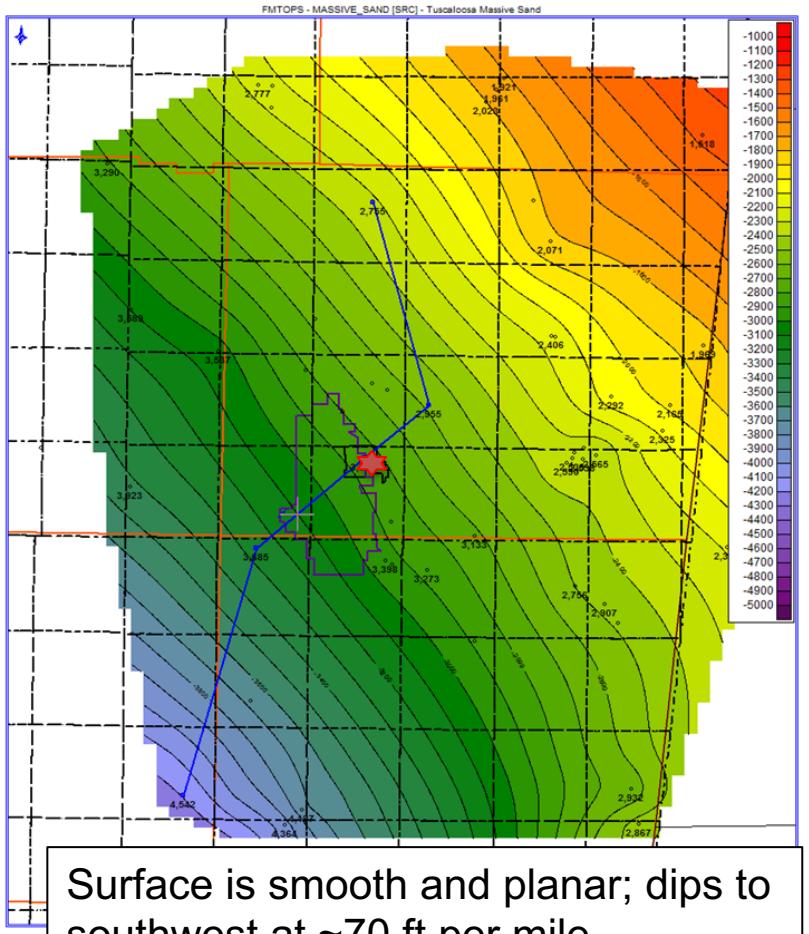
Prior Pre-Feasibility on the Kemper County CO_2 Storage Complex. Mississippi Power Company (MPC), in conjunction with Southern Company Services (SCS), Advanced Resources and others have performed considerable pre-feasibility work on the Kemper County CO_2 Storage Complex. This enabled the project to qualify for the Phase II: Storage Complex Feasibility for CarbonSAFE in response to the U.S. Department of Energy/National Energy Technology Laboratory (DOE/NETL) Funding Opportunity Announcement, DE-FOA-001450.

The pre-feasibility work involved:

1. Performing a Geologic Evaluation of the Proposed CO_2 Storage Site
2. Establishing the Presence of Sufficient CO_2 Storage Capacity
3. Performing Reservoir Modeling for the Areal Extent of the CO_2 Plume and a More Rigorous Estimate of CO_2 Storage Capacity
4. Utilizing Data from Prior Deep Well Drilling
5. Establishing the Availability and Reliability of the CO_2 Source
6. Securing Surface Pore Space Rights, and
7. Conducting Initial Stakeholders Analysis and Other Pre-Feasibility Tasks

Phase II Project Objectives

Structural Contour Map,
Top of Lower Tuscaloosa



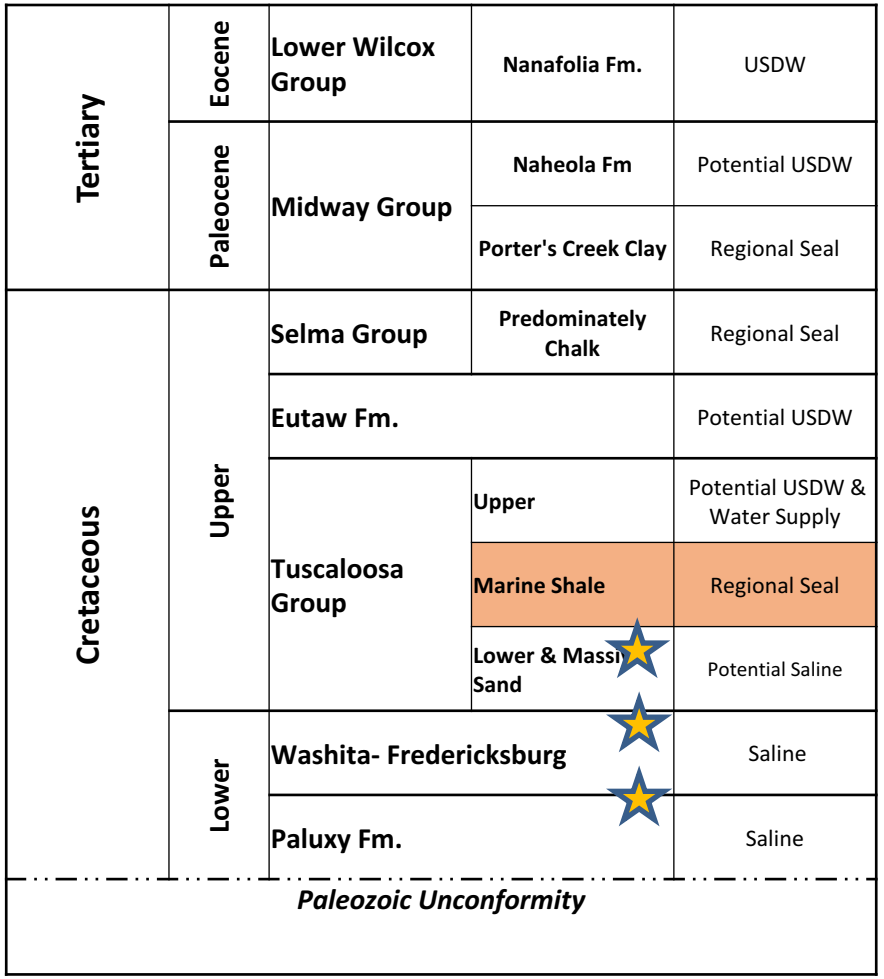
Surface is smooth and planar; dips to southwest at ~70 ft per mile

1. Demonstrate that the subsurface at the storage complex can store commercial volumes of CO_2 safely and permanently within the saline reservoir system,
2. Rigorously establish and optimize the CO_2 storage capacity of the storage complex, including the areal extent of the CO_2 plume,
3. Confirm the viability of each of the reservoir seals as a long-term, reliable confining system for the CO_2 storage site,
4. Undertake rock mechanics and geomechanical modeling to define the potential for induced seismicity at the CO_2 storage site,
5. Conduct a comprehensive risk assessment utilizing reservoir modeling and the NETL-sponsored integrated assessment models,
6. Define a CO_2 MVA system and a quick-response contingency plan,
7. Conduct additional public outreach, and
8. Deliver a commercialization plan, including plans for subsequent site characterization (Phase III) and permitting/site construction (Phase IV).

How do we get there?

1. Drill three, deep subsurface characterization wells.
2. Collect:
   - Whole core,
   - Sidewall core,
   - Geophysical well logs, and
   - Fluid sampling/reservoir testing(?)
3. Analyze
   - Existing 2-D seismic data,
   - Core samples, and
   - Create geologic maps and numerical models
4. Collaboration

Generalized Stratigraphy

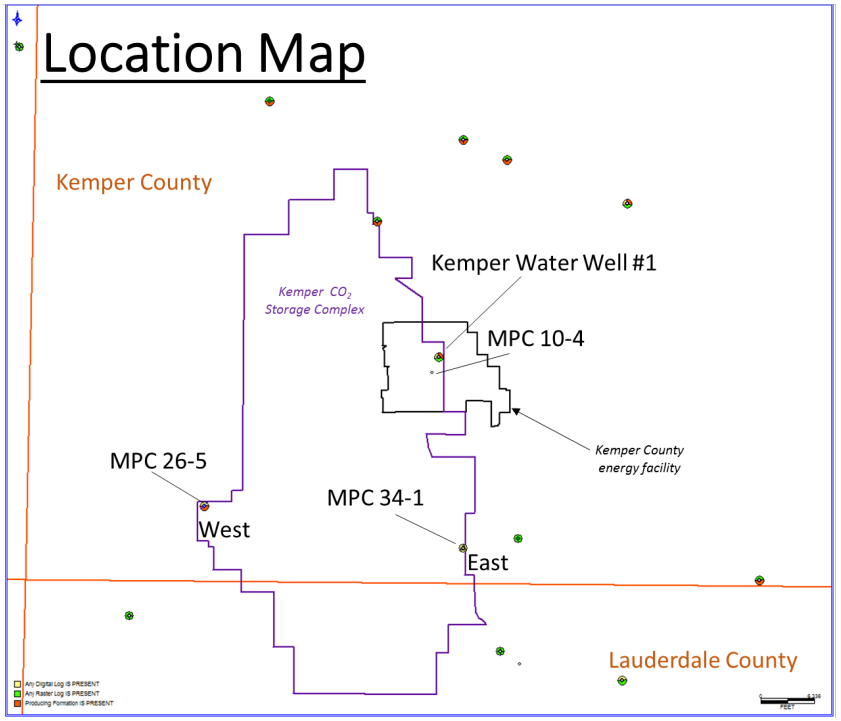


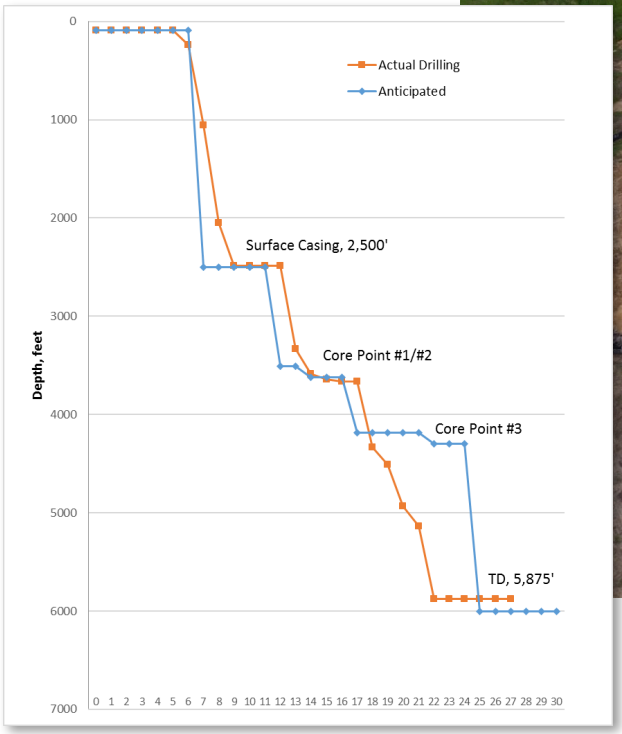
Source: Pashin, J.C., D.J. Hills, D. C. Kopaska-Merkel, M.R. McIntyre, Geological Evaluation of the Potential for CO_2 Sequestration in Kemper County, Mississippi, Final Report, prepared for Southern Company Research and Environmental Affairs, June 1, 2008.

- Three Cretaceous storage units containing clastic sediments with high porosity:
  - Lower Tuscaloosa Grp (Massive sand)
  - Washita-Fredericksburg interval
  - Paluxy formation
- Three prominent reservoir seals:
  - Tuscaloosa Marine Shale
  - Shale interval at top of the Washita-Fredericksburg
  - Shale interval at base of Washita-Fredericksburg
- Paleozoic interval *may* offer additional storage capacity

Field Status

- First project well, the MPC 26-5, spud in May
- 17 days from spud to TD including two core points
- Second well, the MPC 34-1, spud in June
- 14 days from spud to TD including two core points
- Third well, the MPC 10-4, spud in early August
- 14 days from spud to TD including two core points





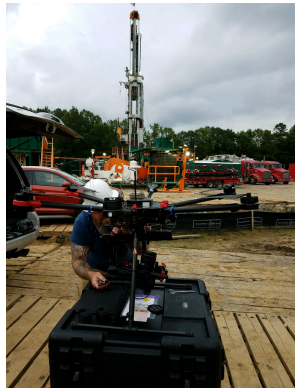
Kemper Storage Complex Capacity

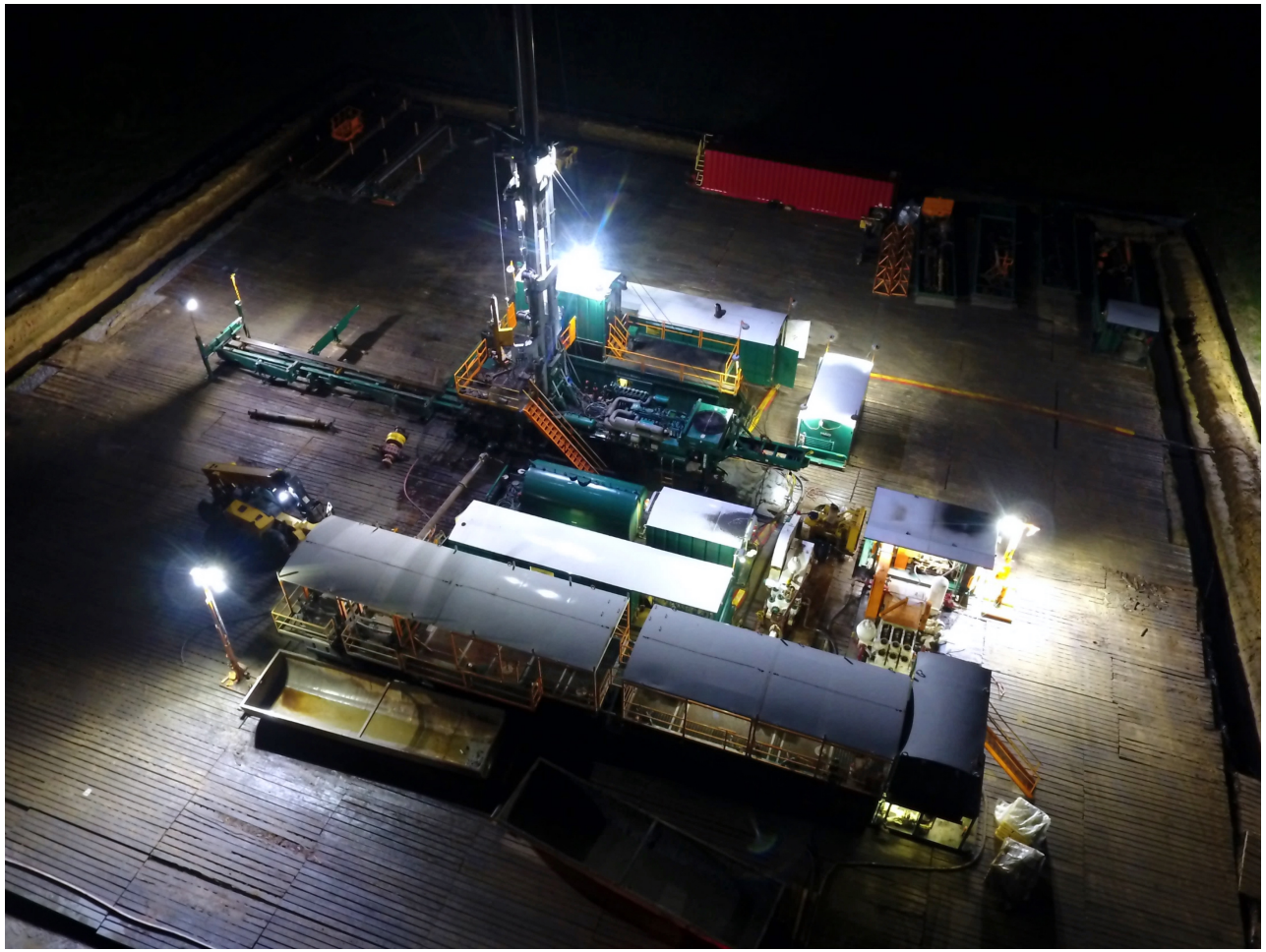
Formation	100% Storage Capacity (MMte)***	P10 (3.1%) Storage Capacity (MMte)***	P50 (6.1%) Storage Capacity (MMte)***	P90 (10%) Storage Capacity (MMte)***
Tusc. Massive Sand	760	20	50	80
Wash-Fred	3,140	100	190	310
Paluxy	1,830	60	110	180
Total	**5,720**	**180**	**350**	**570**

** Assume 0.43 psi/ft hydraulic pressure gradient*
*** from IPCC 2005 Annex Chart*
****million metric tonnes*

Conclusions

- The Kemper County Storage Complex appears to be a world class CO_2 storage prospect
- Reservoirs are vertically confined, increasing the potential for “stacked storage”
- Caprocks are laterally continuous, appear to have confining properties
- No structural “show stoppers”
- Well drilling is predictable, low risk
- There is still a lot of work to do….





U.S. DEPARTMENT OF ENERGY

NATIONAL ENERGY TECHNOLOGY LABORATORY

SOUTHERN COMPANY
Energy to Serve Your World℠

SOUTHERN STATES ENERGY BOARD

Advanced Resources International, Inc.