Southeast Regional Carbon Storage Partnership: Offshore Gulf of Mexico (DE-FE0031557)

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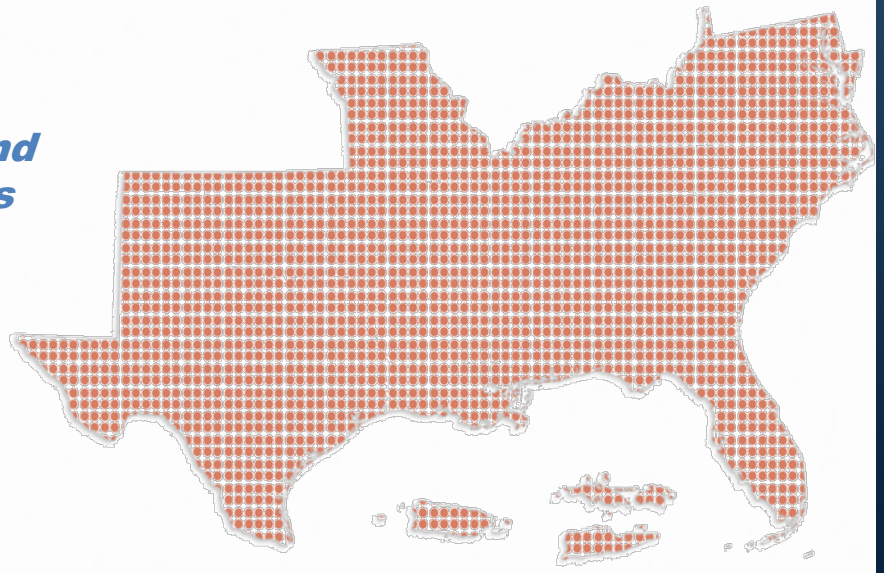
- Each jurisdiction represented by the governor, a legislator from the House and Senate, and a governor's alternate
- Federal Representative appointed by U.S. President
- Secretary, who serves as Executive Director

"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



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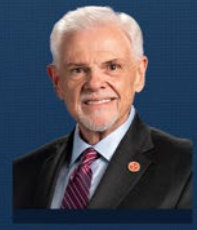

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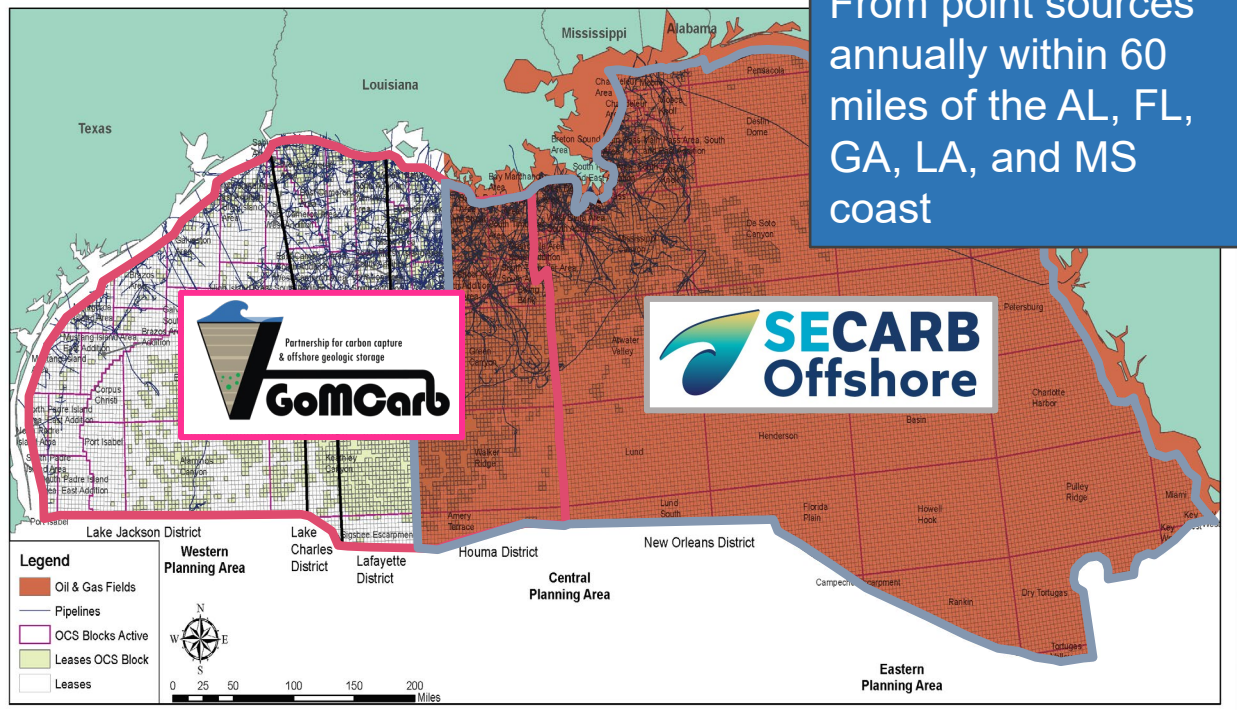
Offshore Partnership - Overview

- Establishing the knowledge base required for secure, long-term, large-scale, subseafloor storage of CO_2 with or without enhanced hydrocarbon recovery

250 MMT CO_2e
From point sources annually within 60 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 – Student Participation

PhD

- Mohamed Abdelaal – storage capacity estimation
- Refaat Hashish – thermal monitoring and injection profiling

PhD

- Joshua Ademilola – seismic interpretation and characterization
- Rupom Bhatterjee – data analytics
- Justin Spears – mapping and seismic interpretation

MSc

- Kodjo Botchway – data analytics
- Xitong Hu (graduated) – data analytics
- Seyi Sholanke (graduated) – seismic interpretation

PhD

- Charlie Schlosser – numerical modeling of faults

MSc

- Lars Koehn – reservoir modeling

Project Timeline

Spring of 2018

Implemented the **project management plan**, hosted the **project kickoff meeting** with partners, began assessing available information within the project area

Spring of 2019

Identify data gaps in the region and complete **regional characterization milestone**

Fall of 2020

Hosted offshore **CO_2 storage workshop**, completed **report on resource characterization for the study area**, completed **parametric study,** developed white paper explaining **SAS Viya platform**

Summer of 2021

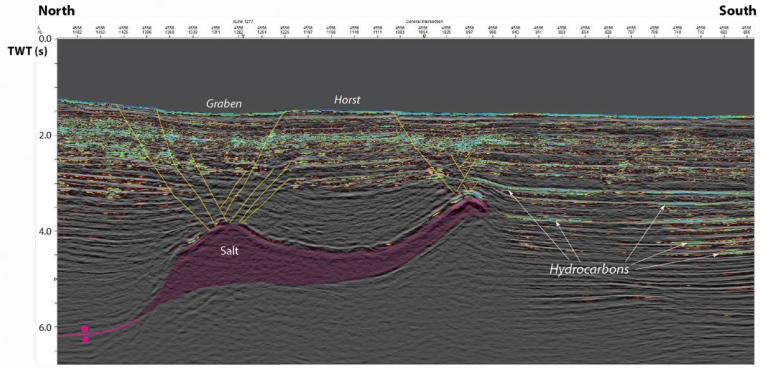
Developed report on **representative storage opportunities**, white paper outlining **optimum commercial strategies**, hosted **virtual Joint Partnership meeting** with GoMCarb

Summer of 2022

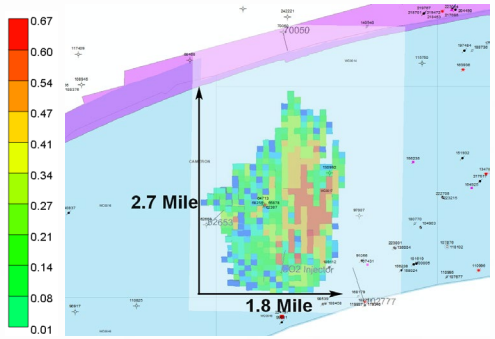
Hosted **2022 Joint Partnership Meeting in New Orleans**, hosted **Regulator Workshop**, developed **dynamic models for representative opportunities**, **evaluated commercial risks**

Offshore Partnership - Overview

1. Characterization



2. Modeling

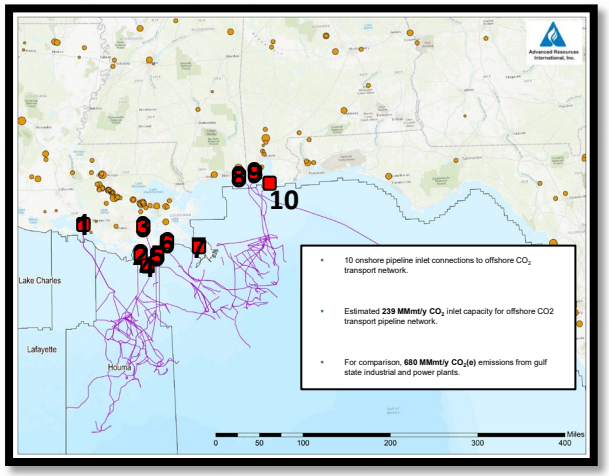


3. Risk Identification

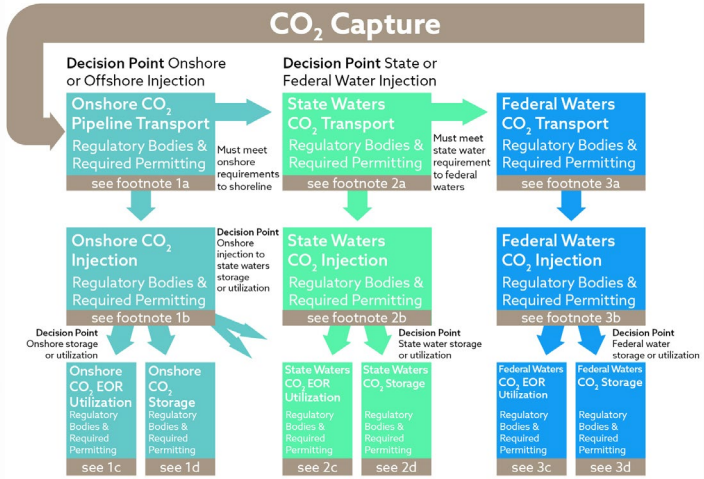
Impact

Likelihood	Negligible	Minor	Moderate	Significant	Severe
Very Likely	Low Med	Medium	Med Hi	High	High
Likely	Low	Low Med	Medium	Med Hi	High
Possible	Low	Low Med	Medium	Med Hi	Med Hi
Unlikely	Low	Low Med	Low Med	Medium	Med Hi
Very Unlikely	Low	Low	Low Med	Medium	Medium

4. Infrastructure

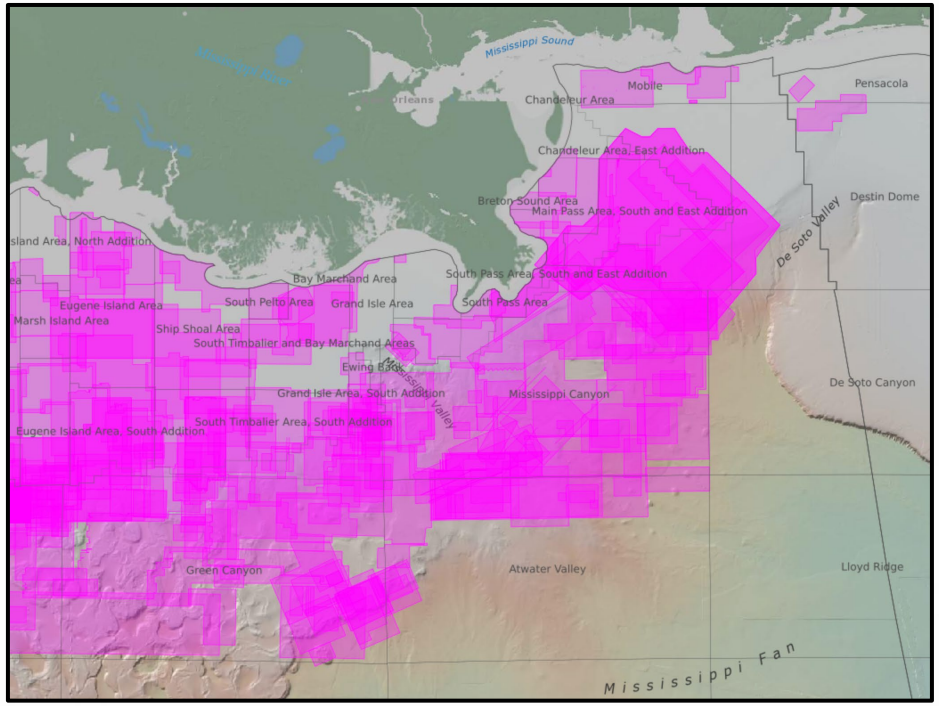


5. Legal and Regulatory

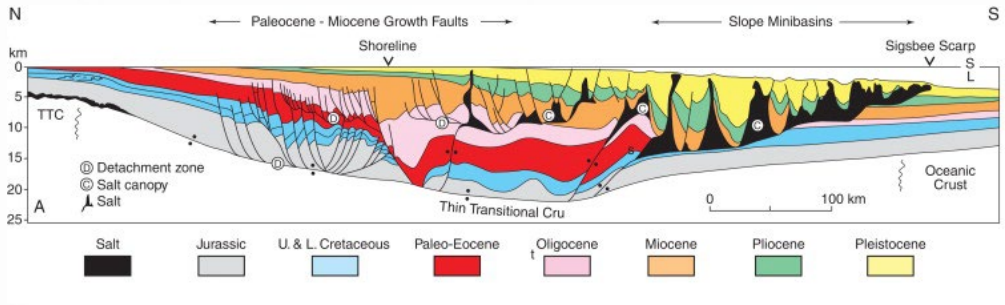


Characterization

- Building on the foundation established by the Southeast Offshore Storage Resource Assessment (SOSRA)
- Targets are largely Miocene through Pleistocene
- Structure in the region related to either growth faulting or salt tectonics
- Static capacity estimates suggest >4 Gt contingent storage resource in depleted reservoirs, and >400 Gt in saline



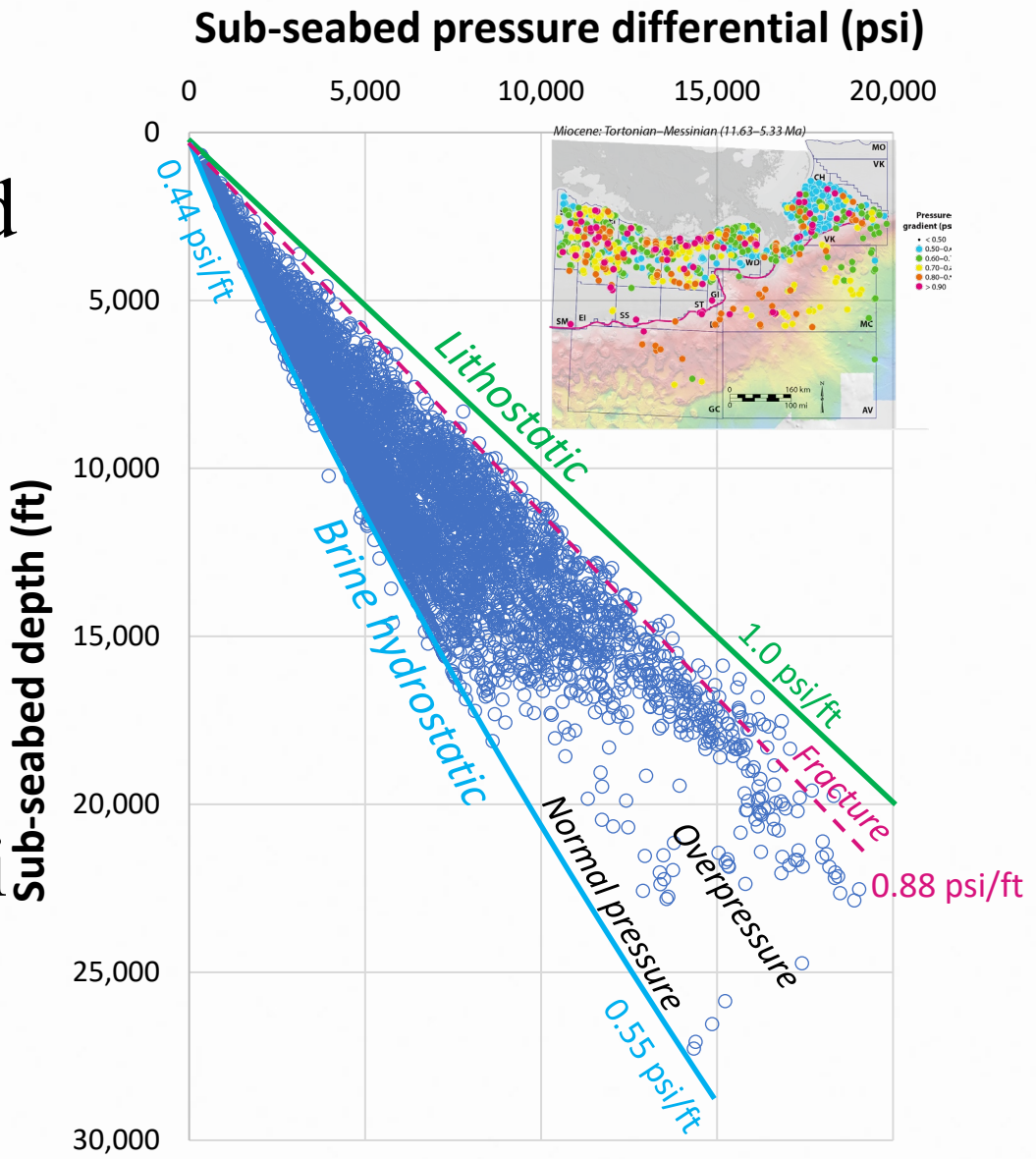
Existing seismic data available through the Bureau of Ocean Energy Management



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

High-Level Screening

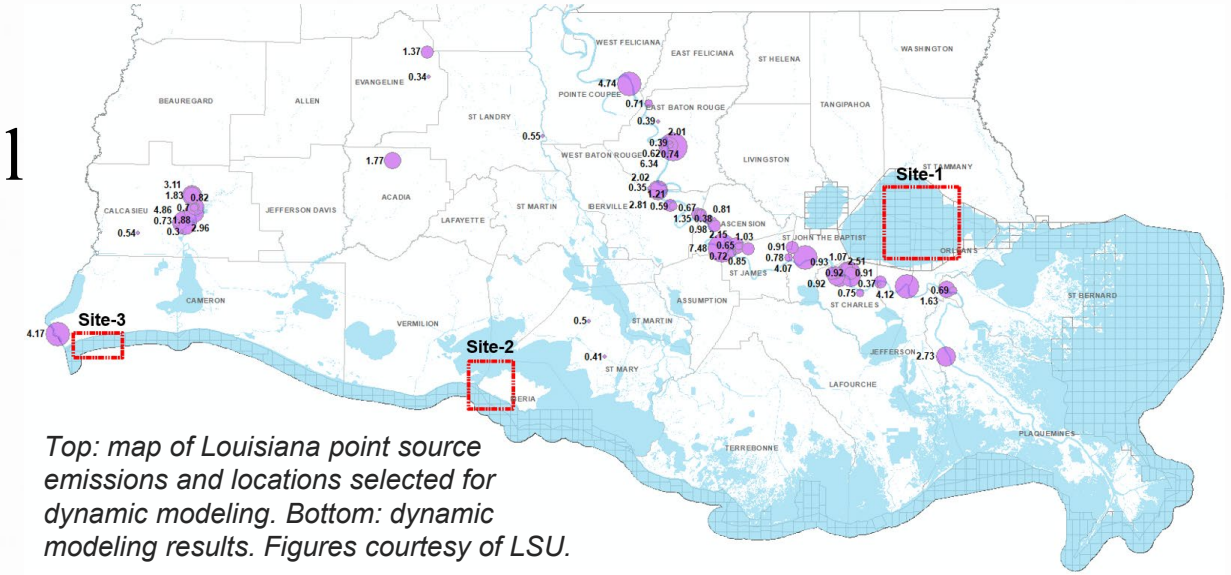
- BOEM Sands database was curated and integrated into SAS Viya to screen for prospective storage opportunities
- Screening included pressure, temperature, porosity, and permeability
- Initial screening revealed prospective areas in the Mississippi Canyon and Green Canyon protraction areas



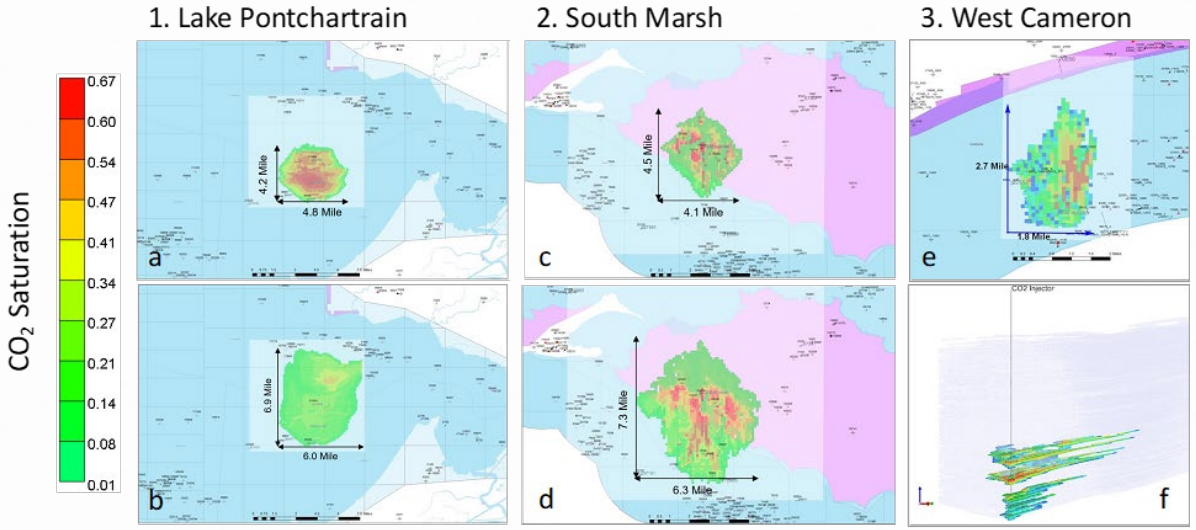
Reservoir pressure for sands located in central Guld of Mexico. Sands approaching lithostatic have little headroom for CO_2. Graphic courtesy of OSU.

Reservoir Modeling - Saline

- Three sites identified as part of initial screening of Louisiana State Waters
- Lake Pontchartrain
  - Lower Miocene shore zone, storage zone is 207 feet thick, 1.45 MMT/mile^2
- South Marsh
  - Middle Miocene fluvial, storage zone is 262 feet thick, 1.73 MMT/mile^2
- West Cameron
  - Lower Miocene fluvial, storage zone is 2,900 feet thick, 21 MMT/mile^2



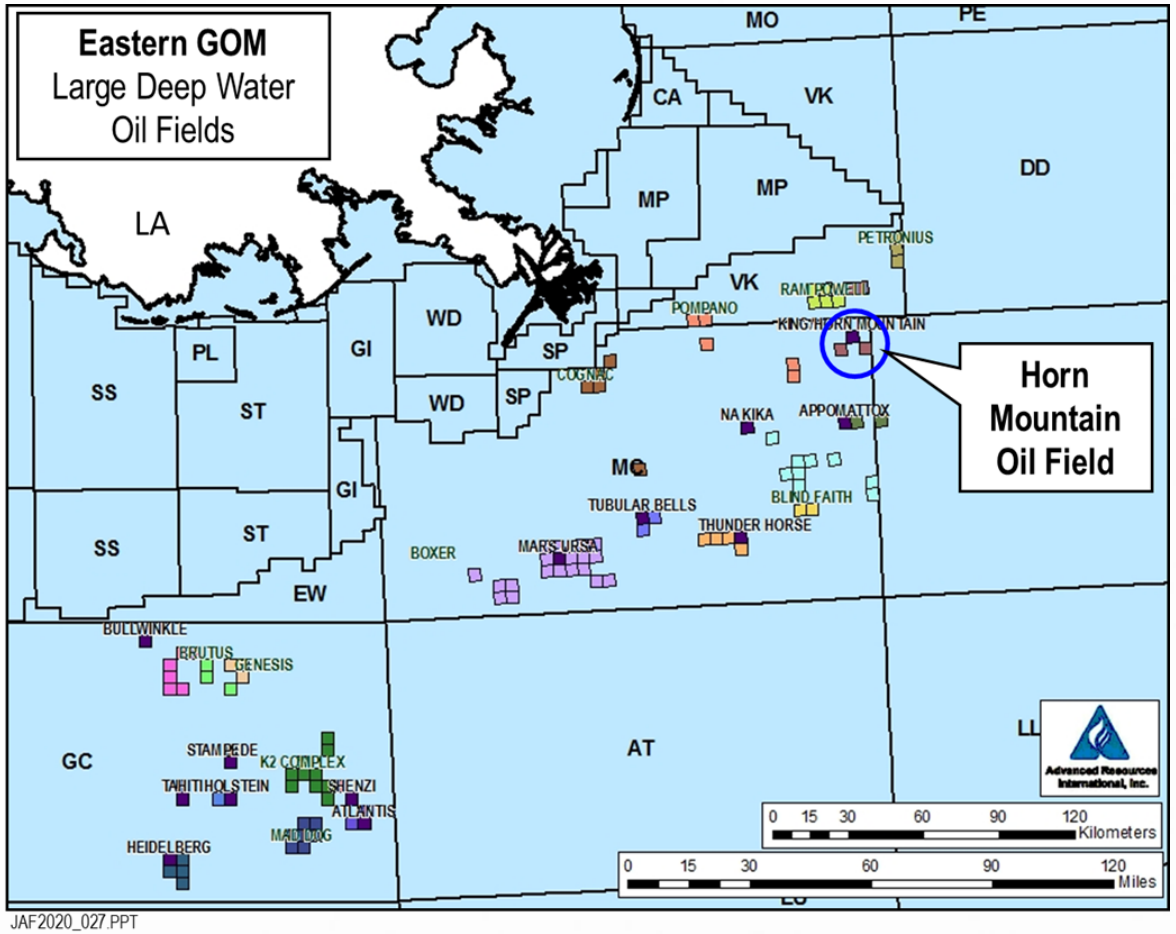
Top: map of Louisiana point source emissions and locations selected for dynamic modeling. Bottom: dynamic modeling results. Figures courtesy of LSU.



30 MMT, 30-yrs | 50 MMT, 50-yrs | 50 MMT, 50-yrs

Reservoir Modeling – Depleted Reservoir

- The selected geologic model for this study is a model developed for the Horn Mountain oil field (Mississippi Canyon 126) in Central Gulf of Mexico, approximately 80 miles from onshore Louisiana
- As of the end of February 2022, over 40% of the Horn Mountain original oil in place has been produced
- Good candidate for deep water, straight CO_2 storage



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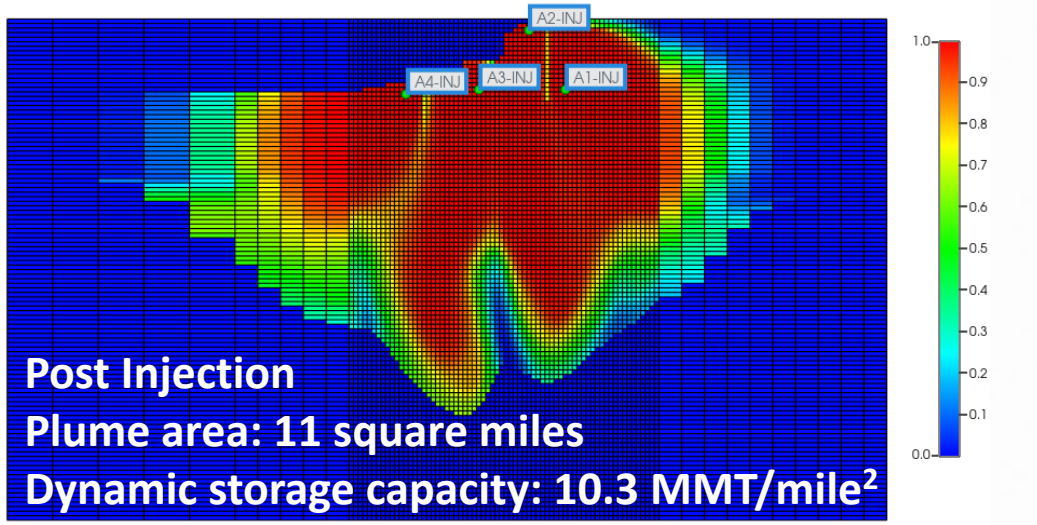
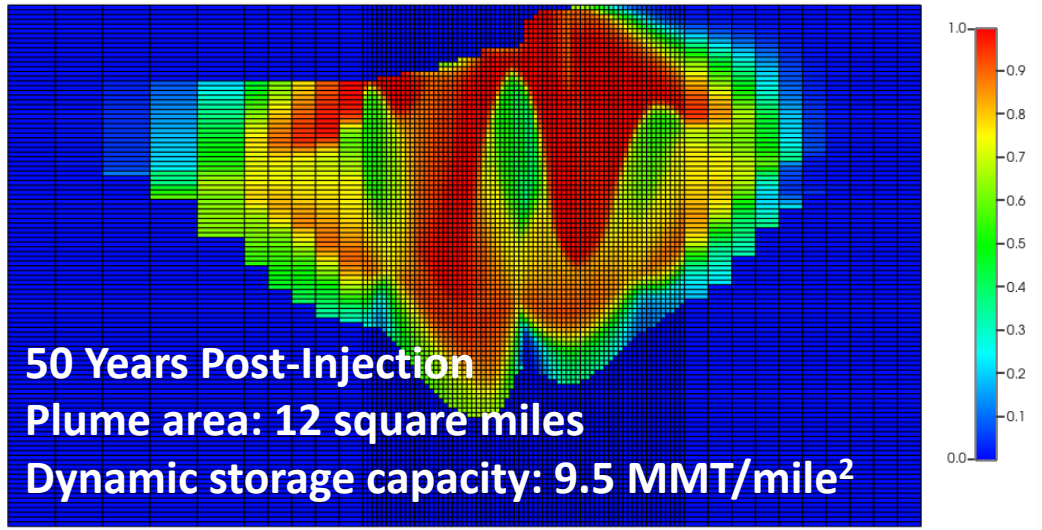
Map illustrating the location of the Horn Mountain Field in the northeast corner of the Mississippi Canyon Protraction Area.

Advanced Resources International, Inc.

Reservoir Modeling – Depleted Reservoir

- Horn Mountain includes two stacked Middle Miocene sands – the M Sand and the J Sand
- M Sand is a uniform anticlinal structure with bounding faults to the north and east
- Geologic model ⇨ reservoir model ⇨ history matching
- Scenario:
  - Four production wells converted to injectors
  - Injected 2,650 tons per day per well for 30 years





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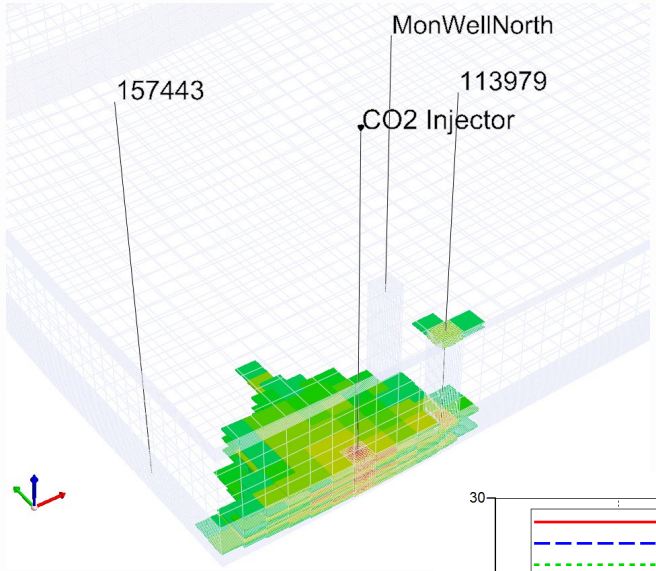
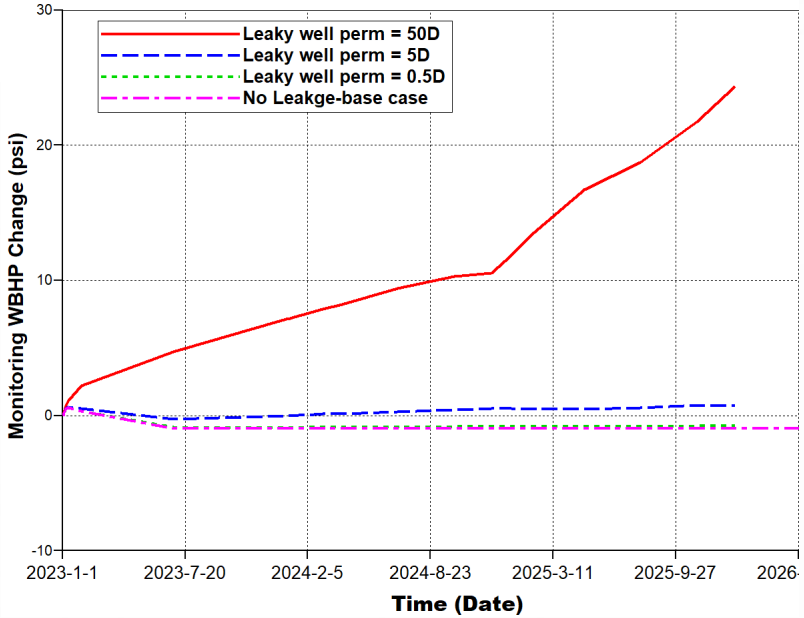
Storage and Operational Risk

- 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
- MVA risks evaluated by the project team include above zone monitoring near leaky legacy well

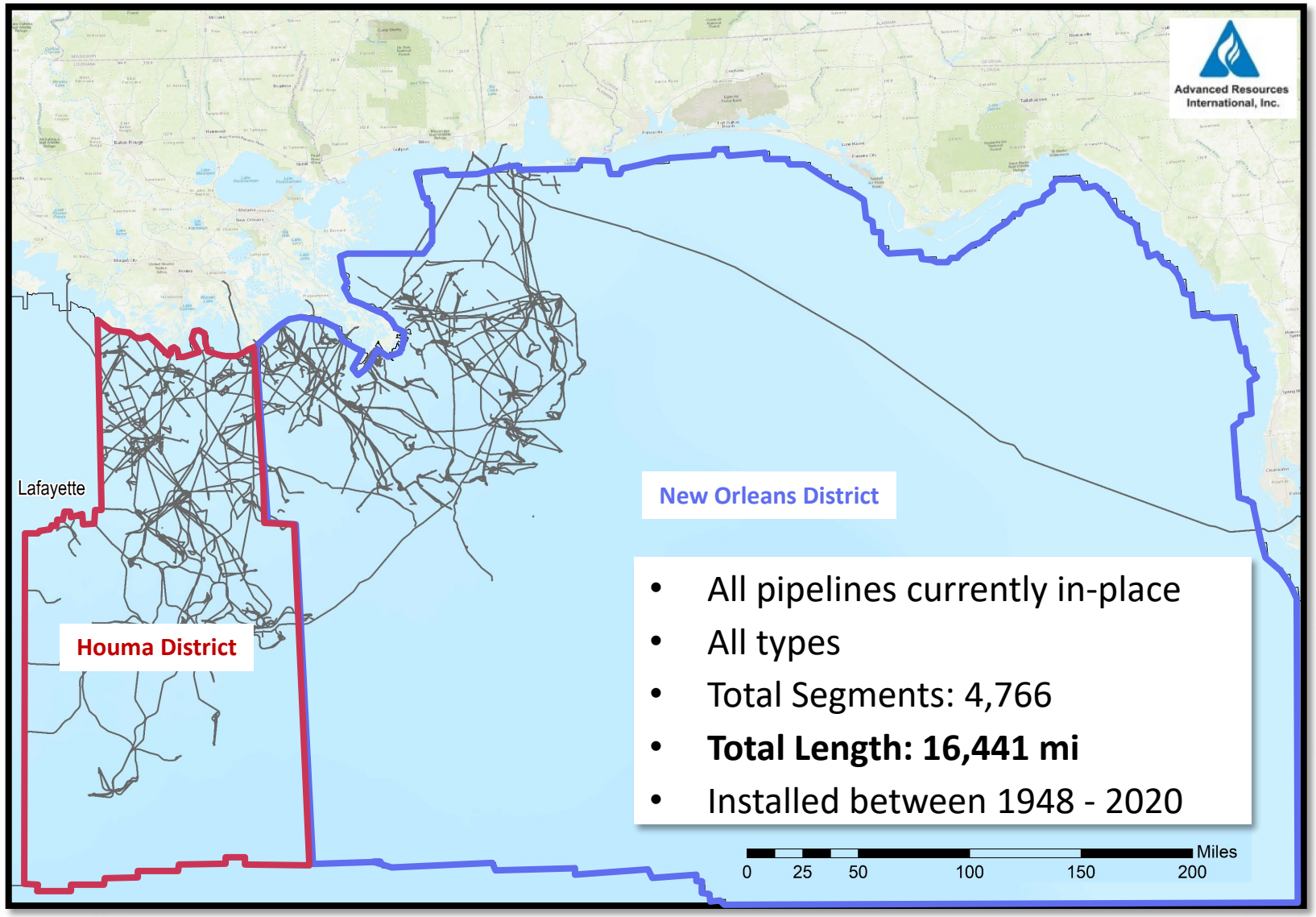


Above zone monitoring technique utilizing the dynamic model generated for the South Marsh Island area in the state waters of Louisiana. Here, an above zone monitoring well is located north of a leaky legacy well. Figure courtesy of Mehdi Zeidouni of LSU.

Above zone monitoring well pressure change detected from leaky legacy well to the south for three different permeability scenarios. Figure courtesy of LSU.



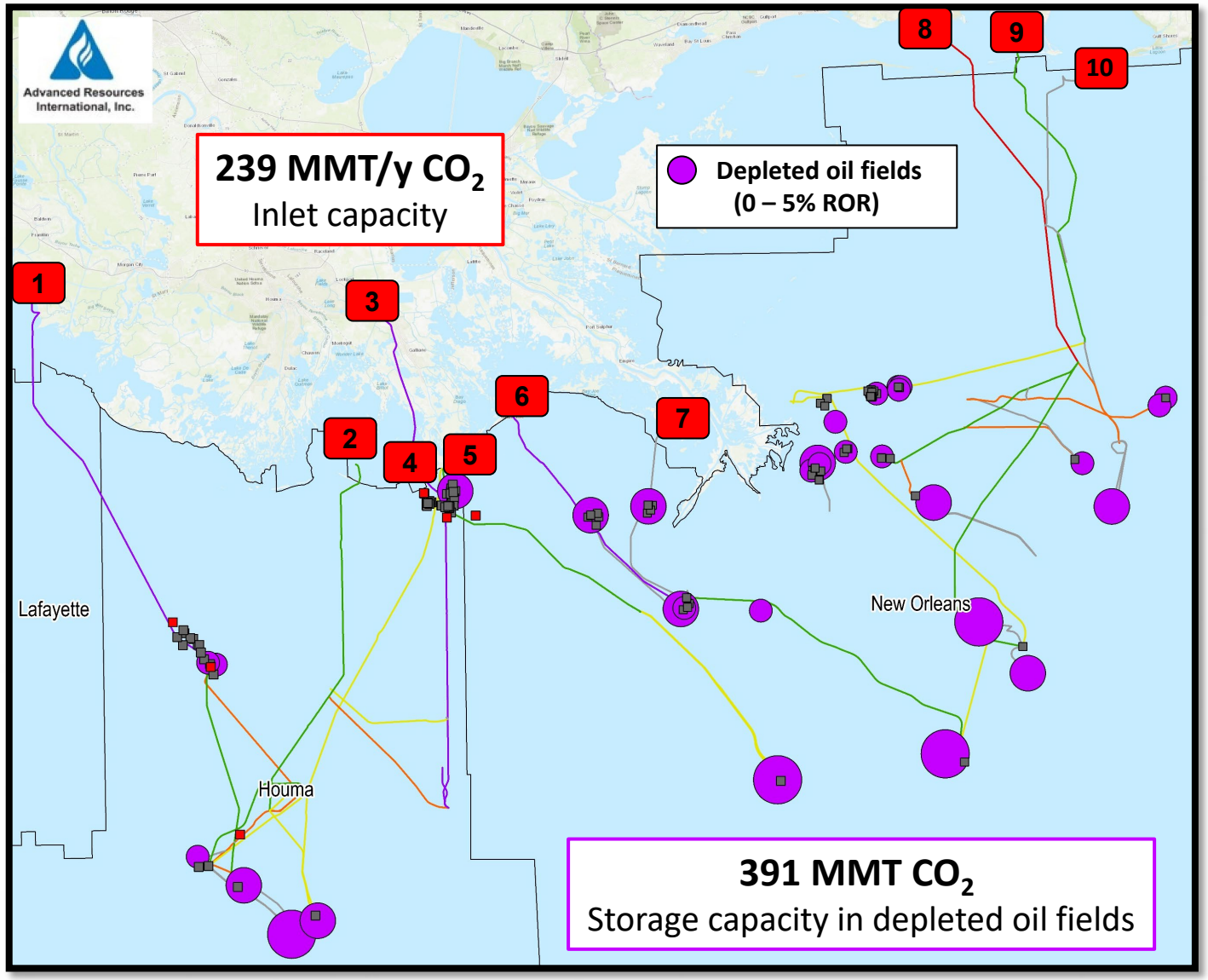
Evaluating Existing Infrastructure



Screening Methodology

- Status – identify active pipelines vs decommissioned/shut-in/removed
- Type – identify oil & gas pipelines vs water/service/other
- Age – identify pipelines constructed after 1980
- Size – minimum 8" diameter (roughly 1 MMmt/y capacity)
- Operating Pressure – minimum of 1,600 psi capability
- Network – continuous link from onshore inlet location

Evaluating Existing Infrastructure (cont.)

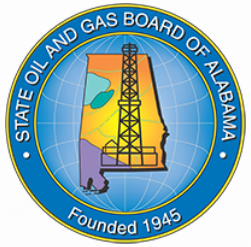


- **239 MMT CO_2 inlet capacity** at 10 onshore pipeline connections
- A total of **391 MMT of CO_2 storage capacity** in 31 depleted oil reservoirs
- 82 pipeline segments totaling 1,784 miles
- 125 offshore platforms; 6 scheduled for abandonment

Regulator Interactions

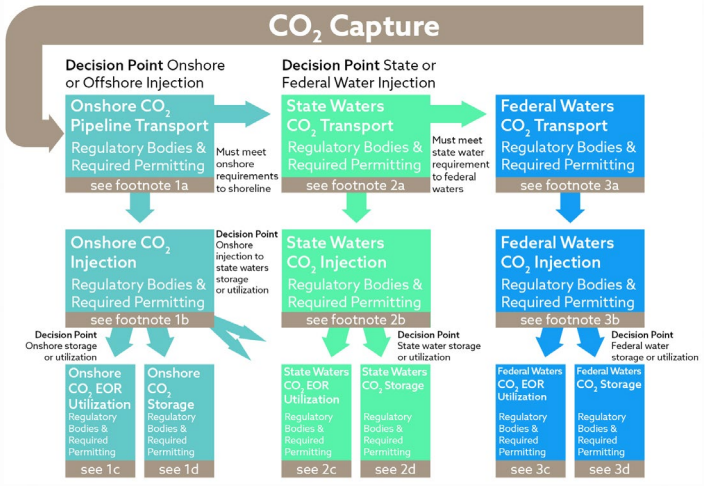
- Hosted May 16 Regulator Workshop in collaboration with GoMCarb
- AL, AR, and MS interested in primacy (consolidating authority)
- Lots of industry interest in LA and TX
- BOEM and BSEE developing regulations as required by the bipartisan infrastructure law
- Class VI well construction, permitting depleted oil and gas fields, and AOR definition

Participation in the 2022 Gulf Region Regulator Workshop



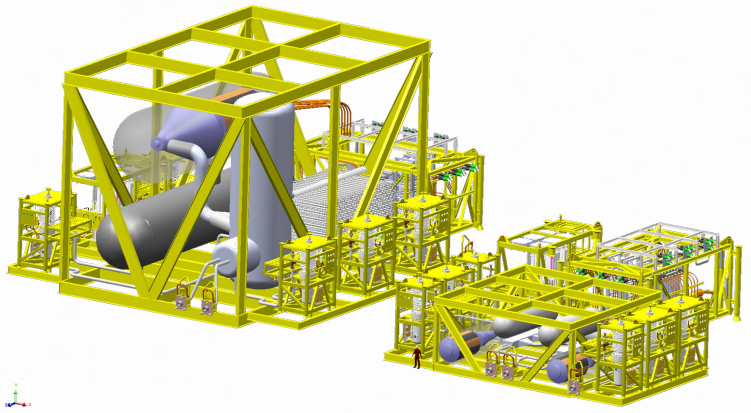
Other Activities

1. Legal and Regulatory



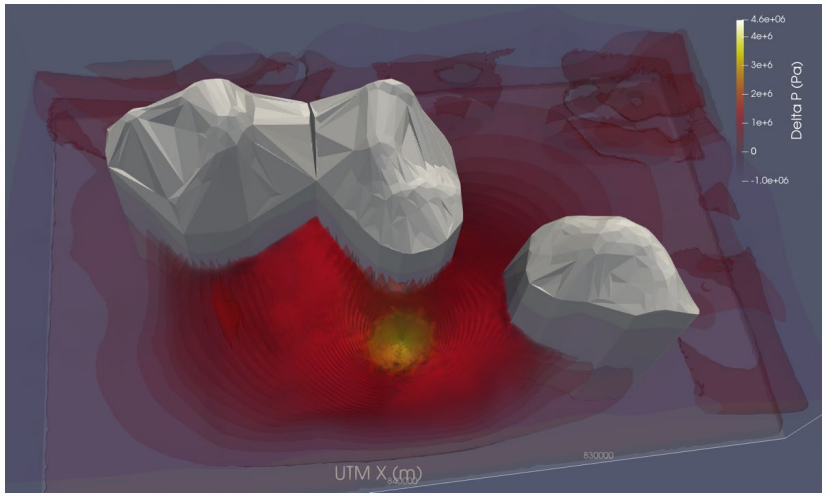
Developing a conceptual flow diagram that includes legal and regulatory considerations for project developers

2. Infrastructure



Developing subsea completions for CO_2 processing from natural gas fields

3. Risk



Developing models to evaluate CO_2 pressure plume interaction with local structural features (e.g., salt diapirs)

Moving Forward

- Continue to import available seismic data, refine geologic characterization and static capacity estimates
- Refine representative models for saline storage, depleted reservoir storage
- Assess infrastructure reuse scenarios and incorporate project cost estimates
- Build out legal and regulatory framework for project developers and assist BOEM and BSEE where appropriate

Thanks!

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