Project Lochridge (DE-FE0032270)

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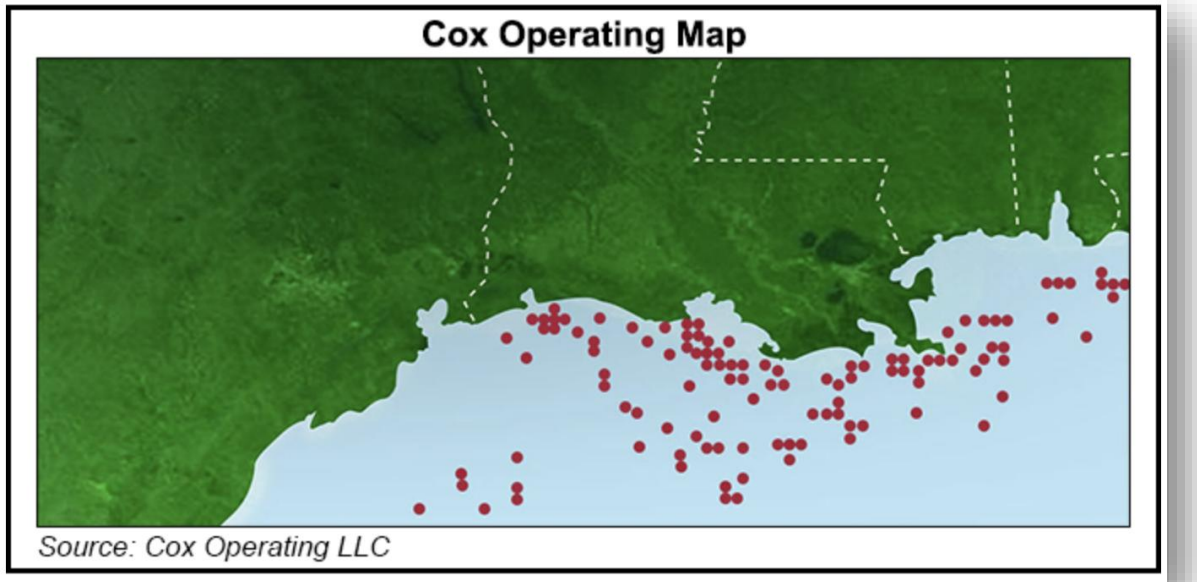
NATIONAL ENERGY TECHNOLOGY LABORATORY

Project Motivation

- Lots of local industrial activity and associated emissions (90 MMT/yr)
- Motivated commercial partners Carbon Zero and Repsol with assets and offshore expertise
- Establish the basis for a commercial CO_2 storage hub in the federal waters of the US Gulf of Mexico
  - Saline Reservoirs
- Serve as an opportunity for knowledge sharing with other project developers
- Community and stakeholder engagement

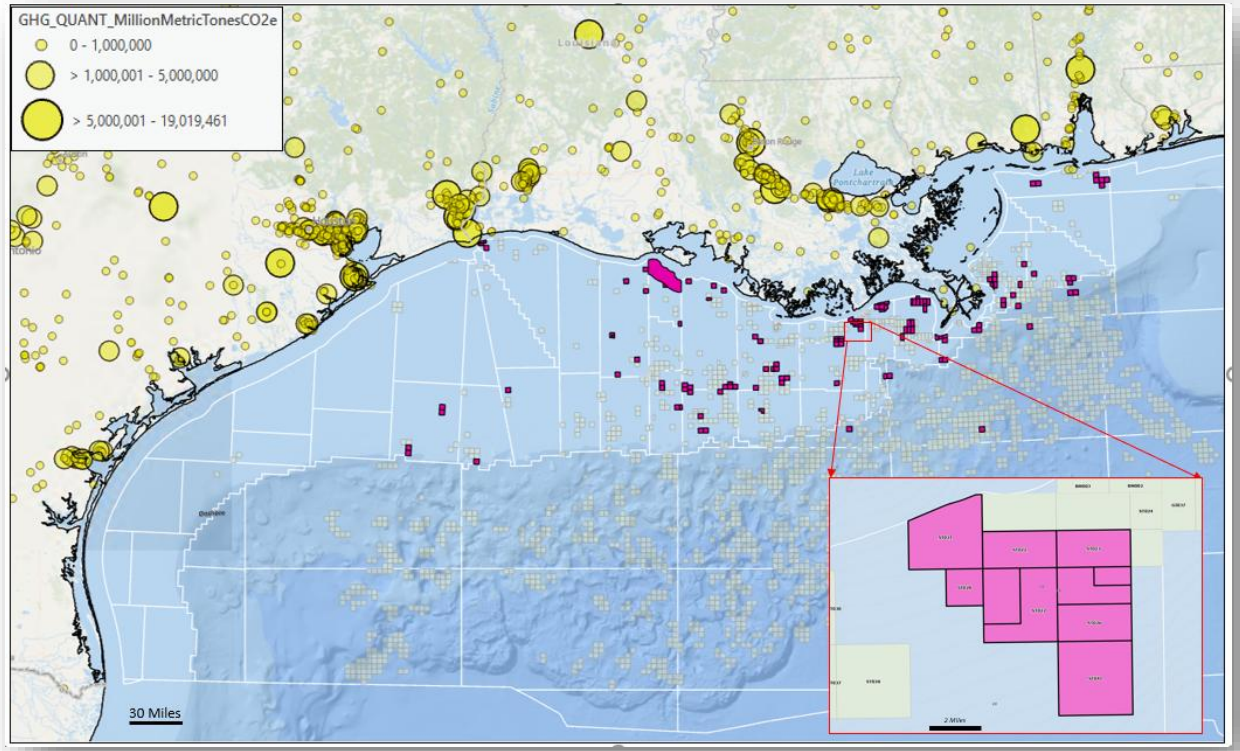
GlobeNewsWire press release announcing the partnership between Carbon-Zero and Repsol.



Cox Operating, a Carbon-Zero affiliate, existing leases in the Gulf of Mexico.

Location

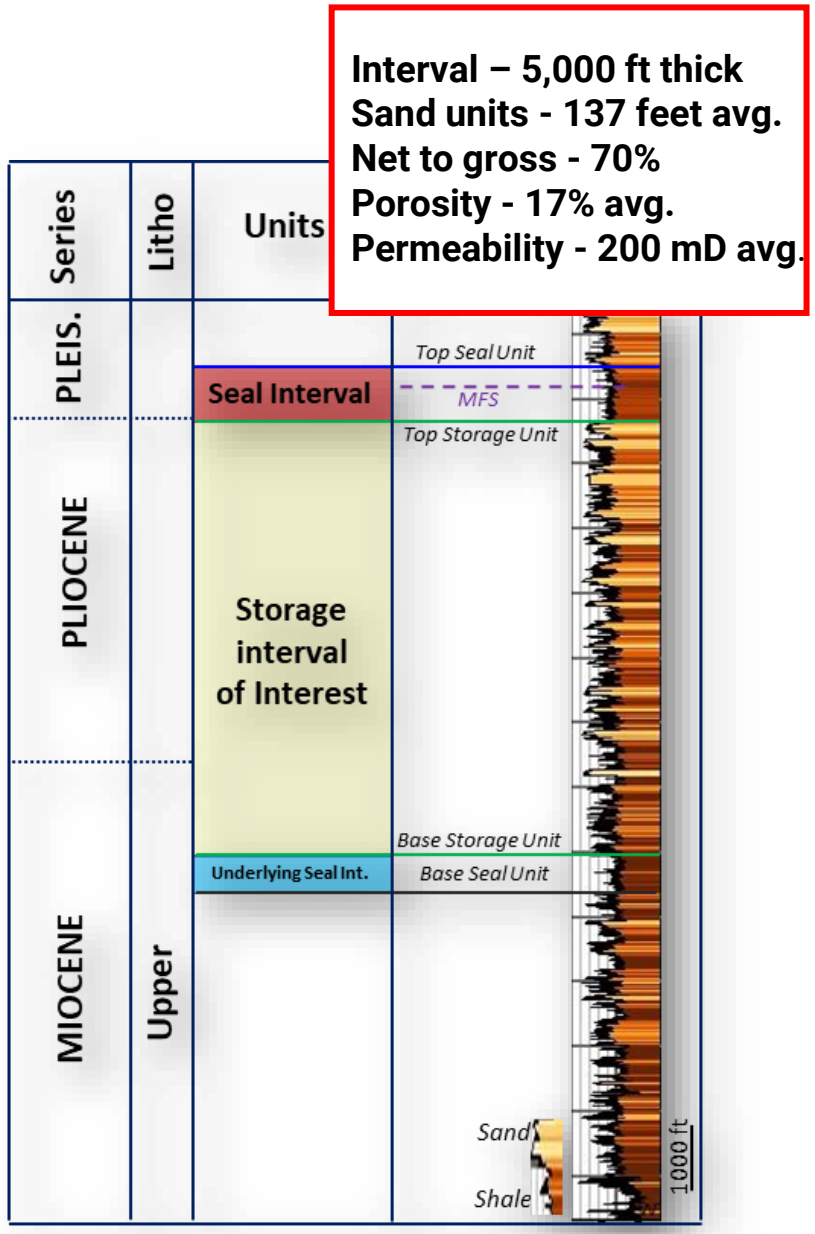
- Initial screening was conducted to identify areas prospective for further investigation
- Criteria included:
  - Close proximity to the coast and regional emitters
  - Large volumes of geological, geophysical, and drilling information available
  - Ideally, limited number of legacy well penetrations
  - Limited proximal resource development
- South Timbalier lease blocks



Map illustrating the location of the South Timbalier lease blocks and regional emitters from the EPA Greenhouse Gas Reporting Database.

Geology

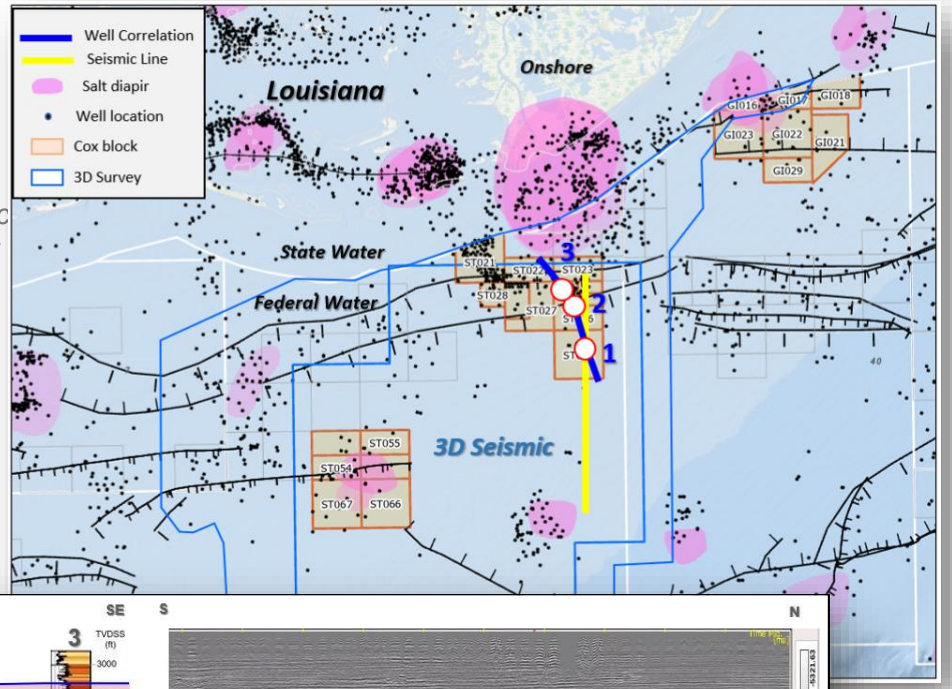
- Storage window depth was used to ascertain approximate depth
  - Storage window is the interval wherein CO_2 is stored a supercritical conditions, but the reservoir is not at risk for over pressure
  - Burke et al. (2012) was utilized to constrain pore pressure
  - 3,000 to 10,000 feet below seabed
- Type logs used to identify thick, sandy intervals in the Upper Miocene/Pliocene



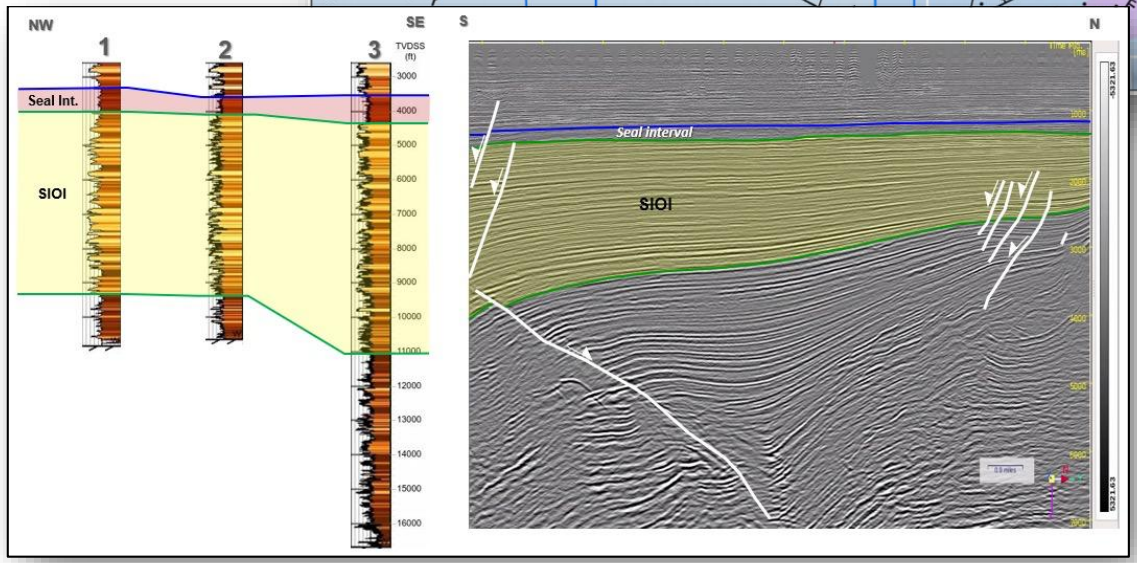
Stratigraphic column and type log for the ST lease blocks.

Geology

- Seismic interpretations confirm the storage interval of interest and confining interval are laterally continuous
- Shale baffles act as composite confining system for individual sand units
- Large extensional faults to the north and salt diapirs to the north and south



Map of the South Timbalier lease area. Also shown are regional faults (black lines), wells (black dots), existing seismic lines (blue and yellow lines), and publicly available 3D seismic data (blue polygons).



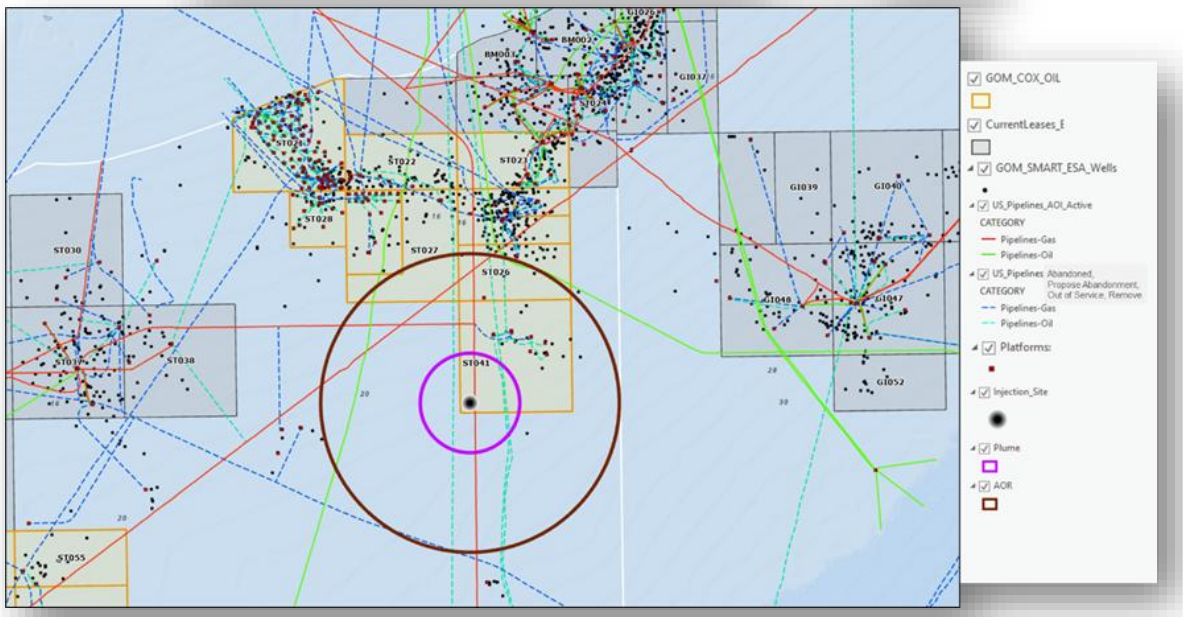
Cross section of three wells from the South Timbalier area (left). North-south seismic section that transects the project site location.

Geology

- Capacity estimates calculated using efficiency factors from the NETL CO_2 Screen Tool
- In all instances, capacity exceeds 50 MMT over a 30-year period
- Likely much greater capacity as these calculation were conducted for only a portion of the storage interval of interest
- P50 area of review transects few existing wells

Calculated static storage capacity estimates for a single interval of the SIOI

	Parameters	P10	P50	P90
Physical Parameters	Area (sq. km)	5	20	35
	Gross Thickness (m)	550	650	750
	Effective Porosity (%)	20	24	28
	Pressure (MPa)	30	35	40
	Temperature (degC)	65	75	85
Efficiency Factors (COBRA 2022)	Injection Duration (years)	30	30	30
	Net-to-Toal Area	1	1	1
	Net-to-Gross Thickness	0.4	0.45	0.5
	Effective-to-Total Porosity	1	1	1
	Volumetric Displacement	0.38		0.58
	Microscopic Displacement	0.31		0.39
Output	Saline Efficiency Factor	5.59	7.48	9.64
	CO2 Storage Capacity (Mt)	**56**	**145**	**368**

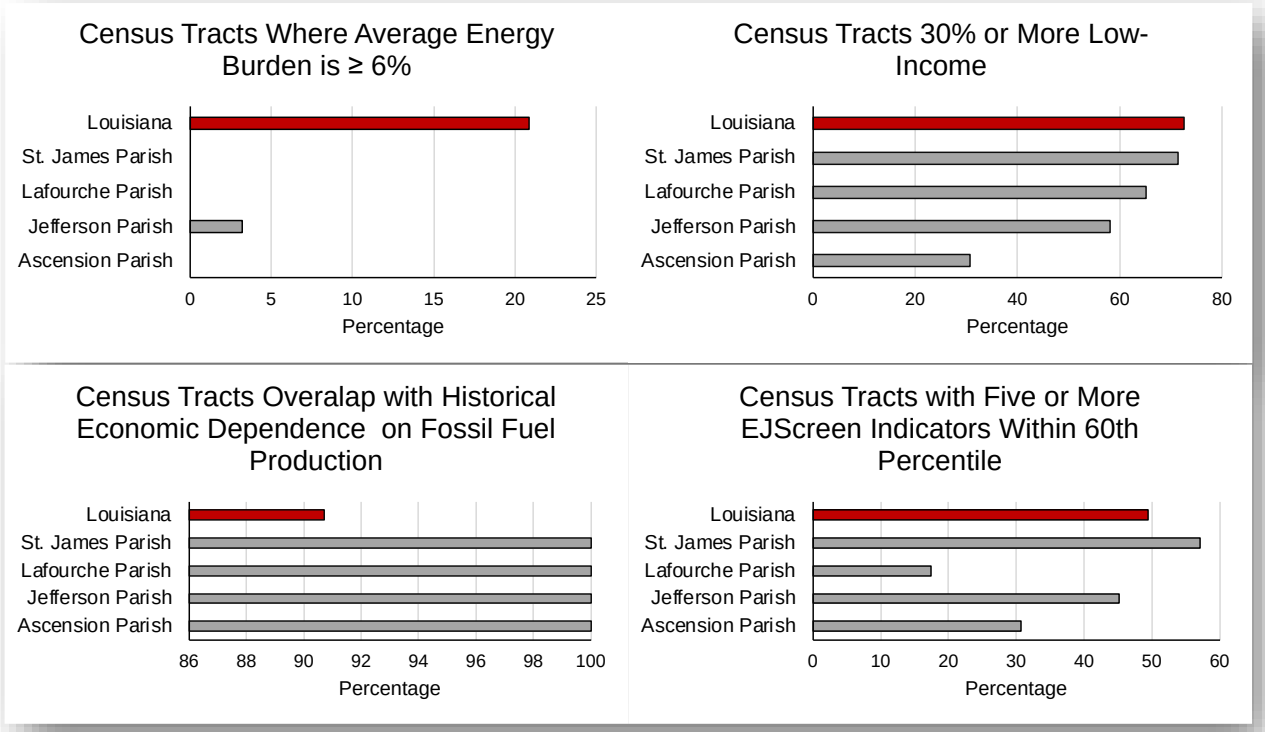


Calculated CO_2 and pressure plume at the proposed site location (ST041 lease block).

Transcending Boundaries

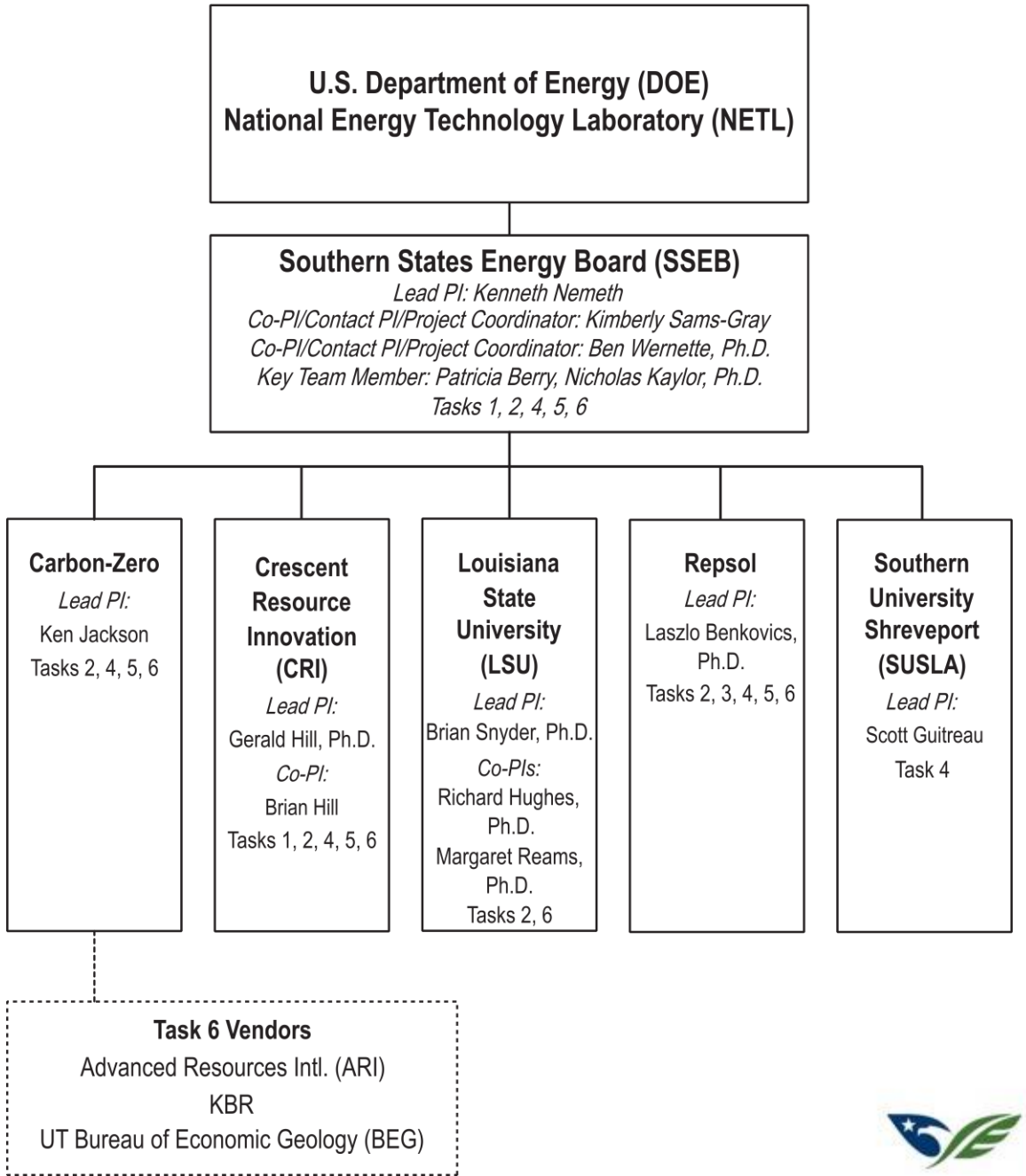
Evaluating Community Dynamics

- No direct impacts as part of this phase of the project
- Assumed an integrated project transporting CO_2 onshore to the offshore environment – 4 parishes transected
- Different legacy burdens will certainly point to different concerns between parishes
- More attention needed moving forward



Overview of EJScreen data for the four administrative areas that may be impacted by an integrated project in the future. Data are compared to Louisiana.. Note that EJScreen Indicators include percentage of pre-1960 housing (lead paint indicator), diesel particulate matter, air toxics cancer risk, air toxics respiratory hazards, traffic proximity and volume, major direct discharges of water, proximity to national priorities list sites, proximity to risk management plan facilities, proximity to treatment storage and disposal facilities, index for ozone in the air, and index for PM2.5 in the air. The aggregate metric (i.e., five or more EJ indicators in the 60th percentile) is adopted from the U.S. DOE Communities LEAP eligibility criteria

Project Lochridge
Contractual Organizational Chart



Transcending Boundaries

Project Objectives

Demonstrate that the subsurface saline formations at the Storage Complex can store at least 50 million metric tons of captured CO_2 safely and permanently over a 30-year period

Conduct meaningful engagement and two-way communications with communities and stakeholders

Identify commercial project risks and develop a comprehensive mitigation strategy

Complete a technical and economic feasibility assessment

Develop a plan for subsequent detailed site characterization to support the U.S. Department of Interior's Bureau of Safety and Environmental Enforcement (BSEE) Outer Continental Shelf (OCS) permit readiness

Tasks

Task 1 – Project Management and Planning

Task 2 – Community Benefits Plan

Task 3 – Site Specific Characterization and Assessment of the CO_2 Storage Complex

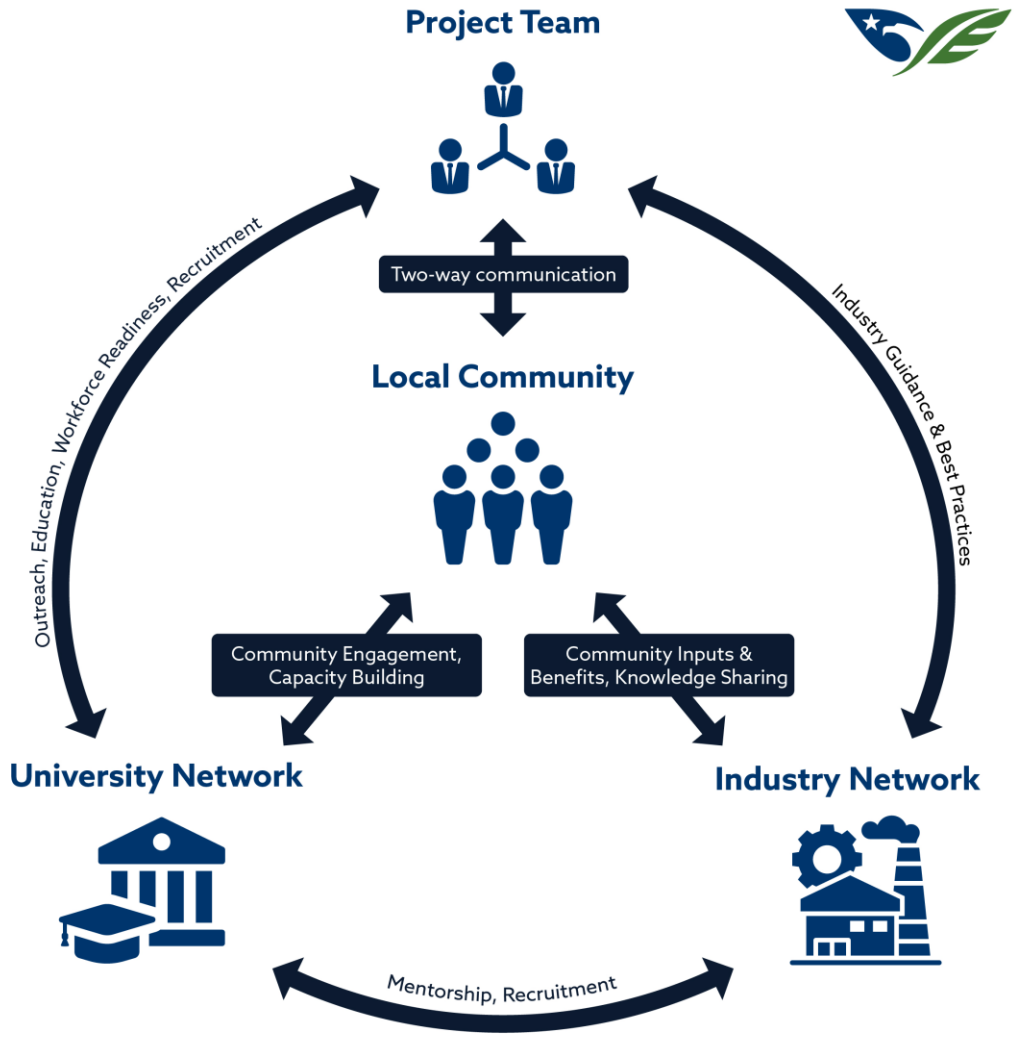
Task 4 – Preliminary Project Risk Assessment with Mitigation and Management Plans

Task 5 – Plan for Subsequent Detailed Site Characterization and BSEE OCS Permitting

Task 6 – Project Technical and Economic Feasibility Assessment, including Conceptual-Level Design Study for CO_2 Transport

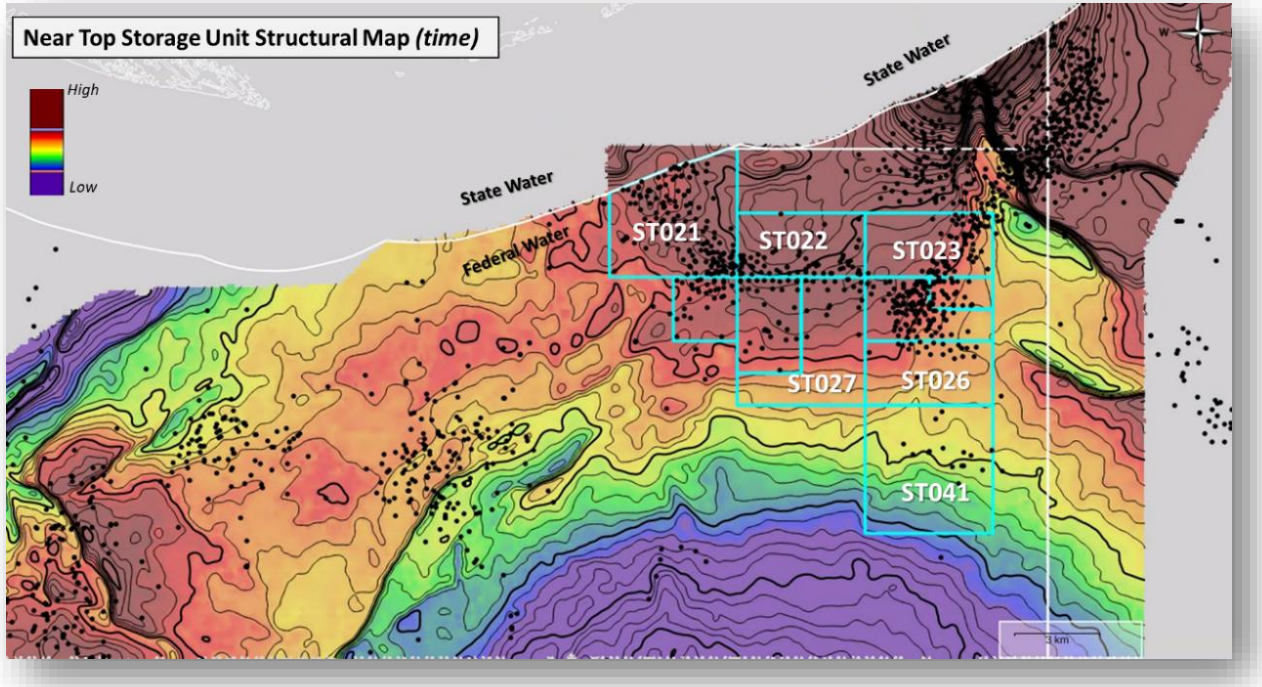
Task 2 – Community Benefits Plan

- Develop a diverse and comprehensive list of stakeholders
- Host at least one community and stakeholder engagement event
- Partner LSU to develop economic impact assessment
- Host engagement events to communicate CCUS job opportunities
- Actively engage with state and federal regulators



Task 3 - Site Specific Characterization and Assessment of the CO_2 Storage Complex

- Data collection through open sources and subscription services
- Review existing well and seismic data, and purchase new data
- Geological and geophysical analysis
- Seismic reprocessing
- Subsurface model
- Dynamic model



Structural grid of the Pleistocene seal that overlies the storage interval of interest in the South Timbalier area of the US Gulf of Mexico.

Deliverables

Task/Subtask	Deliverable Title	Due Date
1.0	Project Management Plan	Update due 30 days after award. Revisions to the PMP shall be submitted as requested by the NETL Project Manager.
3.0	Storage Complex Characterization and Assessment Report	30 Days Prior to End of Performance Period
4.2	Risk Assessment with Mitigation and Management Plans for an Offshore Storage Project	30 Days Prior to End of Performance Period
5.0	Detailed Plan for Subsequent Site Characterization and BSEE OCS Permitting	30 Days Prior to End of Performance Period
6.0	Technical and Economic Feasibility Assessment, Including Conceptual-Level Design Study for CO_2 Transport, and Stakeholder Evaluation	30 Days Prior to End of Performance Period

Thanks!

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