Southeast Offshore Storage Resource Assessment (SOSRA)

Fast Tracking Infrastructure Development for Future Offshore CO$_2$ Storage

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Brian Hill
Energy Finance & Infrastructure Consultant
Southern States Energy Board
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Task 6.0 - Best Practices

**SOSRA TASK OBJECTIVE**

Assist DOE in developing and advancing technologies that will significantly improve the effectiveness and reduce the cost of implementing offshore carbon storage, and be ready for widespread commercial deployment in the 2025-2035 timeframe.

**SOSRA PROJECT APPROACH**

Focus on best practices for CO$_2$ infrastructure development in support of offshore CO$_2$ storage (including storage with utilization) in the Gulf of Mexico.
• The recently passed Bipartisan Budget Act of 2018 (The Budget Act) may lead to more rapid development of CCUS projects in the United States.

• Proper planning of necessary onshore infrastructure could greatly improve the financial viability for future offshore projects.
The Budget Act included language from the Furthering carbon capture, Utilization, Technology, Underground storage, and Reduced Emissions (FUTURE Act). The FUTURE Act provides for tax credits (45Q) for CO₂ capture, utilization, and/or storage.

- 45Q provides a tax credit of
  - $12.83 per metric ton captured rising to $35 per metric ton captured in the next 10 years for CO₂ utilization; and
  - $22.66 per metric ton captured rising to $50 per metric ton captured in the next 10 years for geologic storage without utilization.

- Construction must begin prior to January 1, 2024.

- Credit is received for 12-year period after equipment is originally placed in service.
Offshore Projects Are Eligible for 45Q

Within the 45Q legislative language only “carbon oxide captured and disposed of or used within the United States" is eligible. The credit shall apply only with respect to qualified carbon oxide the capture and disposal, use, or utilization of which is within:

I. The United States (within the meaning of Section 638(1)); or

II. A possession of the United States (within the meaning of section 638 (2))
I. The term “United States” when used in a geographical sense includes the seabed and subsoil of those submarine areas which are adjacent to the territorial waters of the United States and over which the United States has exclusive rights, in accordance with international law, with respect to the exploration and exploitation of natural resources; and

II. The terms “foreign country” and “possession of the United States” when used in a geographical sense include the seabed and subsoil of those submarine areas which are adjacent to the territorial waters of the foreign country or such possession and over which the foreign country (or the United States in case of such possession) has exclusive rights, in accordance with international law, with respect to the exploration and exploitation of natural resources, but this paragraph shall apply in the case of a foreign country only if it exercises, directly or indirectly, taxing jurisdiction with respect to such exploration or exploitation.
Final implementation and regulation of 45Q will require input and guidance from U.S. Treasury and the U.S. Environmental Protection Agency (EPA) for onshore CO$_2$ storage.

The Department of Energy recently updated its Best Practices Manuals (2017) for onshore CO$_2$ geologic storage and utilization.

Offshore storage (including storage with utilization) will be managed by the Bureau of Ocean Energy Management (BOEM) and regulated by the Bureau of Safety and Environmental Enforcement (BSEE).

BOEM Best Management Practices Offshore Transportation and Sub-Seabed Geologic Storage of CO$_2$ - Best Management Practices Subtopics:

- Site Selection and Characterization
- Risk Assessment
- Project Planning and Execution
- Monitoring
- Mitigation
- Safety Inspection and Performance Assessment
- Reporting Requirements
- Emergency Response and Contingency Planning
- Decommissioning and Site Closure

https://marinecadastre.webqa.coast.noaa.gov/espis/#/search/study/27007.
The five 2017 Revised Edition BPMs are:

- **BEST PRACTICES**: Site Screening, Site Selection, and Site Characterization for Geologic Storage Projects
- **BEST PRACTICES**: Public Outreach and Education for Geologic Storage Projects
- **BEST PRACTICES**: Risk Management and Simulation for Geologic Storage Projects
- **BEST PRACTICES**: Operations for Geologic Storage Projects
- **BEST PRACTICES**: Monitoring, Verification, and Accounting (MVA) for Geologic Storage Projects

https://www.netl.doe.gov/research/coal/carbon-storage/strategic-program-support/best-practices
CO₂ Infrastructure Development Opportunity

• Within the Central Gulf Coast Region there are many areas that could benefit from CCUS, both on-shore and off-shore.

• In 2016 SSEB, with assistance from DOE, determined that Louisiana and its industrial corridor along the Mississippi River is uniquely situated to benefit from an integrated CCUS system.

• Additional pipeline infrastructure is needed to connect the Louisiana Industrial Corridor to onshore oilfields with potential for CO₂-EOR.

• Pipeline infrastructure can be sized to allow for expansion into state and federal offshore waters with a relatively small increases in overall spending.
Stationary CO\textsubscript{2} Emitters (2014) Showing a Concentration Along the Mississippi River Industrial Corridor
Louisiana CO$_2$-EOR Opportunities

- Potential high quality industrial sources in Louisiana (natural gas processing, ammonia, hydrogen production, and ethylene oxide production) along with existing CO$_2$ pipeline infrastructure and candidate EOR fields.

- Working from data in DOE publication 2013/1602 *Cost of Capturing CO$_2$ from Industrial Sources* the focus became high purity emitters & hydrogen units.

### Low Purity (<90 vol %)
- Hydrogen (Refinery)
- Iron/Steel
- Cement

### High Purity (>90 vol %)
- Natural Gas Processing
- Ammonia
- Ethylene Oxide
- Ethanol

Source: DOE/NETL-2013/1602
Potential Onshore & Near Shore Opportunities

- Industrial CO₂ Vents
- Candidate EOR Oil Fields
- Existing CO₂ Pipeline
- Offshore Oil Fields

Source: LSU Center for Energy Studies
• DOE study estimated that Louisiana contains 128 onshore reservoirs that are candidates for miscible CO₂-EOR.

• Under “Traditional Practices” 3 million barrels could be recovered, with estimated royalties of $10.6 million.

• Under “State-of-the-Art” Technology 129 million barrels could be recovered, with estimated royalties of $454 million.

• Under “More Favorable Financial Conditions” and “Risk Mitigation Incentives” 1,117 million barrels could be recovered with estimated royalties of $5.2 billion.

• Under “More Favorable Financial Conditions” and “Low Cost CO₂ Supplies” 1,916 million barrels could be recovered with estimated royalties of $9.0 billion.

“With oil recovery of 1.89 billion barrels, an oil price of $72 per barrel (EIA AEO 2017 projected oil price for Year 2020), and a combined shallow and deepwater royalty rate of 18.1%, the Federal Government would receive about $25 billion dollars of royalty revenues from the oil produced using the GOM CO₂ pipeline systems.”

Source: Advanced Resources International
Presented at the 2017 SECARB Annual Stakeholders’ Briefing