SOUTHERN STATES ENERGY BOARD

Transcending Boundaries

SSEB Overview and Current Projects

Brian Hill, Finance and Commercialization Consultant

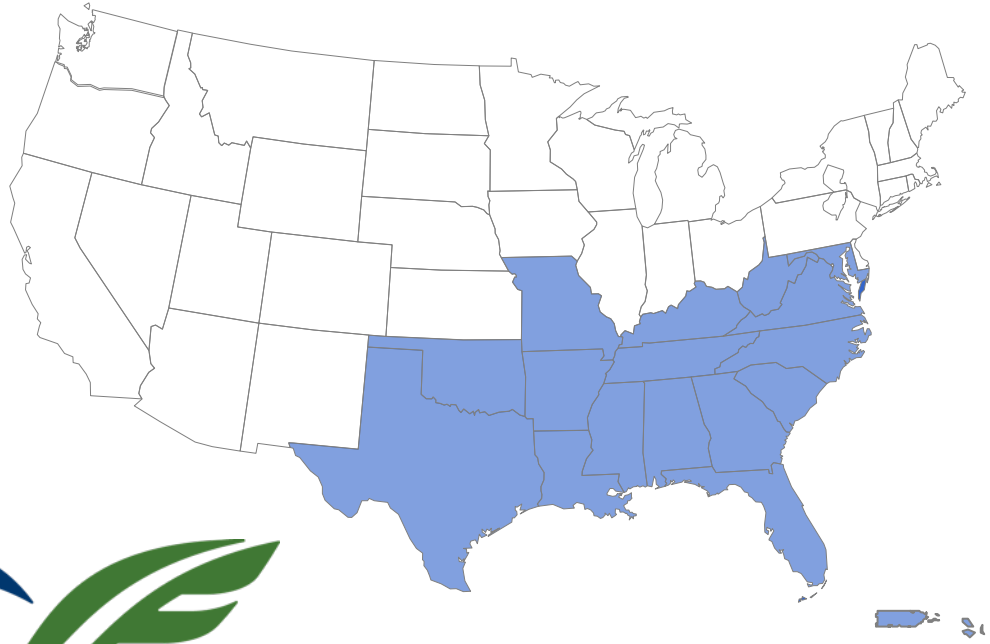
BHill@CrescentRI.com 980-322-8122

April 24, 2019

"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

- **Established 1960 and expanded in 1978**
- **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**



Governors Summit Continued at Annual Meeting of SSEB

Key Issues for states

- Appalachian Storage Hub
- 45Q (CCUS tax credits)
- Hydropower relicensing
- Hurricane support to states
- Workforce development & training

Key Issues in the Shifting Energy Game Board

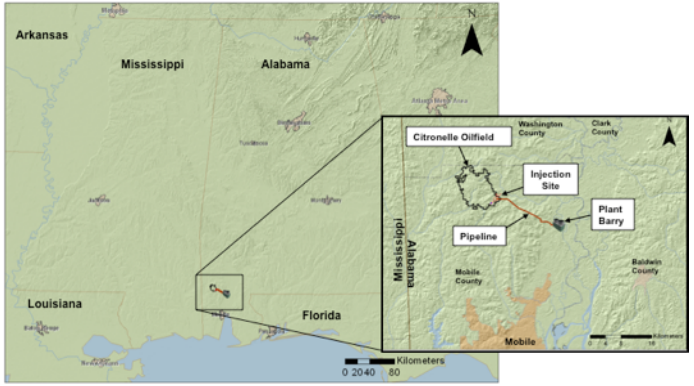
- Impact of hurricanes on major energy resources
- Regional fuel waivers during major natural disasters or supply disruptions
- Appalachian energy/storage hub
- SECARB / Petra Nova emergence of CO_2-EOR in region
- Industrial CCUS in the South
- Project ECO_2S and Regional CO_2 Storage Complex
- Nuclear faces cold reality in the South
- Recent rulings on Atlantic Coast and Mountain Valley pipelines
- DOE – Grid Reliability and Resiliency Markets
- Subsidies to meet state GHG goals and retain baseload power plants
- Rollback of Clean Power Plan and implications for SSEB states
- Fracking infrastructure impacts – land use, water, transport
- Infrastructure Funding – what it might mean in the South

Appalachian Energy Hub

- $10 + Billion infrastructure project
- Creates opportunity for chemical and downstream sectors to grow, creating economic revitalization of Appalachia
- Shale gas revolution has delivered low cost energy & feedstock
- Downstream chemical investments have increased 50%
- Shell's ethane cracker is multi-billion dollar investment
- Storage hub necessary to support development of full regional systems
- Support for the project includes recent U.S. Chamber of Commerce letter to Energy Secretary Perry
- Senator Capito (WV) introduced *Appalachian Energy & Manufacturing Infrastructure Revitalization Act of 2017* in June, 2017 (S.1340)

SECARB CCUS Demo

- SSEB's SECARB Demo at Plant Barry (Bucks, AL)
- 25 MW post-combustion slip-stream carbon capture
- 12 mile pipeline to Citronelle, AL for storage
- Potential for EOR



Power Plant

Capture

Transport

Storage

Petra Nova- Emergence of CCUS in South

SSEB Demo Goes Commercial!

- NRG Energy (Houston, TX)
- Interest in Plant Barry Demonstration
- Plant scale-up to 240 MW
- Post-combustion slip-stream
- Captures 5,200 tons CO_2/day or 90% of CO_2
- Pipeline to Petra Nova West Ranch Oil Field (81 miles)
- EOR 300 bbls/day to 15,000 bbls/day!
- 60 million bbls Recoverable Reserves

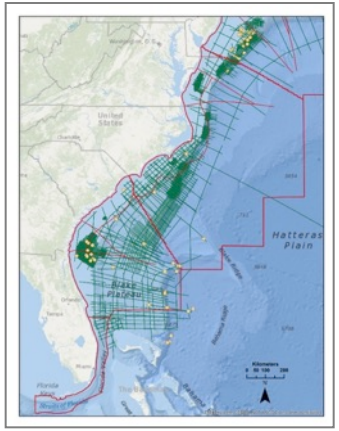
Project ECO_2S | CarbonSAFE

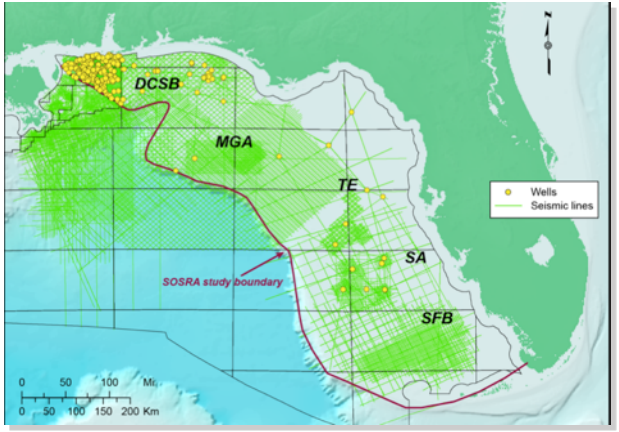
Project ECO_2S: Pursue key advances in CO_2 storage knowledge & technology, including ***optimizing CO_2 storage efficiency, modeling the fate of injected CO_2,*** *and* ***establishing residual CO_2 saturations****. Project ECO_2S will involve "real-life" experiences, issues, and challenges of* ***scaling-up from its regional, pre-feasibility assessment of CO_2 storage*** *to* ***establish a site-specific, commercial-scale CO_2 storage facility****, including* ***capturing "lessons learned"***

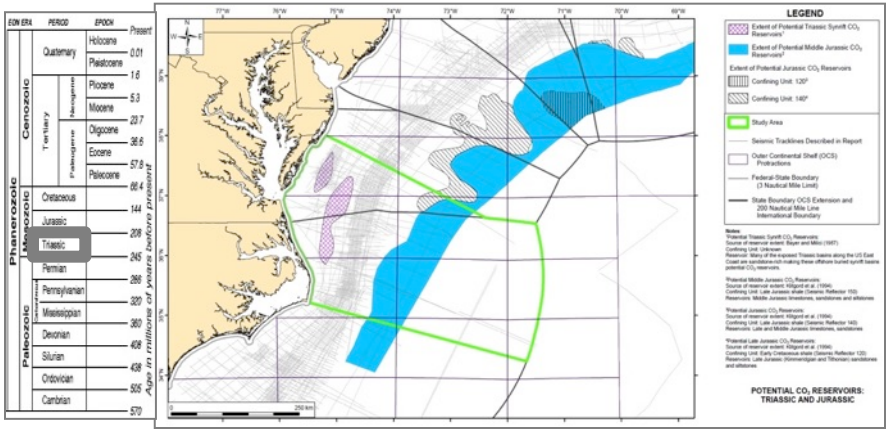
- **CarbonSAFE Program Goals**: Develop a commercial-scale integrated CCS storage complex
- **CarbonSAFE Program Phases:**
  - Phase 1. Integrated CCS Pre-Feasibility Study
  - ***Phase 2. Storage Complex Feasibility Study***
  - Phase 3. Site Characterization
  - Phase 4. Permitting & Construction

- Advanced Resources International, Inc.
- Auburn University
- Battelle Memorial Institute
- Geological Survey of Alabama
- Gerald R Hill PHD, Inc.
- GHG Underground
- Lawrence Berkeley National Laboratory
- Los Alamos National Laboratory
- Loudon Technical Services, LLC
- Mississippi Power Company
- Mississippi State University
- Oklahoma State University
- Pashin Geoscience, LLC
- Southern Company
- Trimeric Corporation
- University of Alabama at Birmingham
- University of Wyoming
- Virginia Polytechnic Institute and State University, Virginia Center for Coal and Energy Research

SOSRA *(Offshore Resource Assessment)*







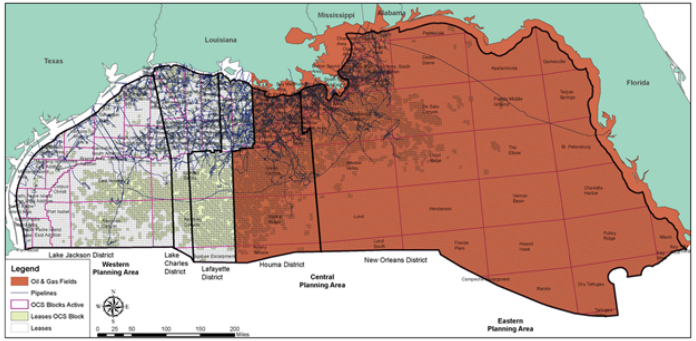
- Characterize offshore CO_2 storage opportunities and conduct a volumetric analysis
- Model offshore CO_2 storage to identify well and reservoir configurations that are capable of meeting the goal of 30 megatonnes or greater storage in key focus areas
- Develop best practices to advance the state of knowledge while reducing the cost of storage operations
- 3 Planning Areas: Mid-Atlantic, South Atlantic, and Eastern Gulf of Mexico

U.S. DEPARTMENT OF ENERGY
NETL
SOUTHERN STATES ENERGY BOARD
VirginiaTech
UNIVERSITY OF SOUTH CAROLINA
OKLAHOMA STATE UNIVERSITY
DMME Virginia Department of Mines Minerals and Energy
Advanced Resources International, Inc.

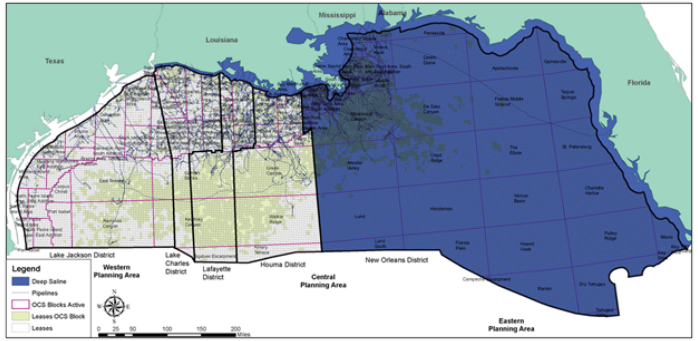
SECARB Offshore

- Expands membership of the Southern States Energy Board's (SSEB) existing Gulf of Mexico (GOM) government-industry partnership to focus on assembling the knowledge base required for secure, long-term, large-scale carbon dioxide (CO_2) subsea storage, with or without enhanced hydrocarbon recovery.
- Supports DOE's long-term objective to ensure a comprehensive assessment of the potential to implement offshore CO_2 subsea storage in all of the U.S. Department of Interior's Bureau of Ocean Energy Management (BOEM) Outer Continental Shelf (OCS) Oil and Gas Leasing Program Planning areas in the GOM.
  - **Objective 1:** Combine the capabilities and experience of industry, academia, and government to develop and validate key technologies and best practices to ensure safe, long-term, economically-viable CO_2 storage in offshore environments.
  - **Objective 2:** Facilitate the subsequent development of technology-focused permitting processes needed by industry and regulators (i.e., Department of Interior and BOEM).
  - **Objective 3:** Collaborate with Federal and State agency programs to improve the confidence in containment of CO_2 in the subsea offshore environment in storage reservoirs over both short and long timeframes.
  - **Objective 4:** Provide a comprehensive assessment of the potential to implement offshore CO_2 storage in the defined GOM Study Area.

SECARB Offshore



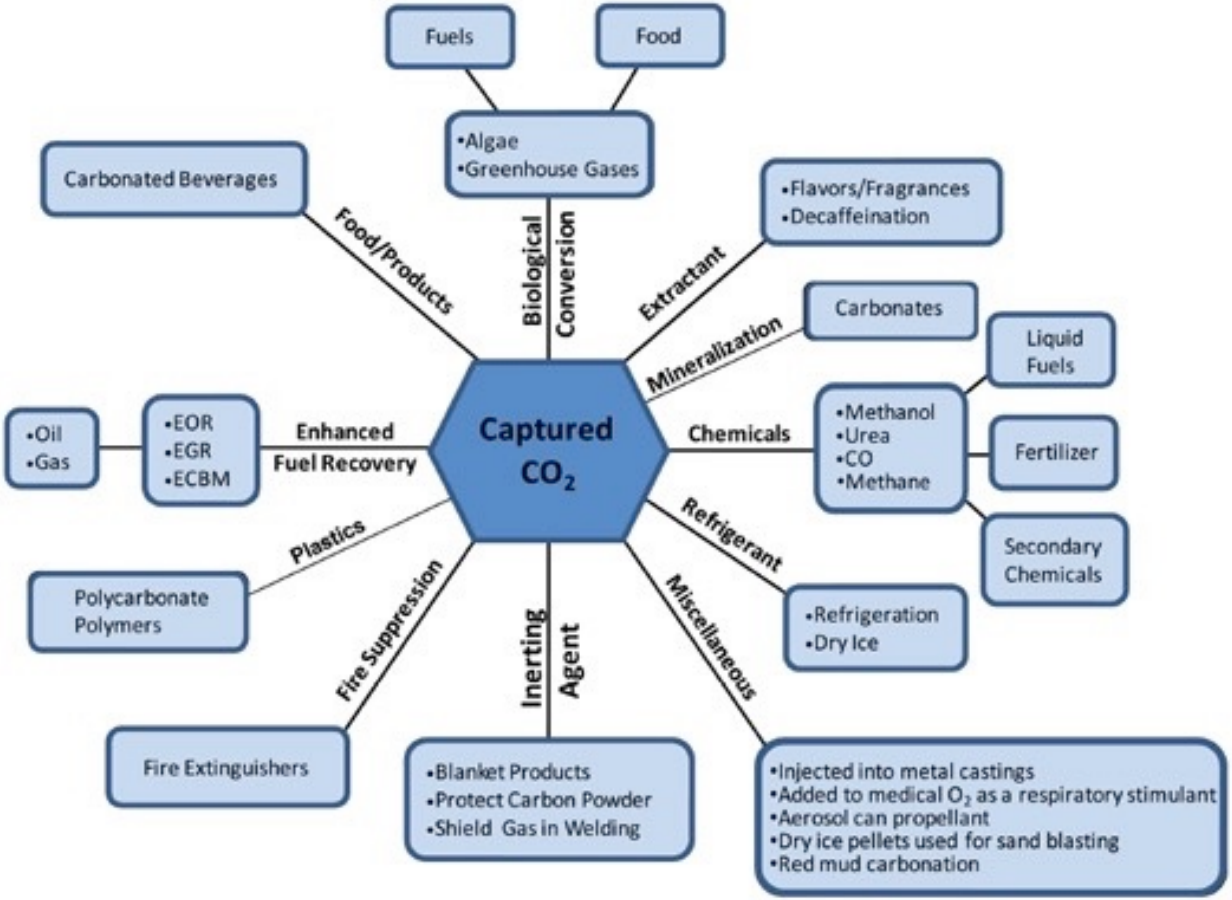
Study Area | Oil and Gas



Study Area | Saline Aquifers

FEDERAL WATERS		
	Depleted Oil & Gas Fields, and Potentially Associated CO_2-EOR	**Deep Saline**
Western Planning Area	No	No
Central Planning Area	Study Area is East of Houma District's Western Boundary (includes Houma District)	Study Area is East of New Orleans District's Western Boundary (excludes Houma District)
Eastern Planning Area	All	All
STATE WATERS		
	Depleted Oil & Gas Fields, and Potentially Associated CO_2-EOR	**Deep Saline**
Texas	No	No
Louisiana	Partial, Includes State Waters East of Houma District Boundary Extension	Partial, Excludes Chandeleur Sound/Islands
Mississippi	Yes	Yes
Alabama	Yes	Yes
Florida (West Coast)	Yes	Yes

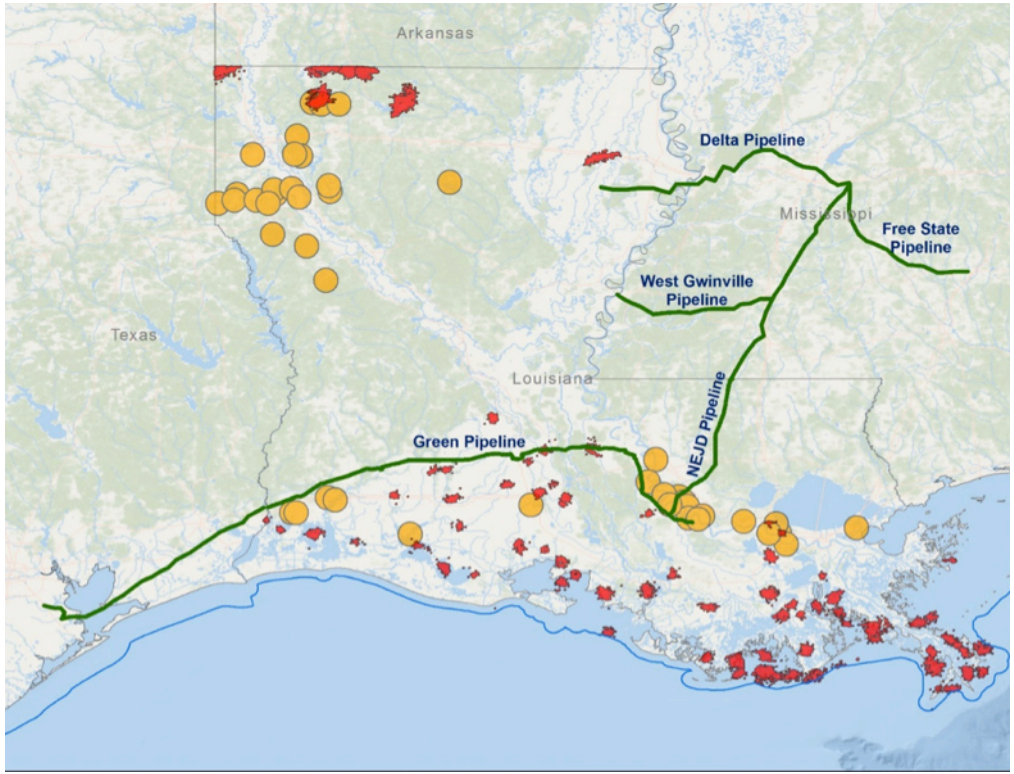
Industrial and Commercial CO_2 Utilization Applications



CO_2 USA *(Industrial CCUS)*

- CO_2 Utilization and Storage Acceleration (CO_2 USA) - Gulf Coast used a market-driven approach to identify opportunities to accelerate CCUS commercialization within the industrial sector
- SSEB and DOE-FE developing roadmap and toolkit
- Central Gulf Coast Region is prime area for Industrial-CCUS
- Louisiana and industrial corridor along Mississippi uniquely situated to benefit from integrated CCUS System
  - Industrial sources produce large amount of CO_2
  - Green pipeline runs across southern Louisiana
  - Many existing oilfields could benefit from Enhanced Oil Recovery (EOR)

Orange = Industries Red = Oil Fields

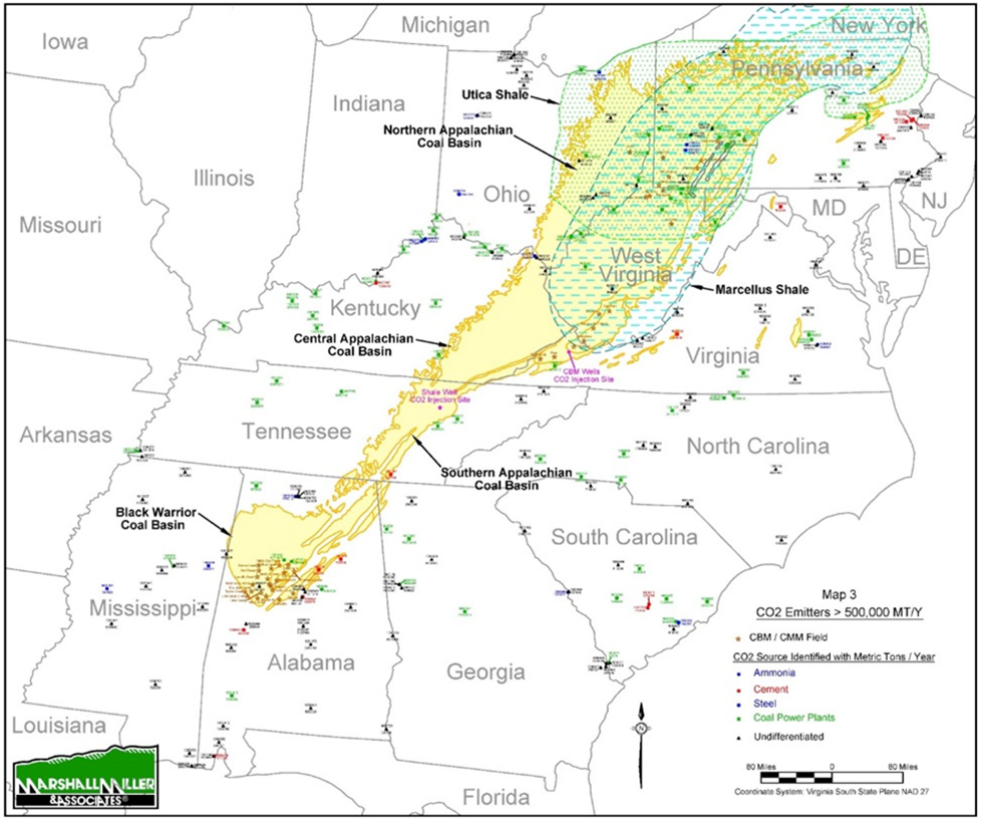


CO_2 Emission Clusters, Pipeline Infrastructure, and Oil Fields

Source: Louisiana State University, Center for Energy Studies, 2016

CO_2 USA - Appalachia

- Closely related to CO_2 USA - Gulf Coast and designed to educate and inform interested parties about possible beneficial uses of CO_2 across Appalachia
- Project is comprised of three regions within Appalachia (Northern, Central and Southern).
- Within each region, specific opportunities may exist that could lead to viable business opportunities to capture and utilize existing CO_2 emissions
- Regional workshops have been held in each region to explore potential business opportunities and solicit feedback on perceived barriers to advancing these potential business opportunities
- Feedback may be used to identify additional research that could reduce existing data gaps and assist market participants in advancing potential CO_2 focused business opportunities.



CO_2 Emitters greater than 500,000 tons per year

SOUTHERN STATES ENERGY BOARD

Transcending Boundaries

Southern States Energy Board
6325 Amherst Court
Peachtree Corners, Georgia
(770) 242-7712 phone
(770) 242-9956 fax
www.sseb.org