



Southeast Offshore Storage Resource Assessment (SOSRA)

Fast Tracking Infrastructure Development for Future Offshore CO₂ Storage

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SOUTH CAROLINA



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 CO₂ infrastructure development in support of offshore CO₂ 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 **F**urthering carbon capture, **U**tilization, **T**echnology, **U**nderground storage, and **R**educed **E**missions (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 is meaning of section 638 (2))

Definition of Section 638 1 & 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.

45Q Implementation and Final Regulations



- 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 CO₂ storage.
- The Department of Energy recently updated its Best Practices Manuals (2017) for onshore CO₂ 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 recently released a final report on Best Management Practices for Offshore Transportation and Sub-Seabed Geologic Storage of CO₂.



BOEM Best Management Practices Offshore Transportation and Sub-Seabed Geologic Storage of CO₂ - 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:

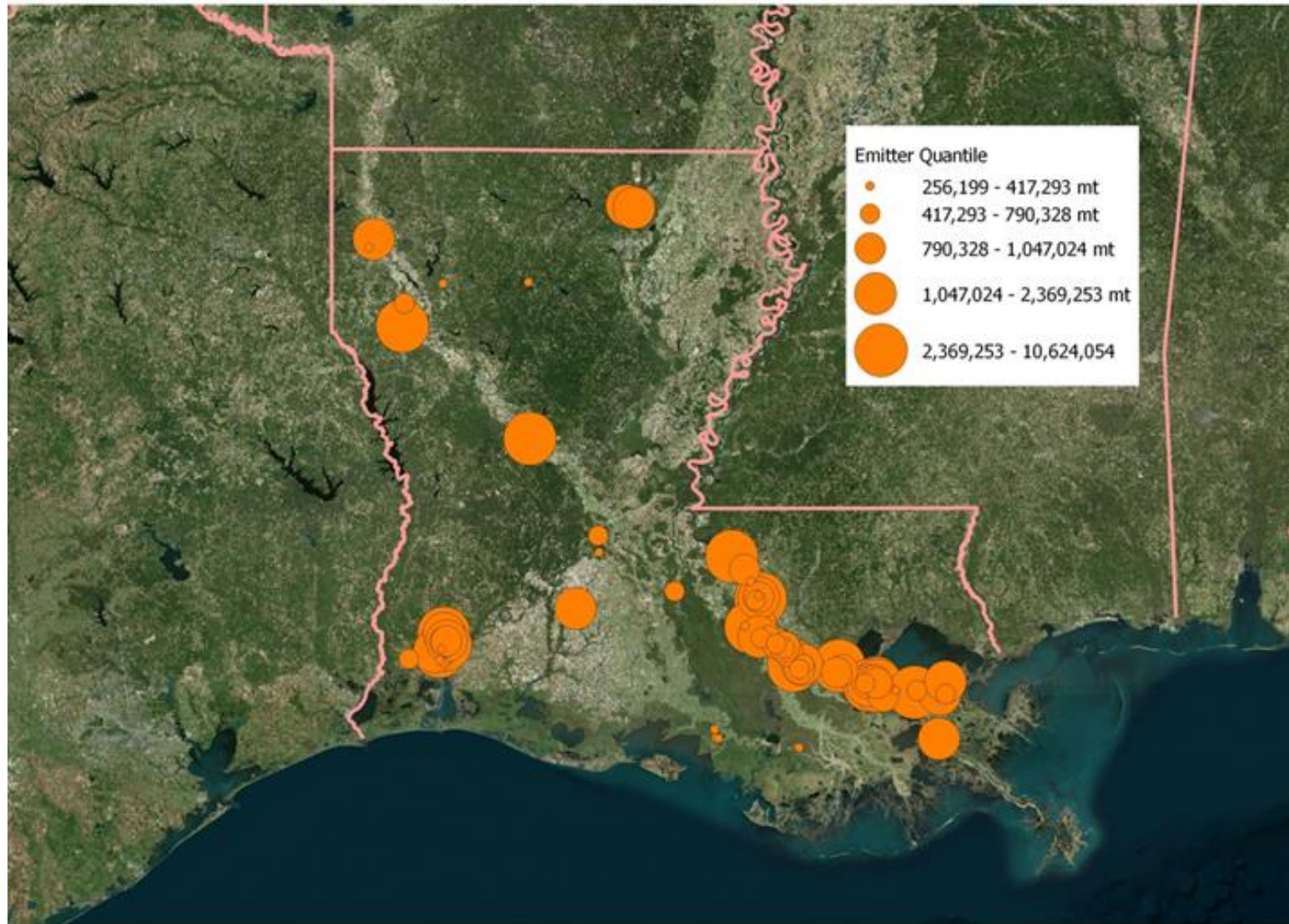
- **BEST PRACTICES:** Site Screening, Site Selection, and Site Characterization for Geologic Storage Projects
- **BEST PRACTICES:** Public Outreach and Education for Geologic Storage Projects
- **BEST PRACTICES:** Risk Management and Simulation for Geologic Storage Projects
- **BEST PRACTICES:** Operations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

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 CO₂ Emitters (2014) Showing a Concentration Along the Mississippi River Industrial Corridor



Sources: LSU | Center for Energy Studies (preliminary analysis)
Environmental Protection Agency

Louisiana CO₂-EOR Opportunities



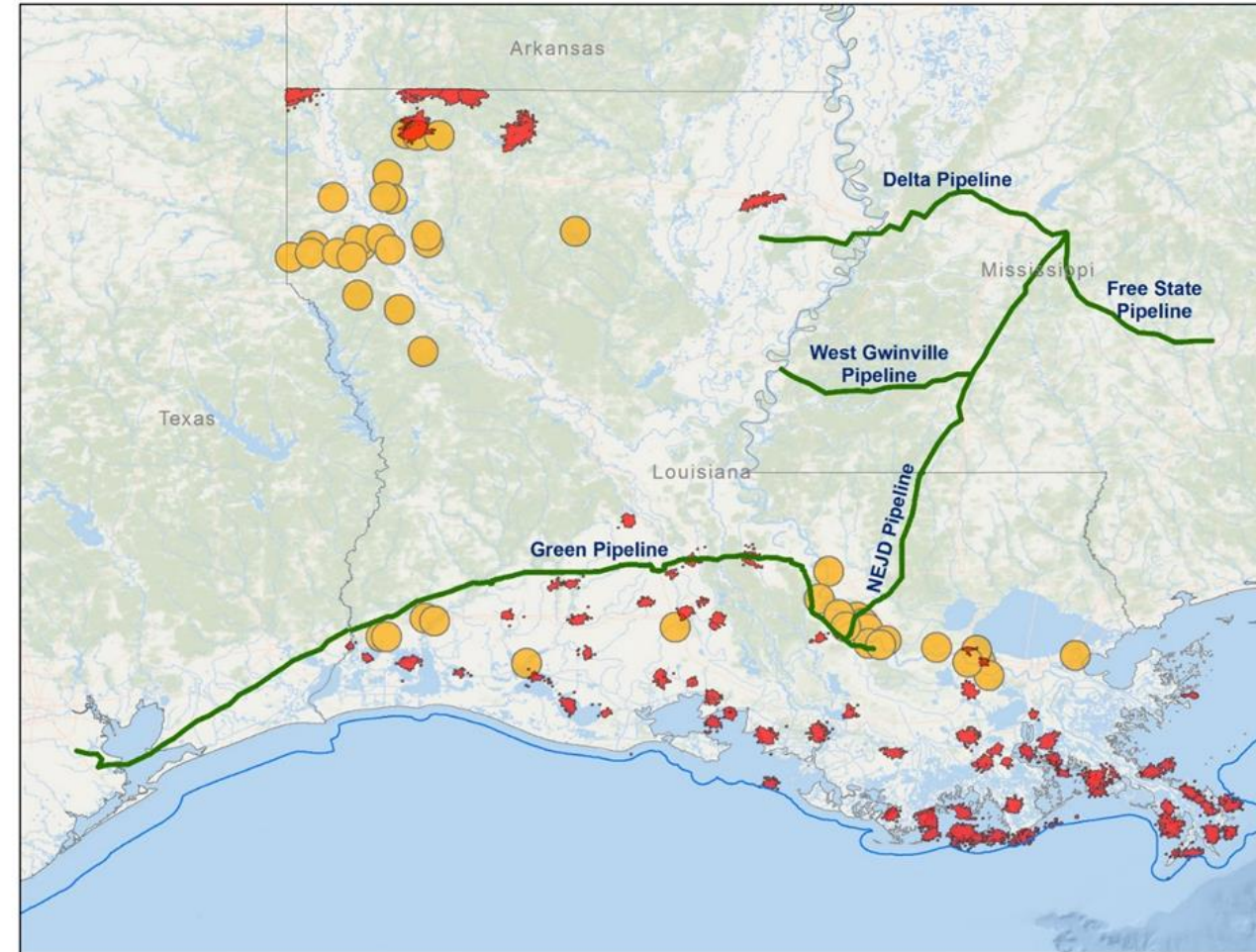
- Potential high quality industrial sources in Louisiana (natural gas processing, ammonia, hydrogen production, and ethylene oxide production) along with existing CO₂ pipeline infrastructure and candidate EOR fields.
- Working from data in DOE publication 2013/1602 *Cost of Capturing CO₂ from Industrial 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



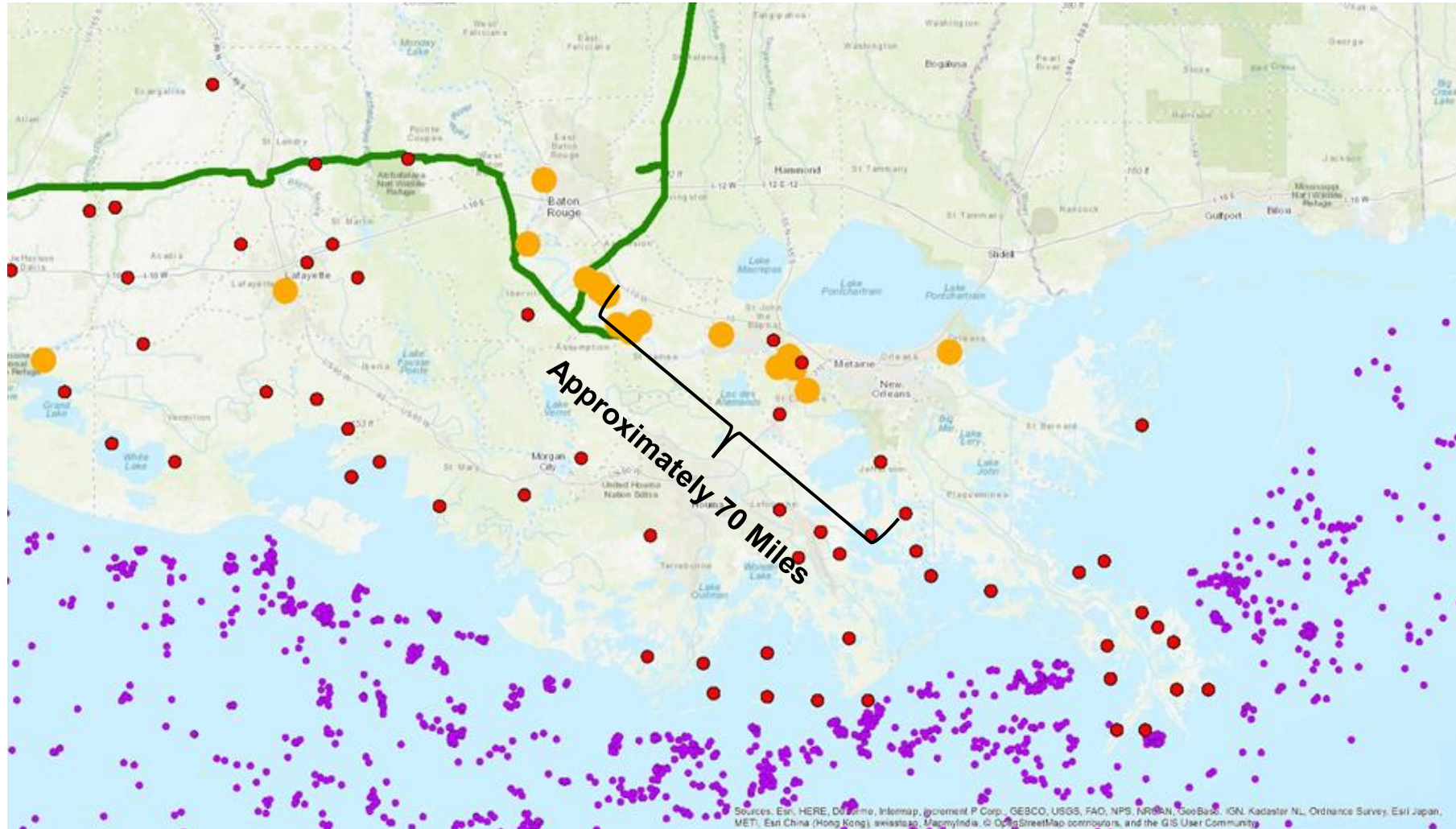
● Industrial CO₂ Vents

■ Existing CO₂ Pipeline

■ Candidate EOR Oil Fields

Source: LSU Center for Energy Studies

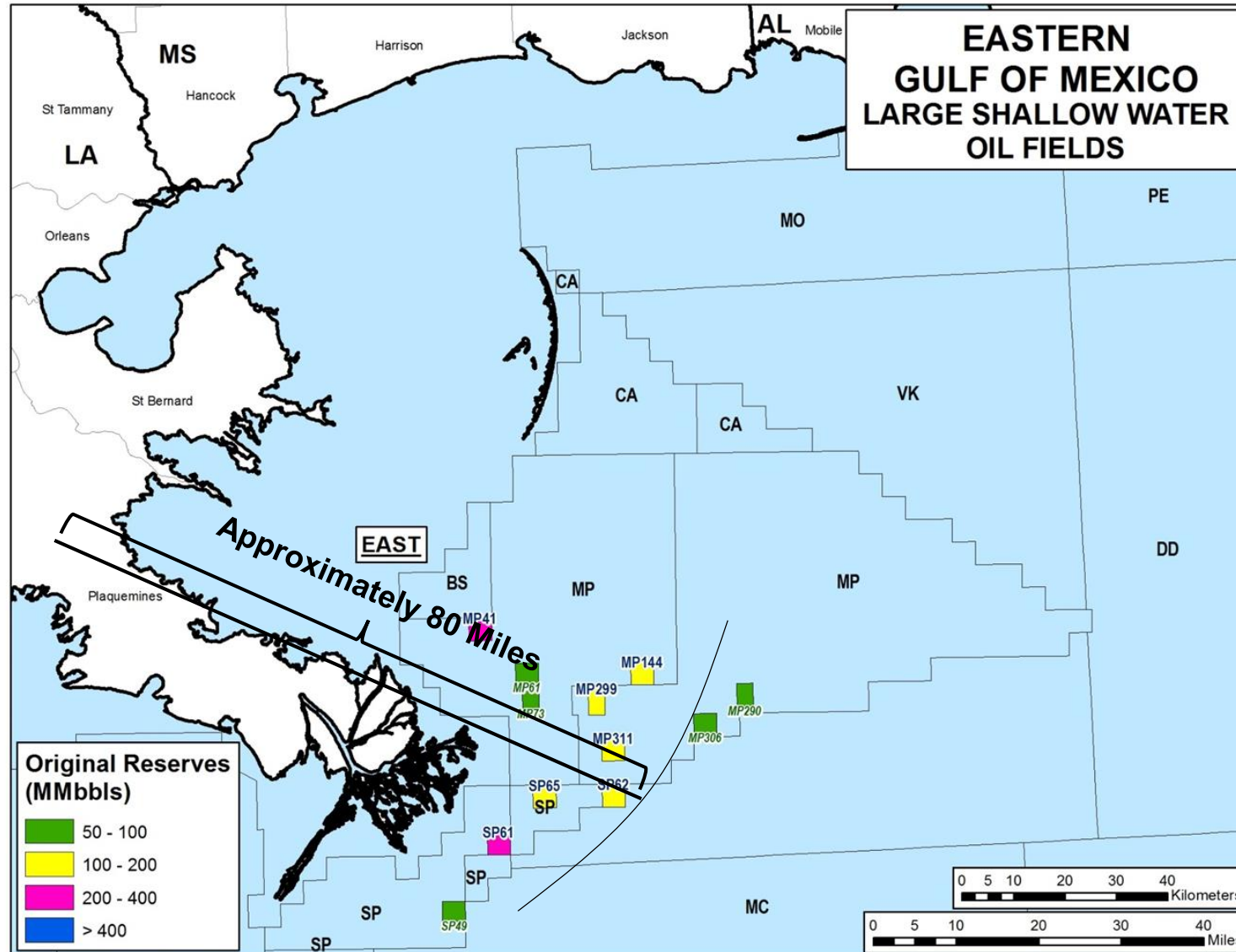
Potential Onshore & Near Shore Opportunities



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

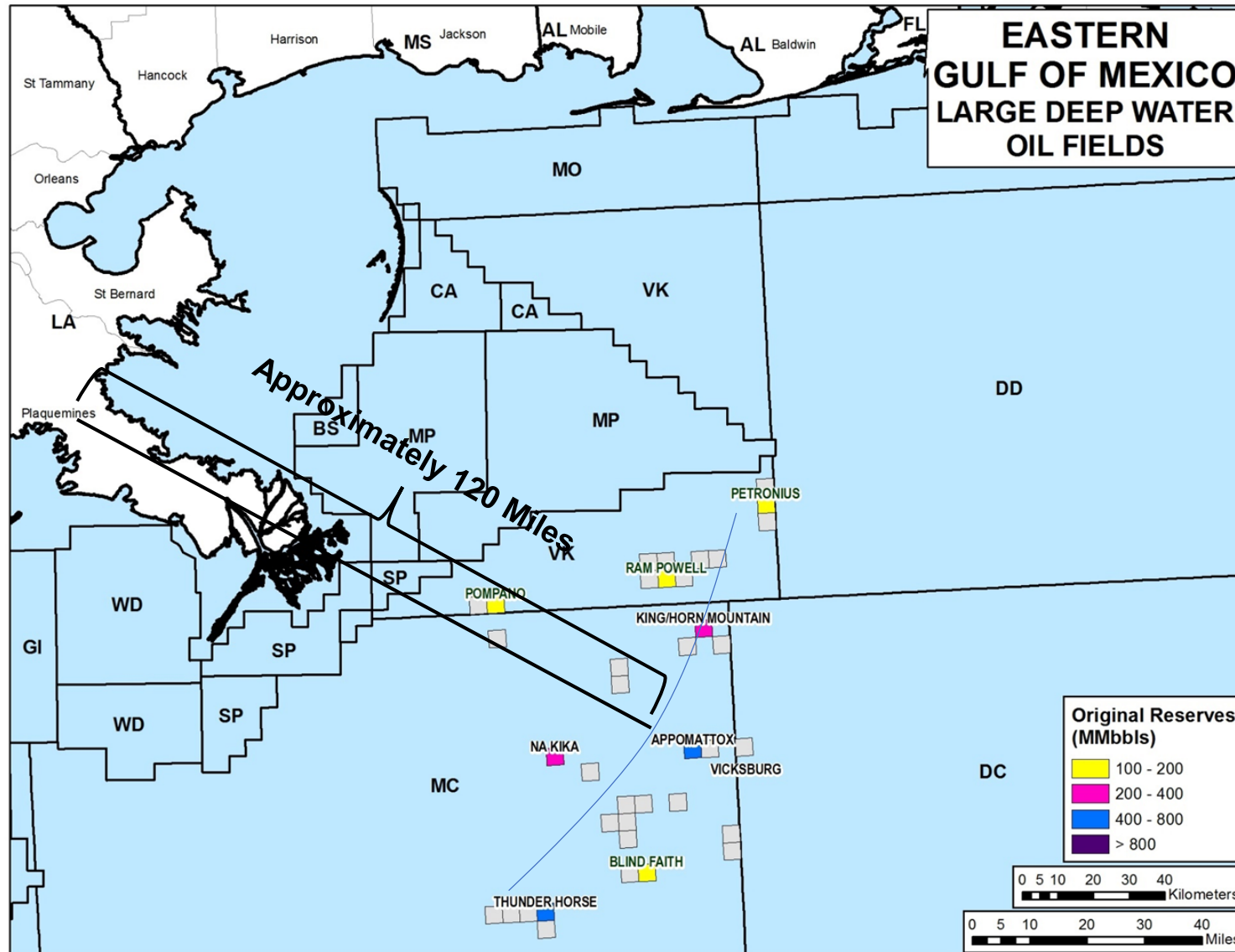
Source: LSU Center for Energy Studies

Eastern Gulf of Mexico Shallow Federal Water



Source: Advanced Resources International, Inc.

Eastern Gulf of Mexico Deep Federal Water

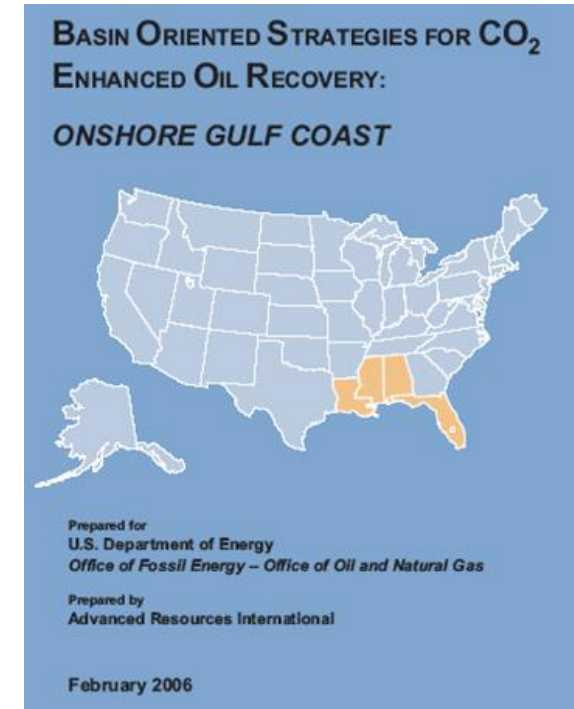


Source: Advanced Resources International, Inc.

Benefits of Establishing CO₂ Utilization, Storage, and Pipeline Systems for the Eastern Gulf of Mexico



- 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.”