

Southeast Regional Carbon Storage Partnership: Offshore Gulf of Mexico | Offshore CCS in the U.S.

March 26, 2025

Ben Wernette, PhD

Southern States Energy Board



This presentation is based upon work supported by the Department of Energy 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, recommendations, 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.



Southern States Energy Board

- Interstate Compact Organization, created by state law and consented to by Congress (PL 87-563, PL 92-440)
- 16 U.S. States and Two Territories
- Each jurisdiction represented by the governor, a legislator from the House and Senate, and a governor's alternate
- Federal Representative appointed by U.S. President
- Secretary, who serves as Executive Director

“Through innovations in energy and environmental policies, programs and technologies, the Southern States Energy Board enhances economic development and the quality of life in the South.”
SSEB Mission Statement



Chair
Gov. Kay Ivey
Alabama



Vice Chair
Rep. Bill Sandifer
South Carolina



Treasurer
Sen. Ken Yager
Tennessee



Gov. Bill Lee
Tennessee



Gov. Henry McMaster
South Carolina



Rep. Lynn Smith
Georgia



Del. Will Morefield
Virginia



Sen. Brandon Smith
Kentucky



Sen. Bryan Hughes
Texas



Chair, SLC E&E Committee
Sen. Bob Hensgens



Federal Representative
Hon. Jim Powell



Secretary
Kenneth Nemeth

State Activities

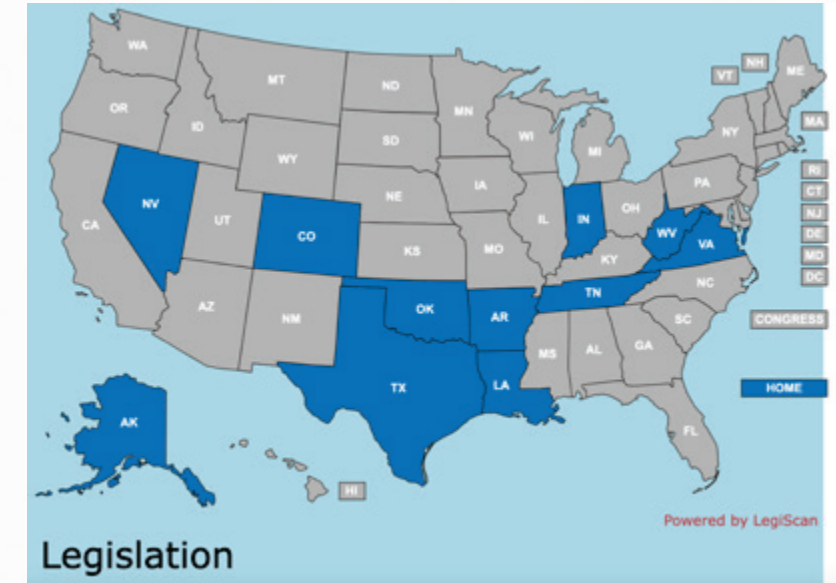
State Legislation

- 2022 was a busy year for CCS
 - AL, AR, MS clarified regulatory oversight of CO₂
- In 2023, 11 states introduced 25 CCS-related measures
 - LA SR 179 – assess impacts of CCS
 - WV SR 162 – DNR lease pore space
- In 2024, 28 states introduced CCS-related measures
 - AL 320 – clarifies amalgamation procedures
 - LA HB 73 – parish tax on CCS projects
 - WV HB 5045 – relating to primacy

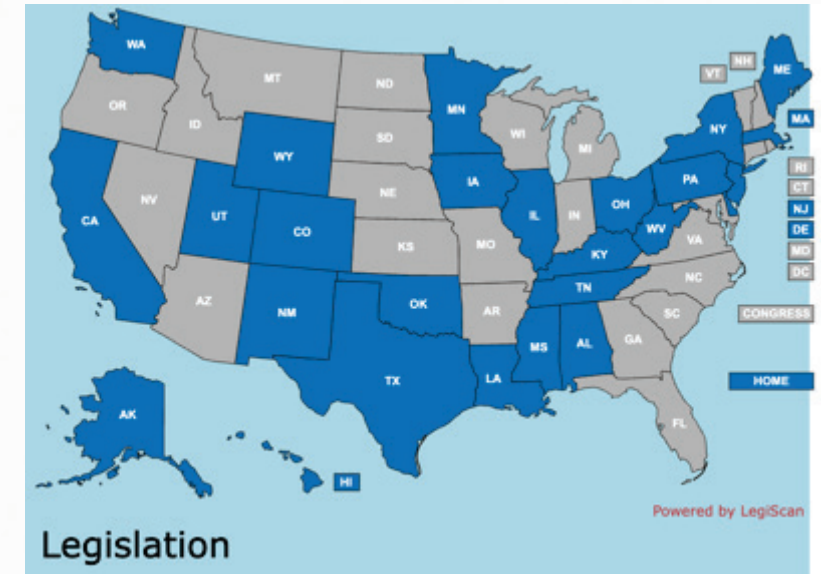
Regulatory

- Louisiana, North Dakota, Wyoming, and West Virginia primacy granted
 - TX GLO continues to lease state waters
 - DOI developing regulations for the Outer Continental Shelf

2023 Carbon Management Legislation by State



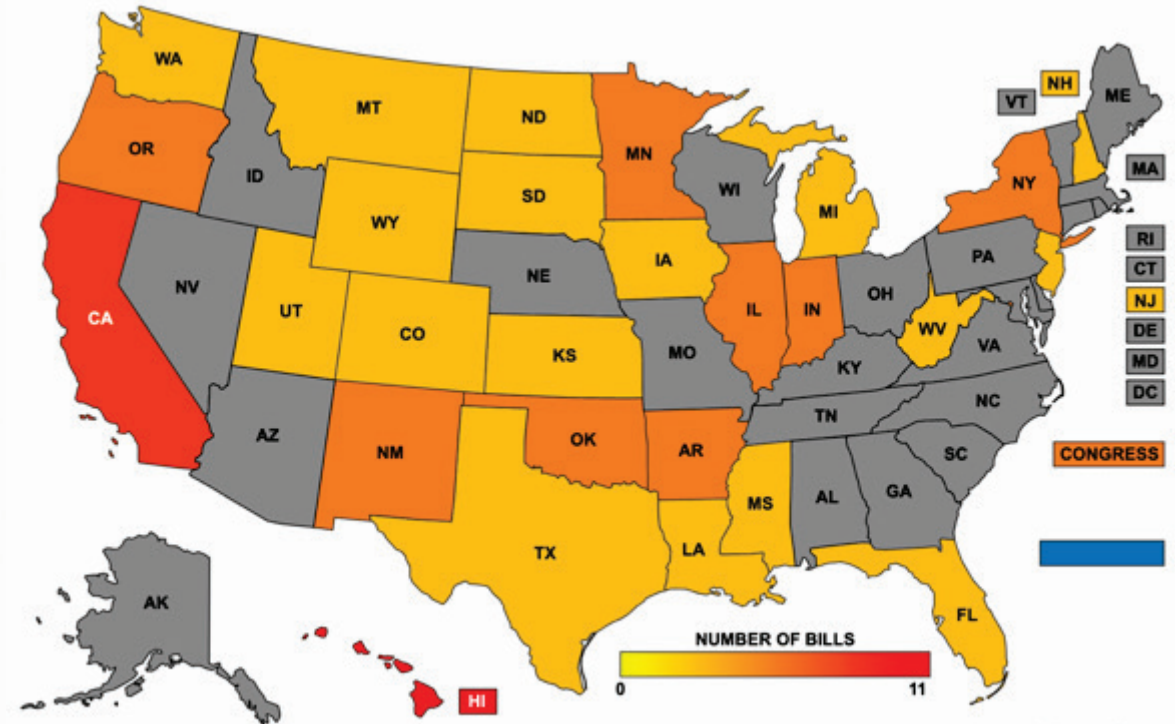
2024 Carbon Management Legislation by State



State Activities – 2025 Legislative Session

- As of March 2025, 26 states have introduced 72 separate measures
- Notable Legislation
 - AR HB 1411 (passed) –AR OGC regulatory authority, introduces fee structure for Class VI wells
 - IL SB 1723 (introduced) – prohibits CCUS in proximity to sole source aquifers
 - OK SB 269 (introduced) – provides OK Corporation Commission oversight authority over Class II and Class VI wells
 - OK HB 1147 (introduced) – prohibits capture and storage of CO₂ from the atmosphere
 - SD SB 49 (passed) – prohibits use of eminent domain for CO₂ pipelines
 - TX HB 2612 (introduced) – expands GCA authority to finance CCS projects using public bonds

2025 Carbon Management Legislative Activities



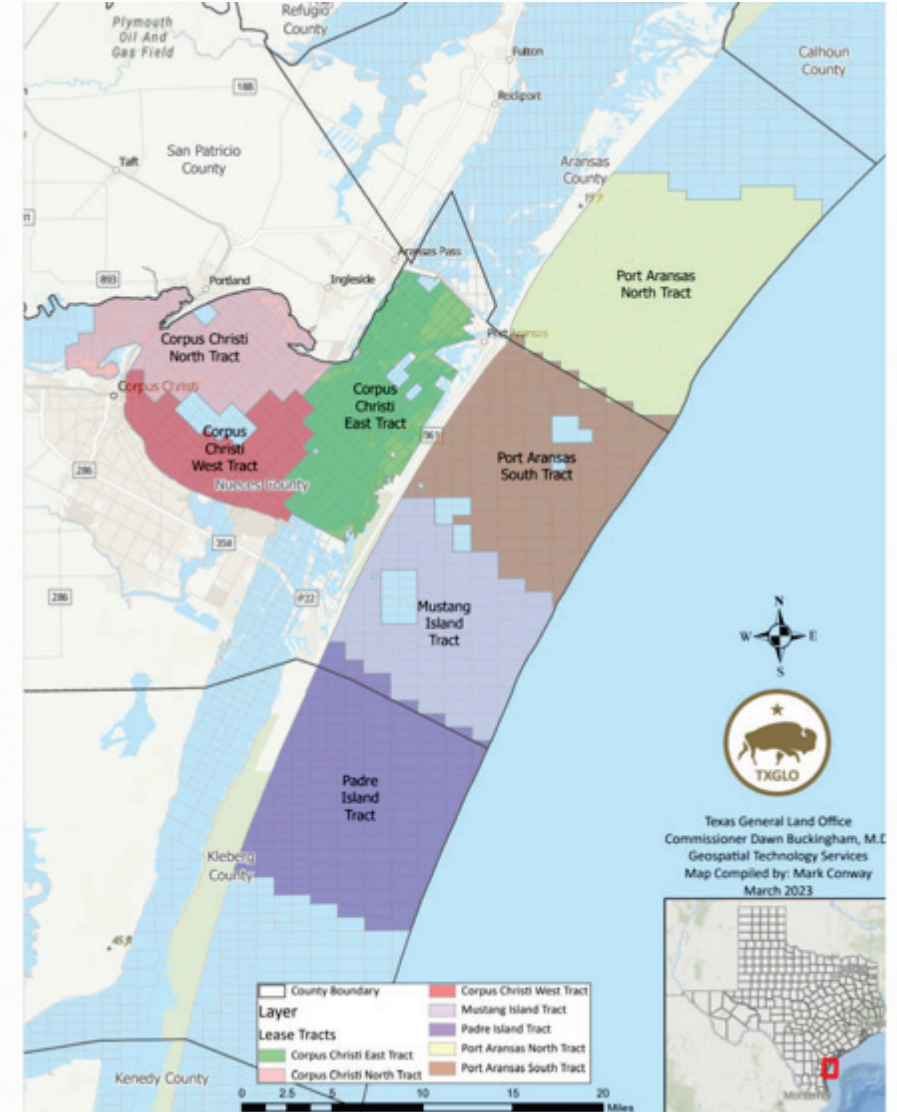
Powered by LegiScan

As of March 10, 2025

Updates – U.S. Offshore CCS

- Many states are developing CCS regulations and assigning oversight to state agencies legislation
- TX GLO continues to lease state waters – **1 million acres offered in June of 2024 sale**
- DOI developing regulations for the Outer Continental Shelf

2024 South Texas State Water Tracts

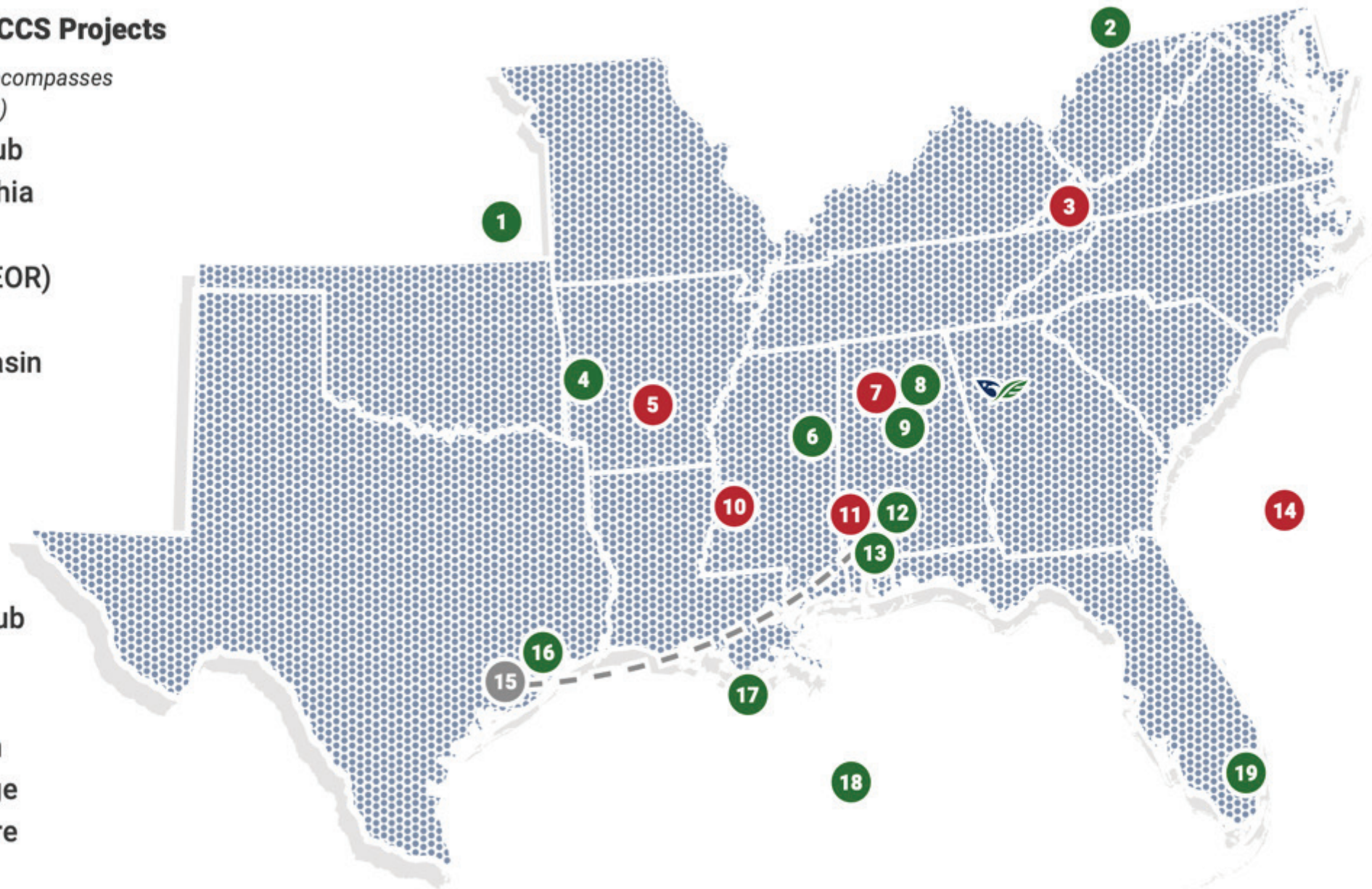


Current and Former CCS Projects

1. SECARB-USA (*encompasses majority of our region*)
2. Tri-State CCS Hub
3. Central Appalachia
4. Foreman FEED
5. Arkansas (CO₂-EOR)
6. Kemper County
7. Black Warrior Basin
8. Project OASIS
9. NCCC (DAC)
10. Cranfield
11. Citronelle
12. SEDAC Hub
13. Longleaf CCS Hub
14. SOSRA
15. Petra Nova
16. Univ. of Houston
17. Project Lochridge
18. SECARB Offshore
19. Project ACCESS

● Open Project ● Technology Transfer

 Closed Project



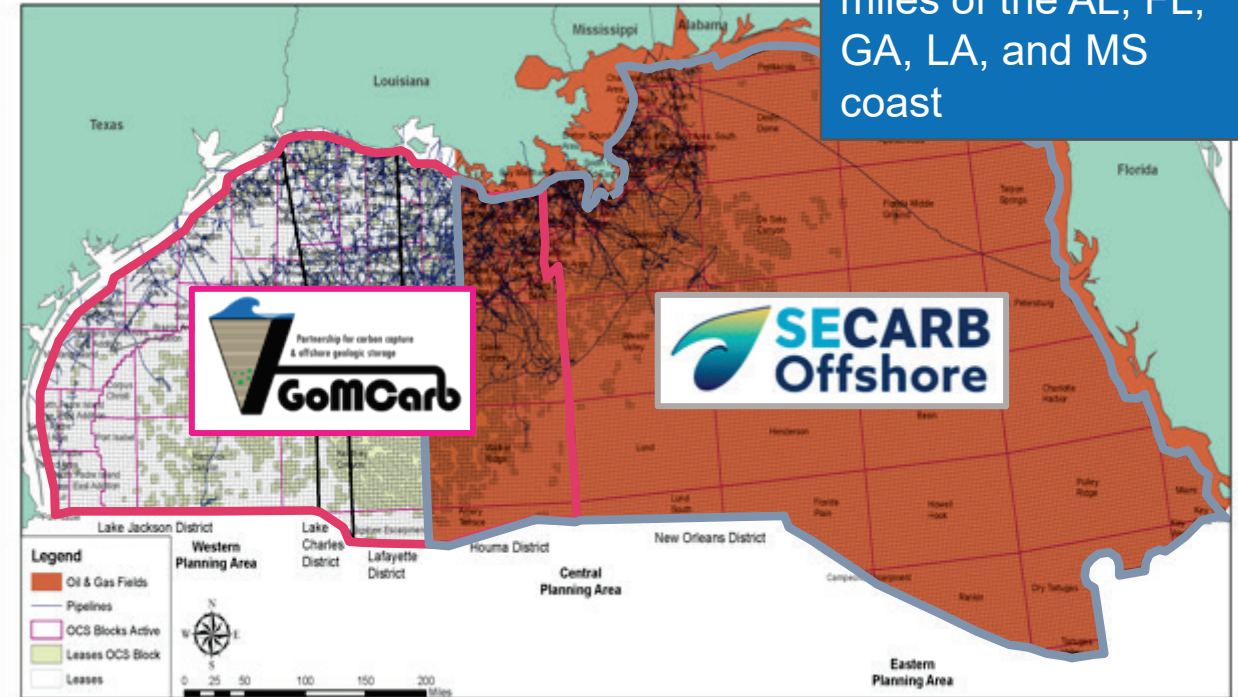
Offshore Partnership - Overview

- Establishing the knowledge base required for secure, long-term, large-scale, subseafloor storage of CO₂ with or without enhanced hydrocarbon recovery



**260 MMT CO₂e
per year**

From point sources
annually within 50
miles of the AL, FL,
GA, LA, and MS
coast



Division of the SECARB Offshore and GoMCarb study areas. Figure courtesy of Advanced Resources International and modified by SSEB.

Offshore Partnership - Overview

Subsurface characterization utilizing existing data

Subsurface modeling informed by subsurface characterization

Identification of risks – legacy infrastructure

Infrastructure evaluation

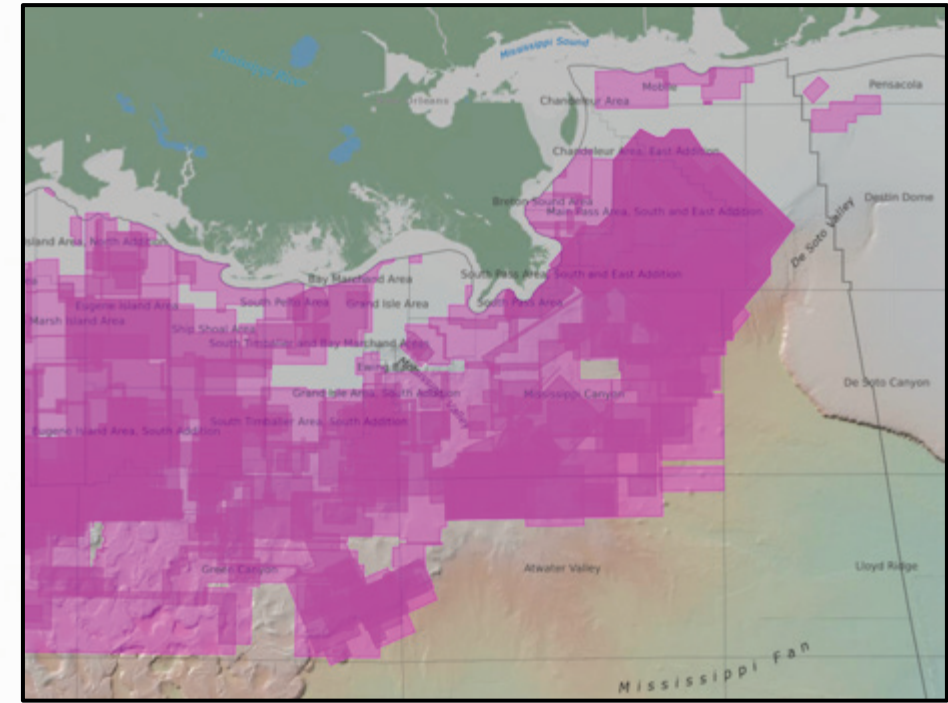
Evaluation of legal and regulatory considerations

Outreach

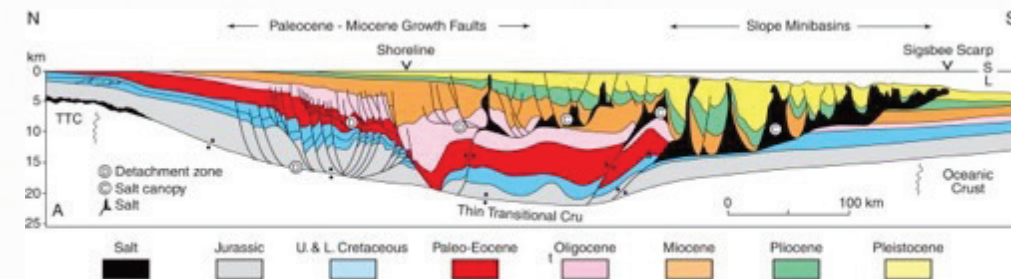


Characterization

- Building on the foundation established by the Southeast Offshore Storage Resource Assessment (SOSRA)
- Targets are largely Miocene through Pleistocene
- Shelf dominated by high gas-oil ratio; slope dominated by low gas-oil ratio
- Structure in the region related growth faulting and salt tectonics
- Impressive capacity, more than sufficient to support an extensive offshore CCS industry

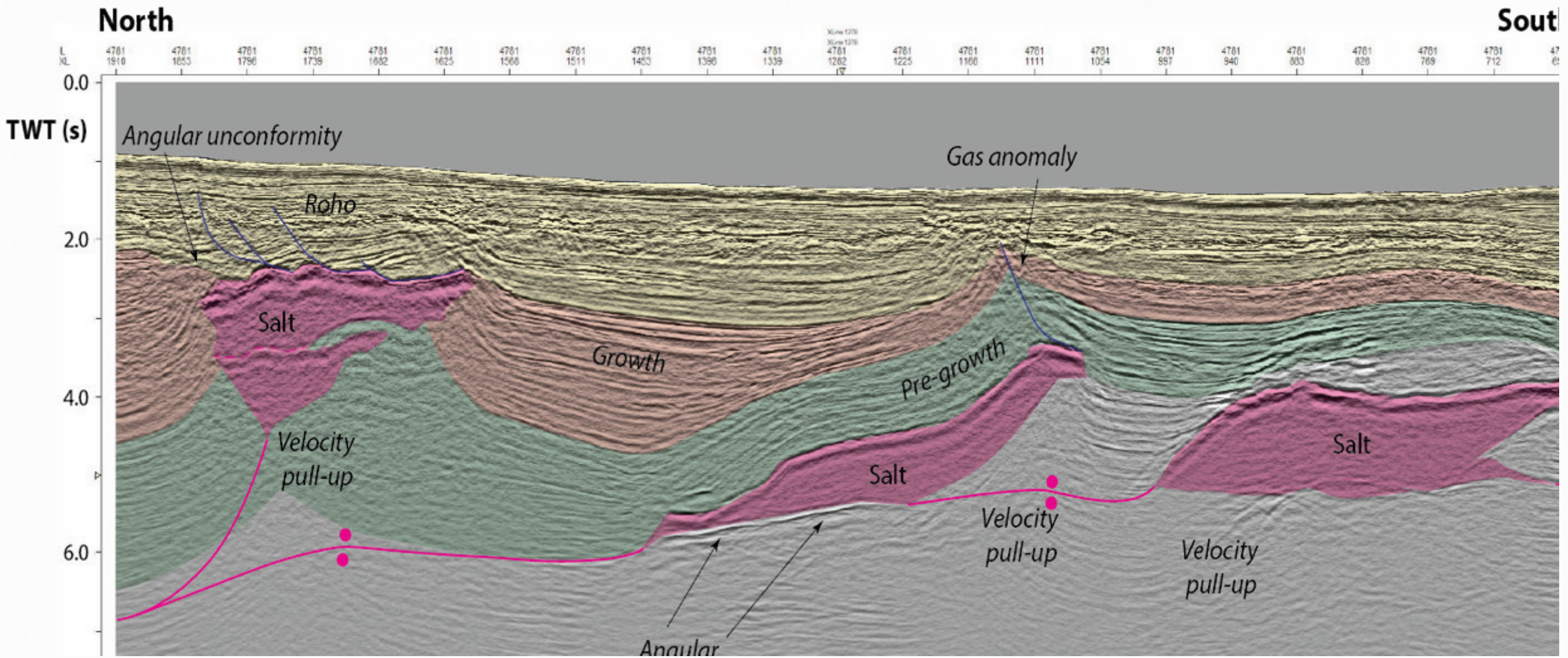


Existing seismic data available through the Bureau of Ocean Energy Management



Schematic illustration of shelf-slope Miocene geology of the central Gulf of Mexico and associated structure. From Galloway et al. (2008)

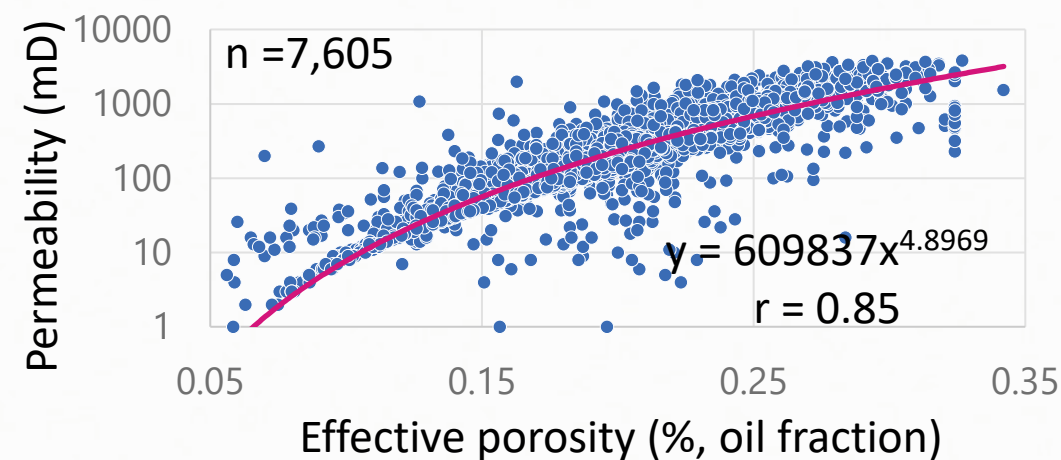
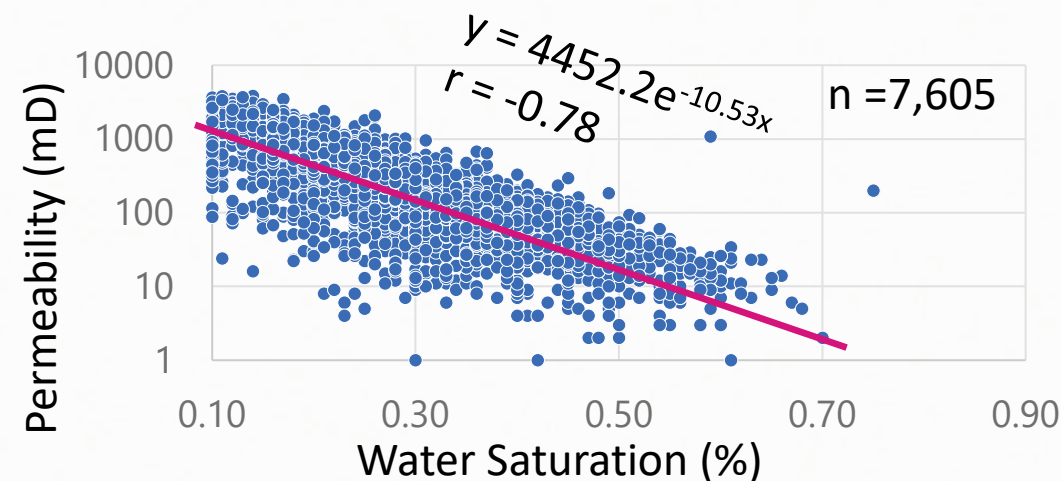
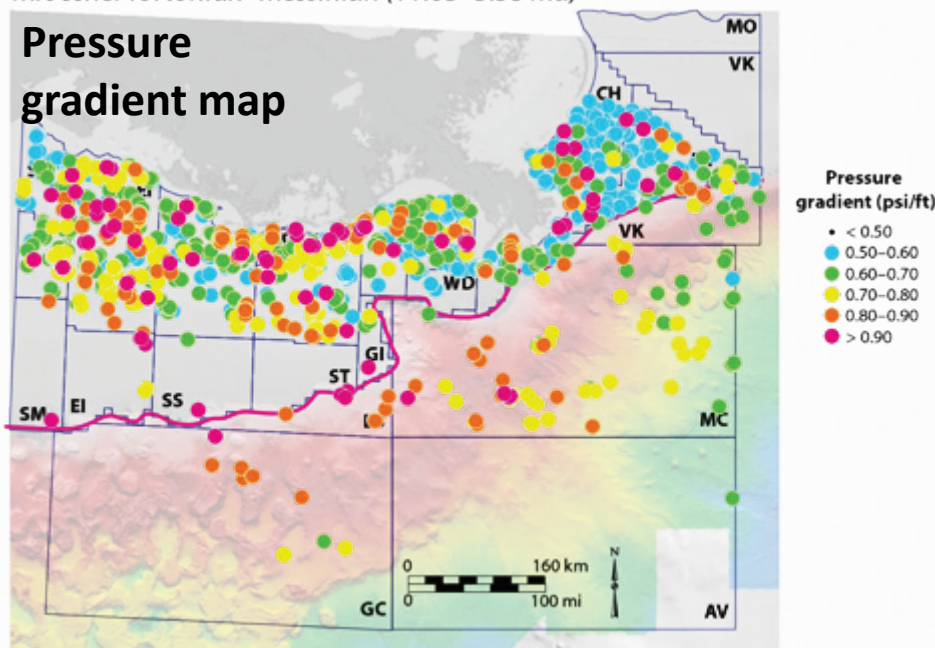
Mars Ursa Minibasin Complex



High-Level Screening

- BOEM Sands database was curated and integrated into SAS Viya to screen for prospective storage opportunities.
- Screening included pressure, temperature, reservoir, and fluid properties.
- Initial screening revealed the most prospective areas in the Mississippi Canyon and Green Canyon protraction areas
- **P50 estimates for resource for all protraction areas is over 10 Gt CO₂**

Miocene: Tortonian–Messinian (11.63–5.33 Ma)



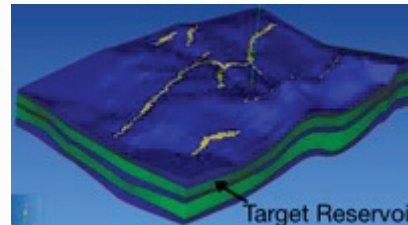
Reservoir Modeling - Saline

- Constrain uncertainty of CO₂ storage with stochastic reservoir modeling and ensemble simulation
- Permeability variability accounts for $\pm 20\%$ CO₂ saturation
- Temperature is a precursor to CO₂ breakthrough
- Fault compartmentalization drive pressure build-up – more research is needed

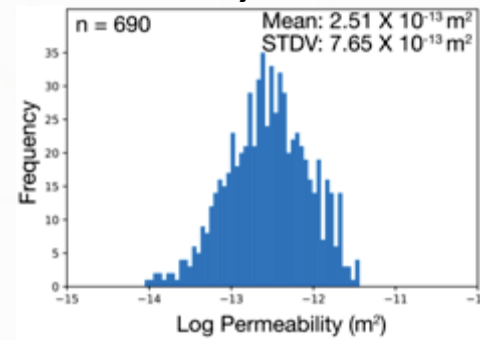
Study Area



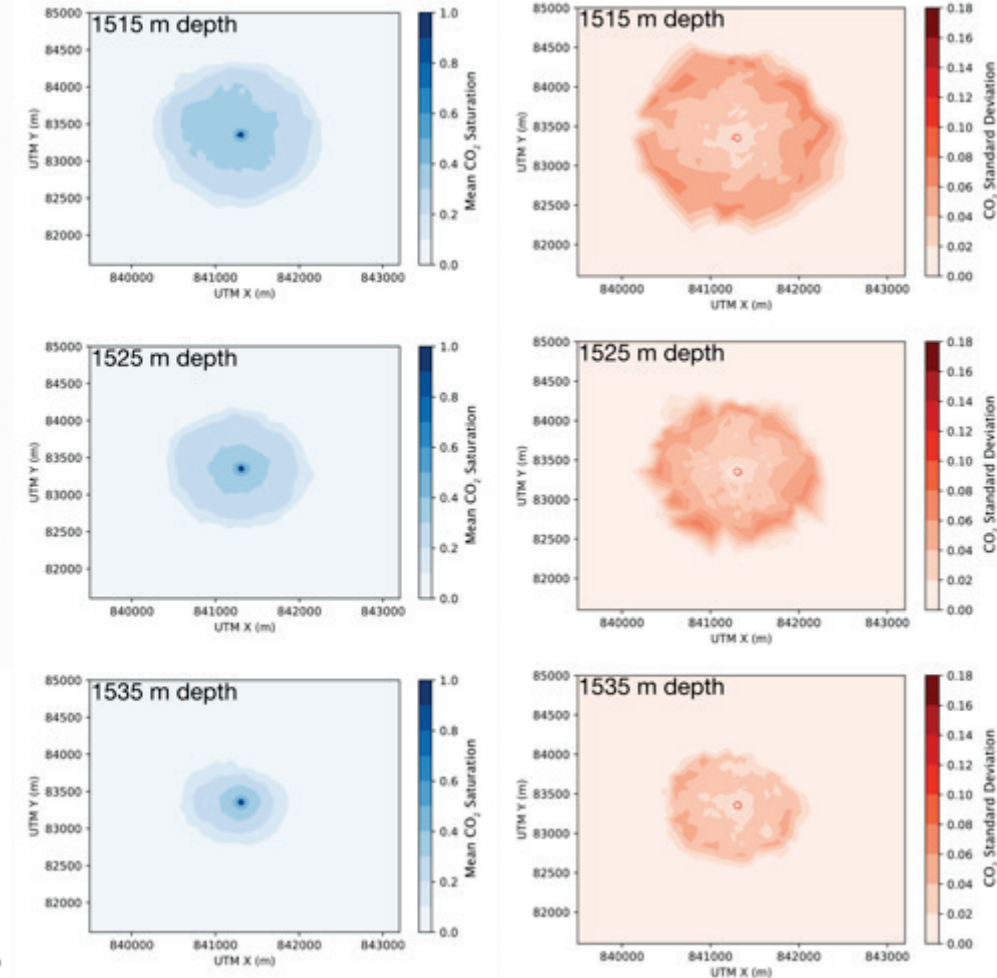
Reservoir Model



Permeability Distribution

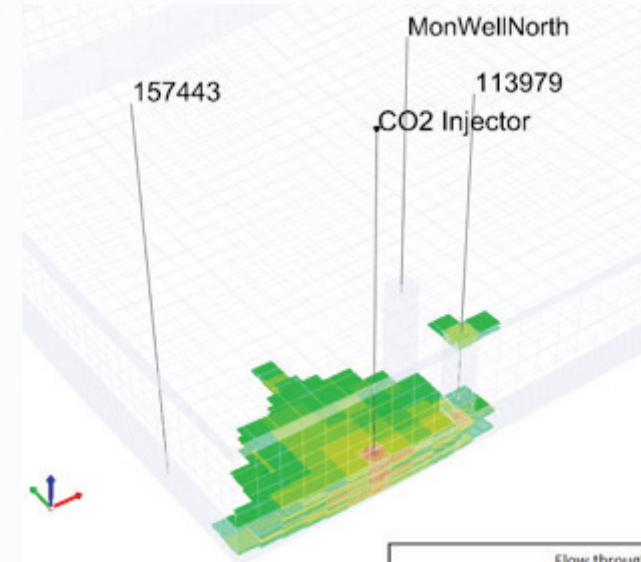


Results from 50 equally probable reservoirs:



Storage and Operational Risk

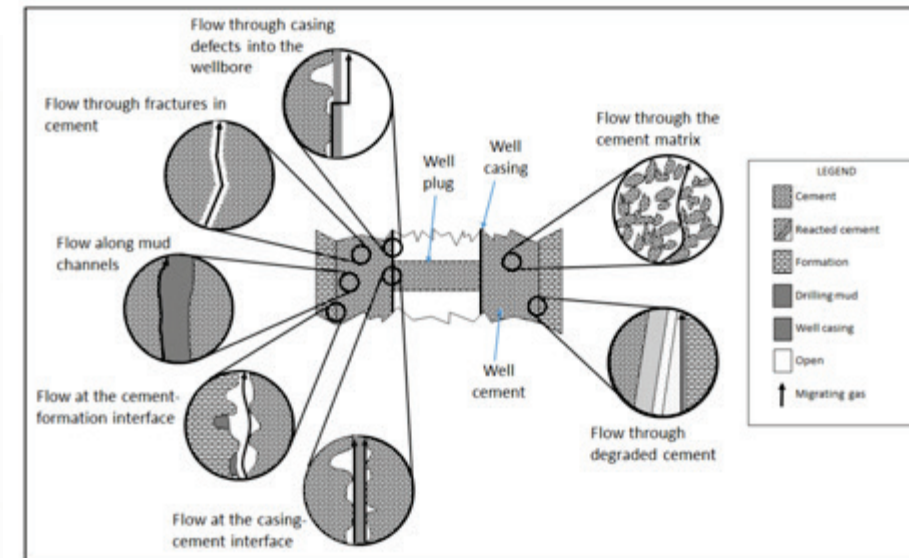
- Developed a risk registry that considers operation risks including (1) subsurface risks; (2) regulatory risks; (3) infrastructure risks; (4) MVA risks; (5) commercialization risks; and (6) public perception
- **Risk assessment protocol for existing well penetrations in the GOM**
 - Three case studies



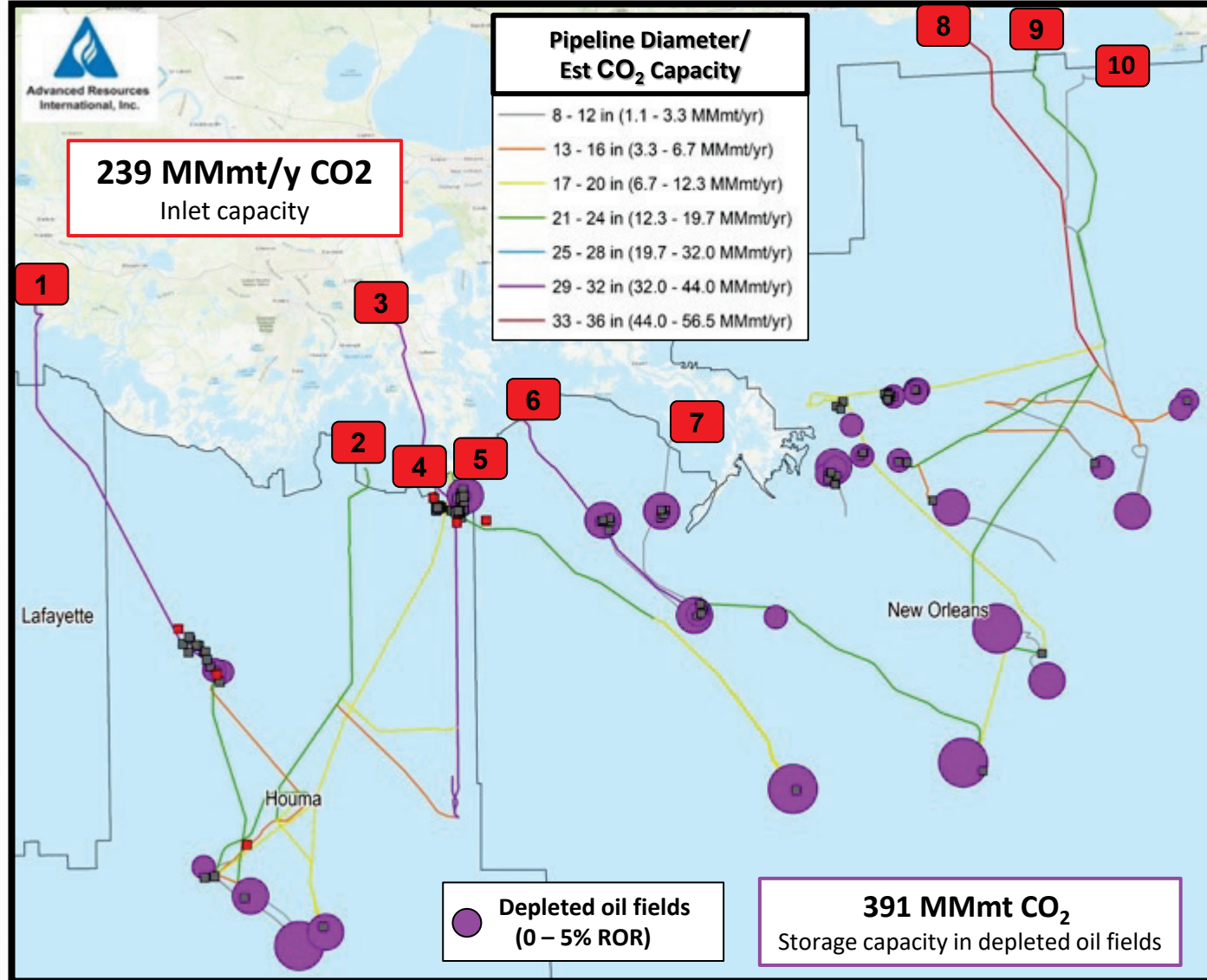
Above zone monitoring technique utilizing the dynamic model generated for the South Marsh Island area in the state waters of Louisiana. Here, an above zone monitoring well is located north of a leaky legacy well. Figure courtesy of Mehdi Zeidouni of LSU.

Illustration of potential leakage pathways for CO₂ through cement defects and casing defects. Figure from Gasda et al., 2004.

BATTELLE



Evaluating Existing Infrastructure

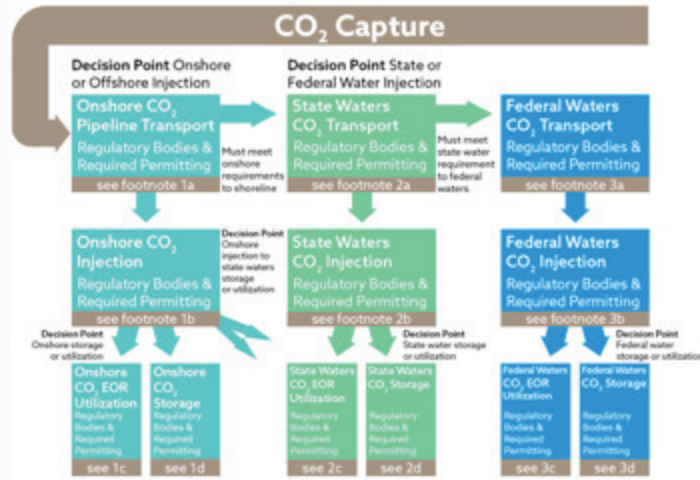


Screened O&G Infrastructure

- 82 pipeline segments totaling 1,784 miles
- 125 offshore platforms; 6 scheduled for abandonment.
- **239 MMmt CO₂ inlet capacity** at 10 onshore pipeline connections.
- A total of **391 MMmt of CO₂ storage capacity** in 31 depleted oil reservoirs

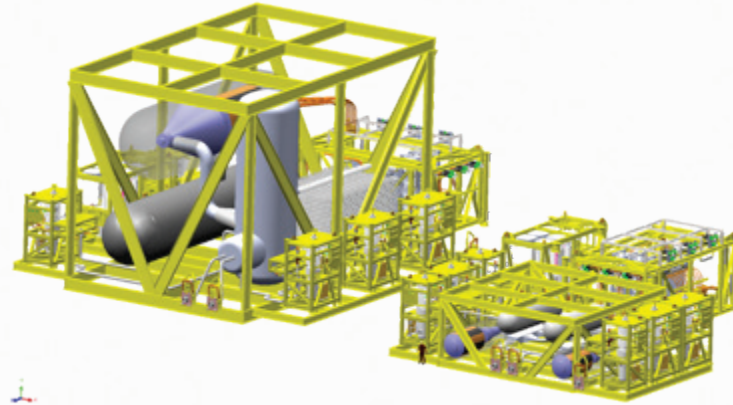
Other Activities

1. Legal and Regulatory



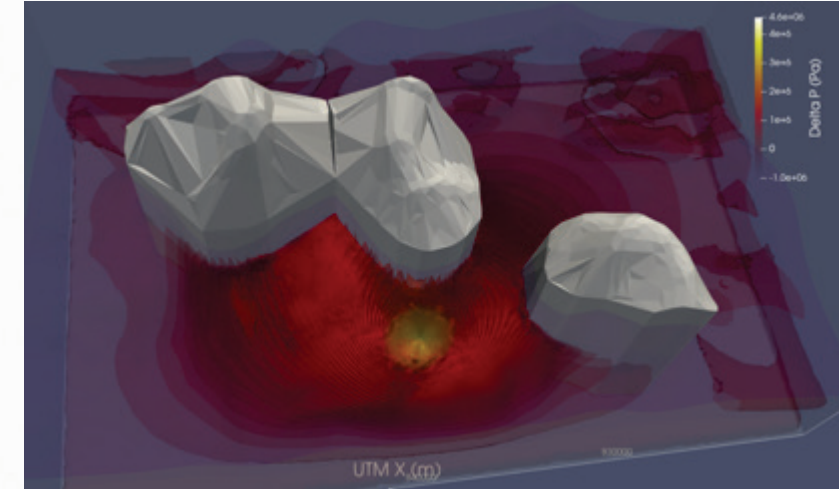
Developing a conceptual flow diagram that includes legal and regulatory considerations for project developers

2. Infrastructure



Developing subsea completions for CO₂ processing from natural gas fields

3. Risk



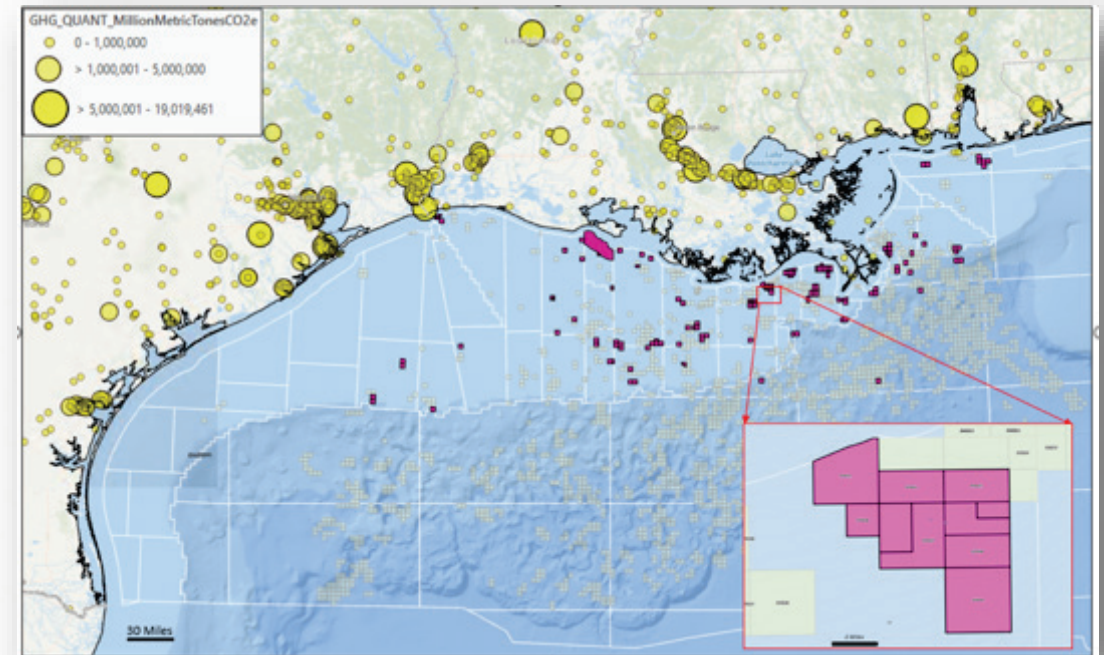
Developing models to evaluate CO₂ pressure plume interaction with local structural features (e.g., salt diapirs)

Development – Project Lochridge

- Local industrial activity and associated emissions (90 MMT/yr)
- Motivated commercial partners NRW and Repsol with assets and offshore expertise
- Goal: Establish the basis for a commercial CO₂ storage hub in the federal waters of the US Gulf of Mexico



Lochridge Location in the Gulf of Mexico



Thanks!
wernette@sseb.org

