



Southern States and Carbon Dioxide for Enhanced Oil Recovery

September 29, 2011
Midwest Delegation to Gulf Coast

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Acknowledgements

- This material is based upon work supported by the U.S. Department of Energy National Energy Technology Laboratory.
- Cost share and research support provided by SECARB/SSEB Carbon Management Partners.



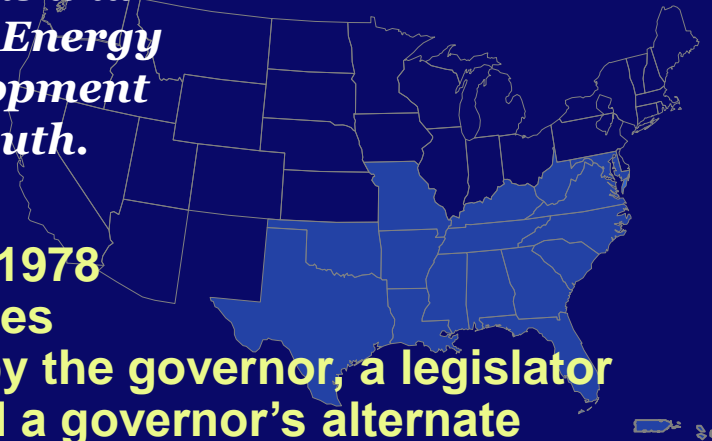


SSEB Mission



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.

- **Established 1960, 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**



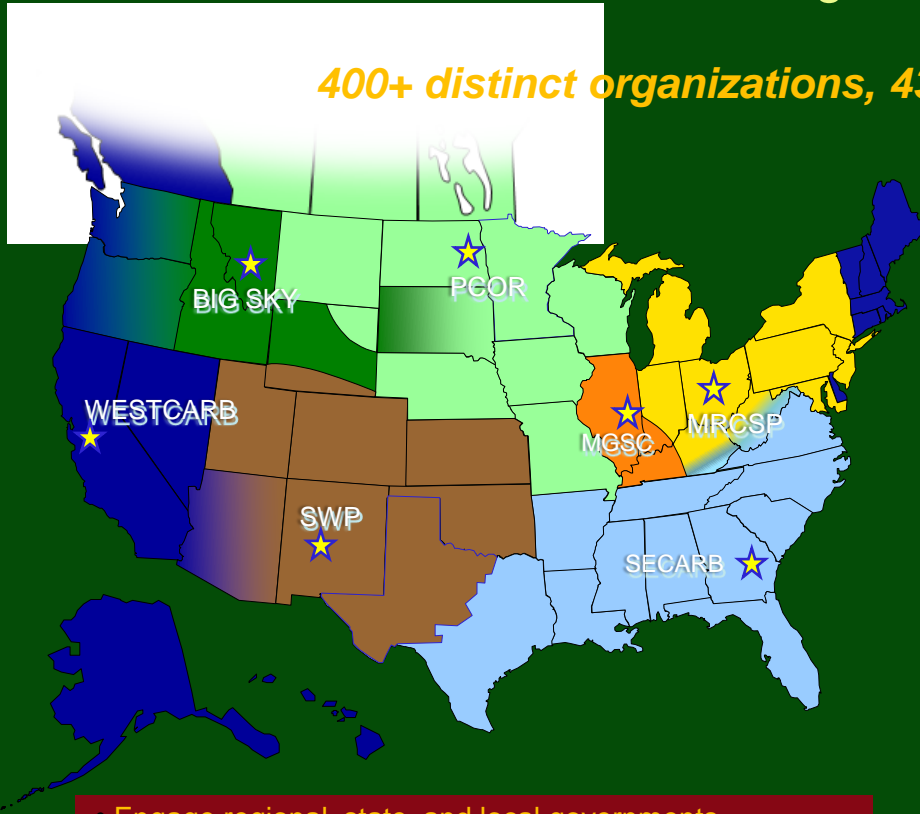
***Southern States: 46% US Electric Capacity & Generation with generation mix of Coal (45%), Natural Gas (28%) & Nuclear (20%)**

Regional Carbon Sequestration Partnerships

Developing the Infrastructure for Wide Scale Deployment

Seven Regional Partnerships

400+ distinct organizations, 43 states, 4 Canadian Provinces



- Engage regional, state, and local governments
- Determine regional sequestration benefits
- Baseline region for sources and sinks
- Establish monitoring and verification protocols
- Address regulatory, environmental, and outreach issues
- Validate sequestration technology and infrastructure

Characterization Phase (2003-2005)

Search of potential storage locations and CO₂ sources

Found potential for 100's of years of storage

Validation Phase (2005-2011+)

19 injection tests in saline formations, depleted oil, unmineable coal seams, and basalt

Development Phase (2008-2018+)

Large scale injections

Commercial scale understanding

Regulatory, liability, ownership issues

SECARB Research Participants: Diverse and Numerous

Advanced Resources International

Alabama Power Company

Alpha Natural Resources

American Coalition for Clean Coal Electricity

American Electric Power

Amvest Gas Resources, Inc.

AMVEST Oil and Gas

ARCADIS US

Arch Coal

Baker Hughes, Inc.

Bright Energy, LLC

BP America, Inc.

BP AlternativEnergy

CDX Gas, LLC

Clemson University

CNX Gas

CONSOL, Inc.

CSX Transportation

Dart Oil & Gas Corporation

Dart Energy Corporation

Denbury Resources, Inc.

DNV

Dominion Energy

Dominion Resources

Duke Energy

Dupont Titanium Technologies

Eastern Coal Council

Electric Power Research Institute (EPRI)

Entergy Services

Equitable Production Company

Exxon Mobil Production Company

Florida Municipal Electric Association

Florida Power & Light Company

Geological Survey of Alabama

GeoMet

Halliburton

Hilcorp Energy Company

Kentucky Energy & Environment-Division of

Energy Development & Independence

Kentucky Geological Survey

Interstate Oil and Gas

Compact Commission

Marshall Miller & Associates

McJunkin Appalachian Oilfield Company

Mississippi Power Company

Mississippi State University (MSU)

Natural Resources Partners

NRG Energy

Old Dominion Electric Cooperative

Penn Virginia Operating Company, LLC

Penn Virginia Resources

Piney Land Company

Pocahontas Land Corporation

Praxair, Inc.

Progress Energy

Santee Cooper Power

SCANA Energy

Schlumberger

Shell Exploration & Production Company

S&ME, Inc/Energy Maintenance Services

Group I, LLC

South Carolina Electric & Gas Company

Southern Company

Southern Company Services

Southern Natural Gas & El Paso Exploration

and Production

Southern States Energy Board 

Tellus Operating Company

Tennessee Valley Authority

Texas Bureau of Economic Geology

-Gulf Coast Carbon Center

U.S. Department of Energy/National Energy

Technology Laboratory

Virginia Tech

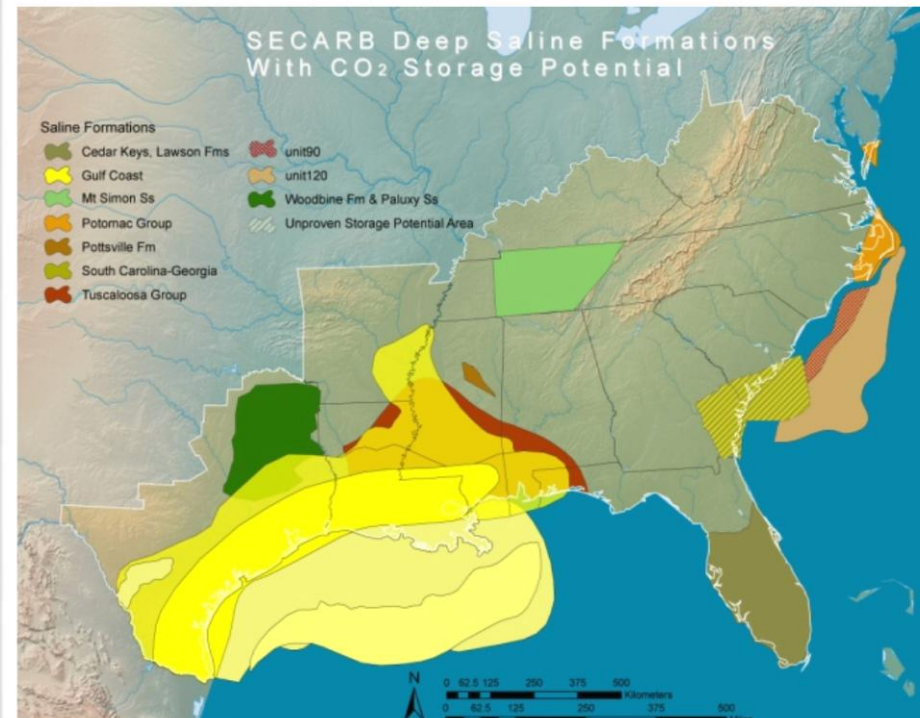
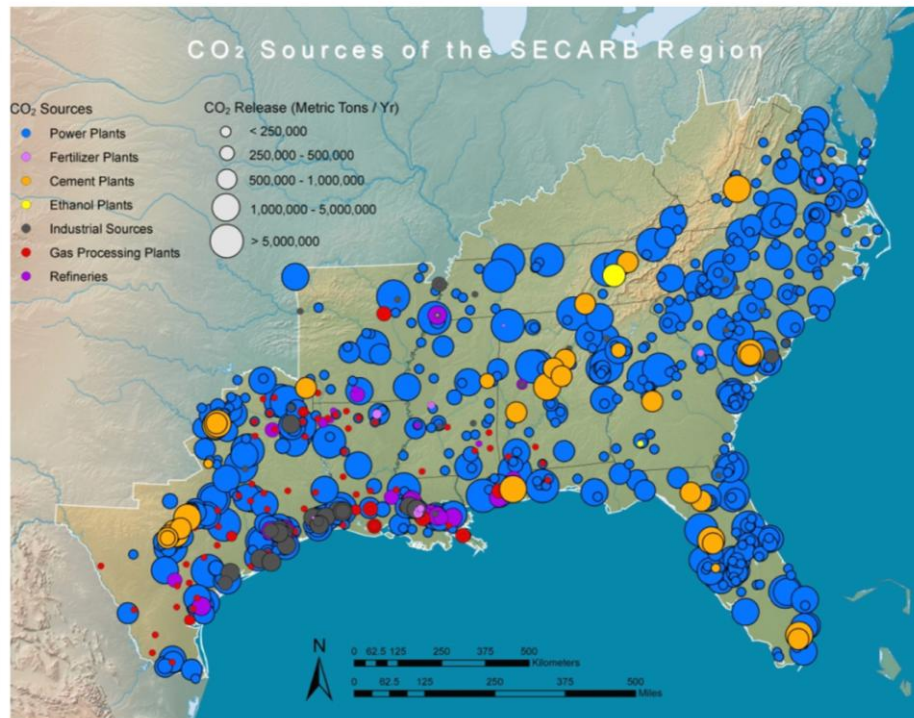
VA Center for Coal and Energy Research

West Virginia University

350+ Stakeholders



SECARB CO₂ Sources & Geologic “Sinks”



SECARB Phase II

All Validation Projects Successfully Completed



Coal Seam Project
Host Company: El Paso E&P
near Tuscaloosa, Alabama



Coal Seam Project
Host Company: CNX Gas
Russell County, Virginia

Characterization for Large-Volume CO₂ Storage Options



Stacked Storage Project
Cranfield Test Site
Host Company: Denbury Resources, Inc.
near Natchez, Mississippi



Mississippi Test Site
Mississippi Power's Plant Daniel
Escatawpa, Mississippi



Introduction to SECARB Phase III Projects

EPRI | ELECTRIC POWER
RESEARCH INSTITUTE

Anthropogenic Test

Capture: Alabama Power's Plant Barry,
Bucks, Alabama

Transportation: Denbury

Geo Storage: Denbury's Citronelle Field,
Citronelle, Alabama



Early Test

Denbury Resources' Cranfield Field
Near Natchez, Mississippi

CO₂ Source: Denbury

CO₂ Transportation: Denbury

Saline MVA: GCCC





Regional Carbon Sequestration Partnership “Firsts” Achieved by SECARB



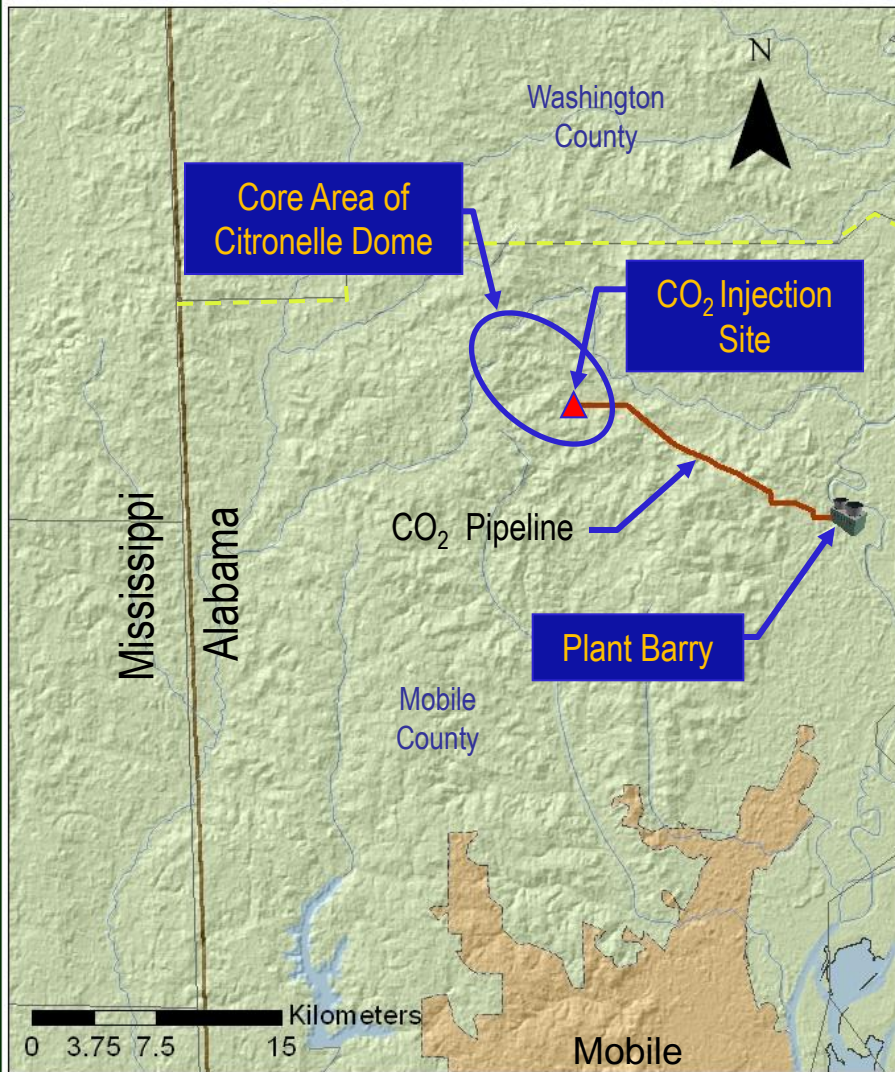
SECARB Phase II:

- The Gulf Coast Stacked Storage Project was the first of the RCSPs to monitor a 500,000 tonne CO₂ injection. Nov 30, 2010, 1.75 million tonnes monitored at the site.

SECARB Phase III:

- The Early Test is the first of the RCSPs to commence CO₂ injection.
- The Early Test is the first of the RCSPs to monitor a 1 million tonne CO₂ injection. Volume injected as of Nov 30, 2010, is 3.37 million tonnes (Phases II and III).
- The Anthropogenic Test is the first of the RCSPs to utilize anthropogenic CO₂.
- **CSLF International award** – Fall 2010 in Warsaw, Poland

SECARB Phase III Anthropogenic Test



The 25 MW CO₂ capture unit at Alabama Power's (Southern Co.) Plant Barry became operational in June 2011.

A newly built 12 mile CO₂ pipeline will transport CO₂ from Plant Barry to the Citronelle Dome.

From 100 to 300 thousand metric tons of CO₂ will be injected into the Paluxy saline formation for up to 3 years.

Advanced Resources and supporting researchers will conduct 3 years of monitoring after CO₂ injection and then close the site.

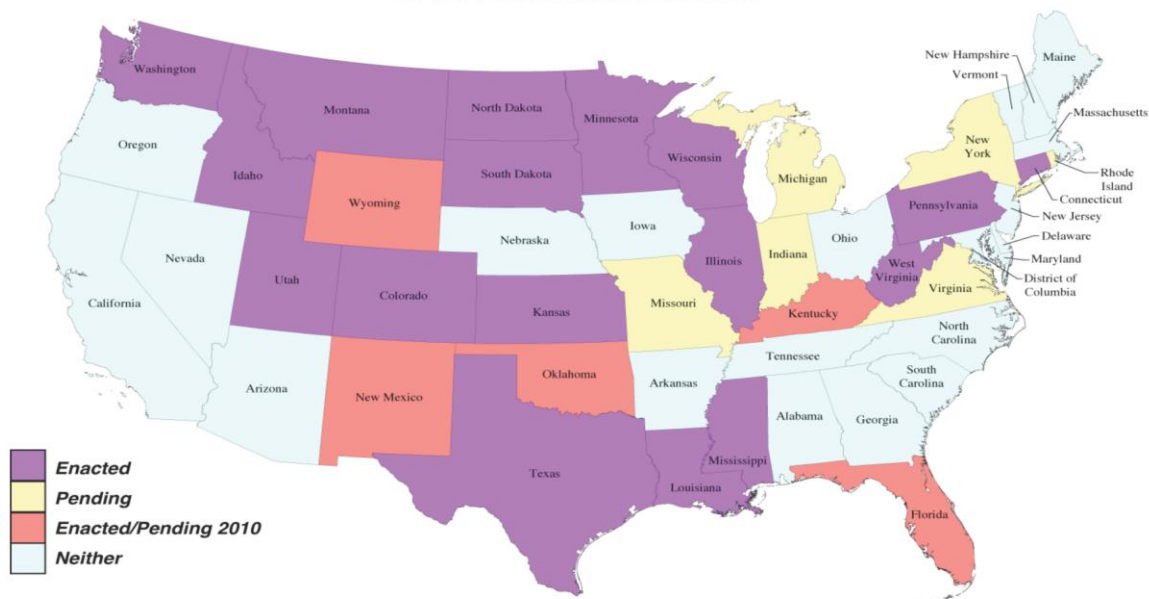


State CCS Legislation



***22 states enacted, 10 pending**

SOUTHERN STATES ENERGY BOARD
Carbon Capture and Sequestration Legislation
In the United States of America



www.sseb.org



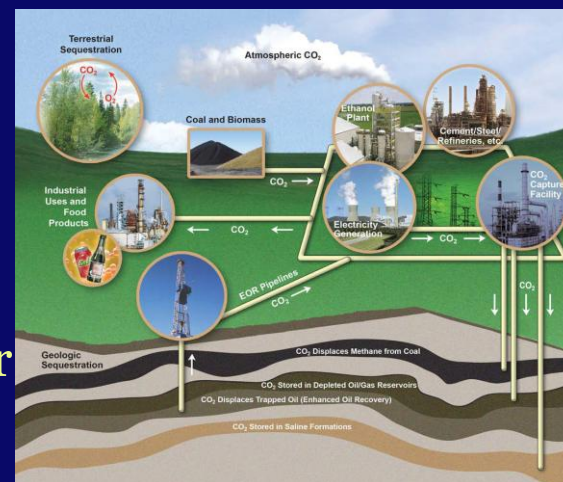
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CCS State Legislation



- State responses to key issues
 - Project Authority
 - State Environmental Authority
 - Pore Space and CO₂ Ownership
 - Pore space owned by surface owner
 - CO₂ owned by operator
 - Liability
 - Operator liable during operation; state assumes long term liability
 - Financing Sources
 - Tax incentives



SECARB Annual Stakeholder Briefing

- 2011 – Sixth Stakeholder Briefing
- 114 Registered Participants (Over 600 in 6 years!)
 - Legislators, Regulators, Industry, Academics, Legal, Utility, Non-profits, Government, National Labs
- Highlights
 - Virginia Governor & SSEB Chair Robert McDonnell
 - Federal Representative Linda Breathitt
 - SECARB Phase II & III Project Updates
 - SECARB Support
 - Outreach and Education
 - CO₂ Pipeline Study
 - Offshore Assessment
 - Other CCS Projects
- SECARB-Ed Training Sessions





SECARB-Ed



➤ Purpose

- ✧ Develop a self-sustaining regional CO₂ sequestration training program to facilitate the transfer of knowledge and technologies required for site development, operations and monitoring of commercial CCS projects.

➤ Objectives

- ✧ Implement sponsorship development program
- ✧ Develop short courses on CCS technologies
- ✧ Conduct regional training and other activities through outreach and networking
- ✧ Perform region/basin technology transfer services



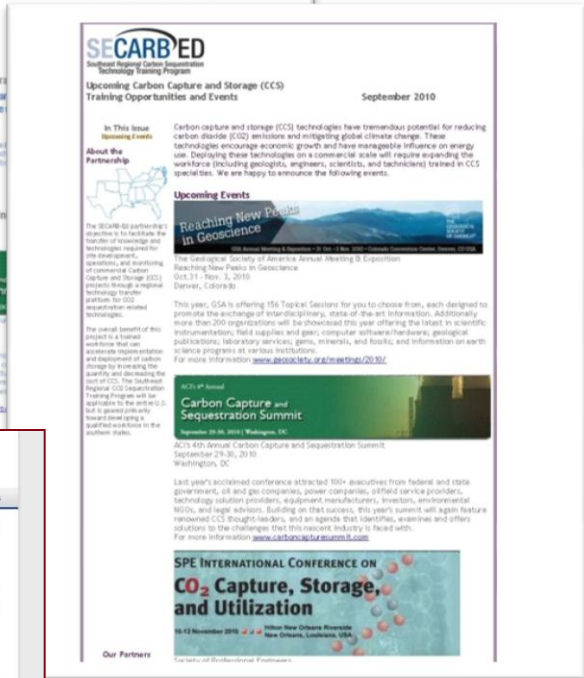
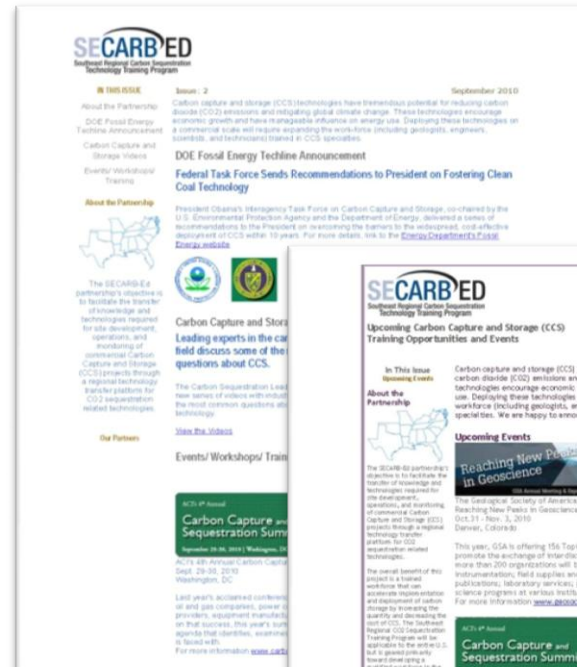
E-Alerts, Newsletters & Webpage

Quarterly Training Newsletter and E-Alert:

- Summary of upcoming training opportunities
- Material of a technical nature relevant to the SECARB-Ed region
- Results from on-going CCS research
- Public policy updates related to CCS
- Alerts to forthcoming R&D solicitations

Webpage

- www.SECARB-Ed.org



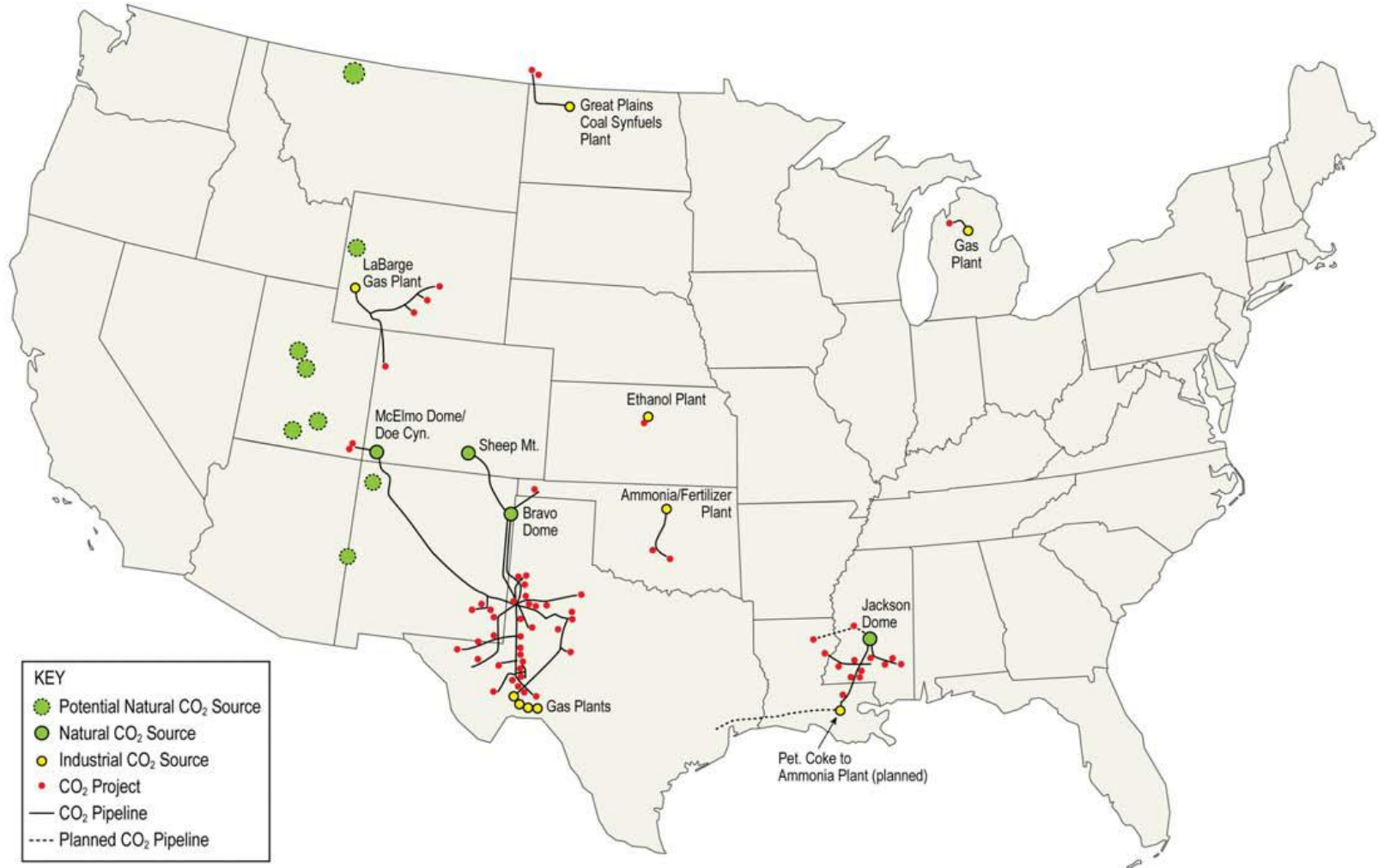


Pipeline Study



- Established in 2009 under SECARB Phase II
- Duration: 18 months
- Purpose: Identify barriers /opportunities for wide-scale construction of pipelines to transport carbon dioxide for geologic storage, enhanced oil recovery, and other commercial uses.
- Pipeline Transportation Task Force
 - Legal and Regulatory Research and Analysis
 - Summary Report to Include Research Findings and Recommendations (Released 1/31/11)
 - Visit sseb.org to download the report.
- Technology Transfer Strategy

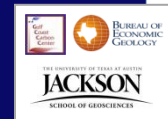
CO₂ Transportation: Pipeline networks currently exist in support of EOR. Billions of Dollars will be needed to construct integrated CCUS transportation systems



Offshore Study



- Established in 2009 under SECARB Phase III
- Duration: 18 months
- Purpose: Determine if offshore settings and any existing infrastructure are suitable for a sequestration project.
 - Two scenarios:
 1. Existing oil and natural gas fields near end of productive life.
 2. Geologic settings may be suitable but area not subject to oil and natural gas production.
- Legal and Regulatory Task Force (Chaired by AL State Geologist)
 - Identify legal and regulatory requirements for offshore sequestration, including the potential for re-use of existing wells for injection:





Recent CCS Activity



- CSLF Endorsement of CCUS as key component of combating climate change
- Knowledge Sharing – regional & international
 - US-Canadian Dialogue
 - DOE/SECARB Working Group of European CCS Demonstration Project Network
 - Current meeting in Poland, discussing 6 projects in 6 different countries
 - Global CCS Initiative- Founding member with Australia
- DOE Record of Decision on Summit Texas Clean Energy Project funding – September 27
 - 90% CCS Capture, 3 million tons/year, IGCC with CCUS & Urea Production – Most CO₂ to Permian Basin for EOR
 - \$450 Million - DOE Clean Coal Power Initiative (200 MW plant)



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