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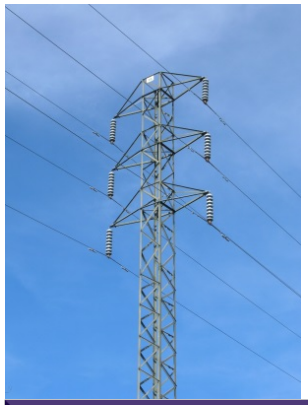
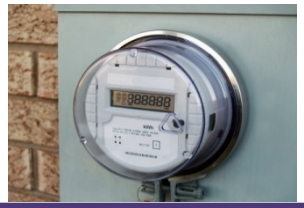
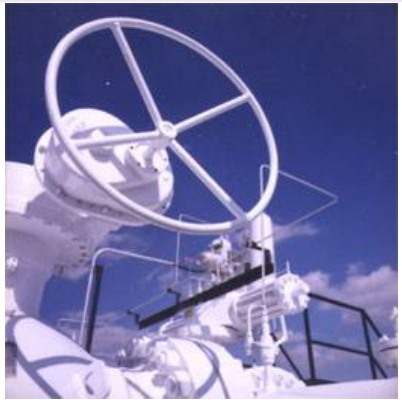


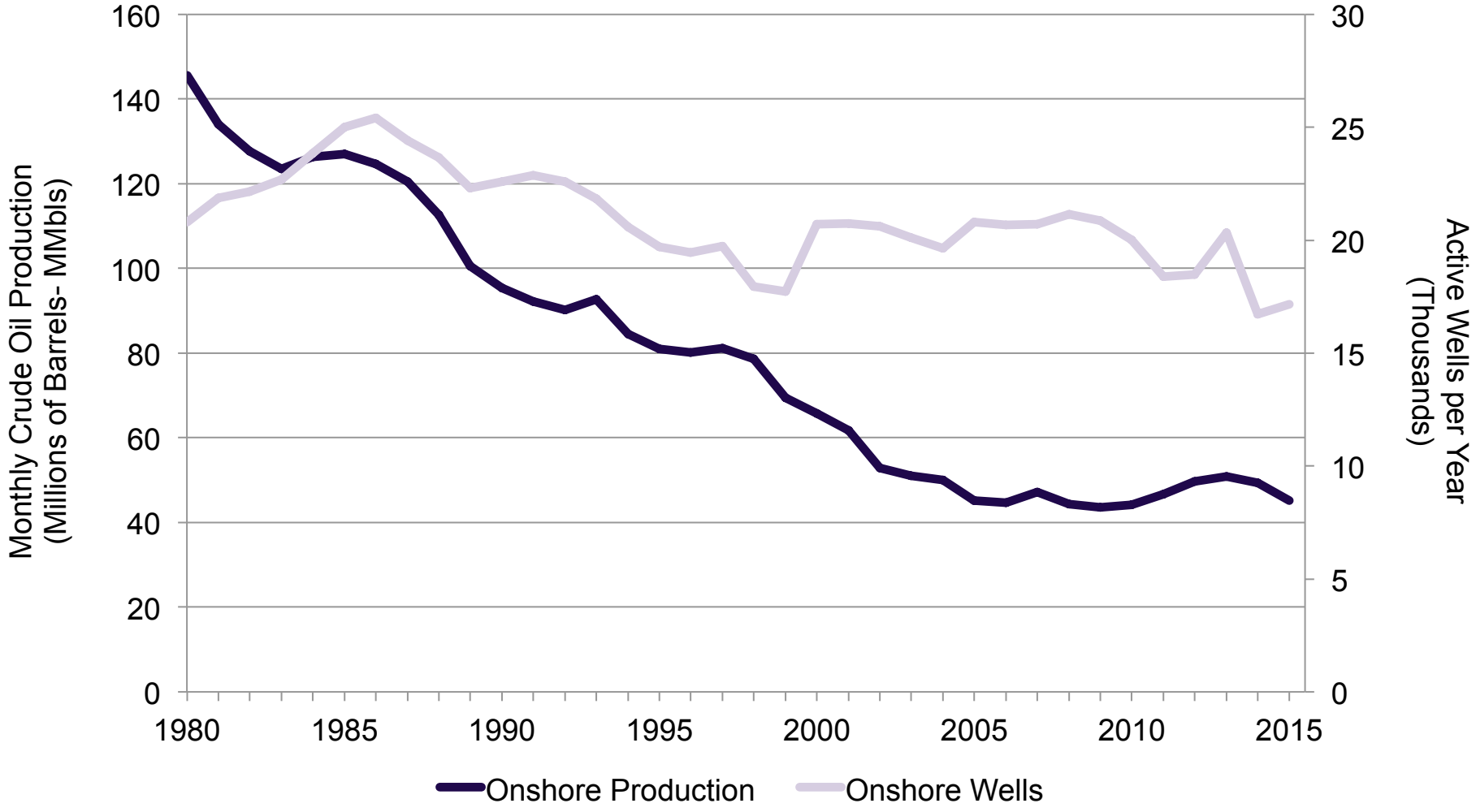
Potential carbon utilization and enhanced oil recovery in coastal Louisiana.

Southern States Energy Board
Industrial CCUS Conference
New Orleans, LA
October 2-3, 2016

David E. Dismukes, Ph.D.
Center for Energy Studies
Louisiana State University

Overview

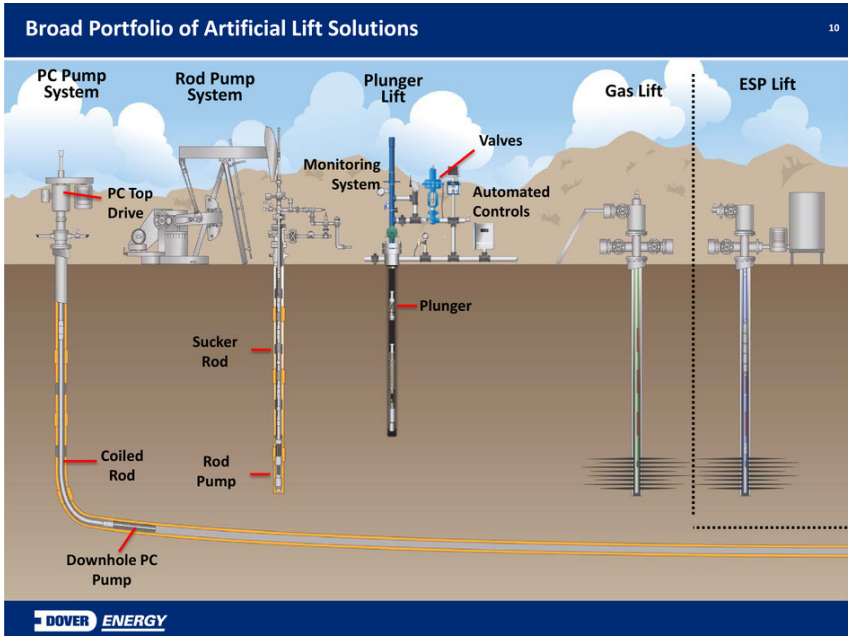
Louisiana crude oil production and active wells

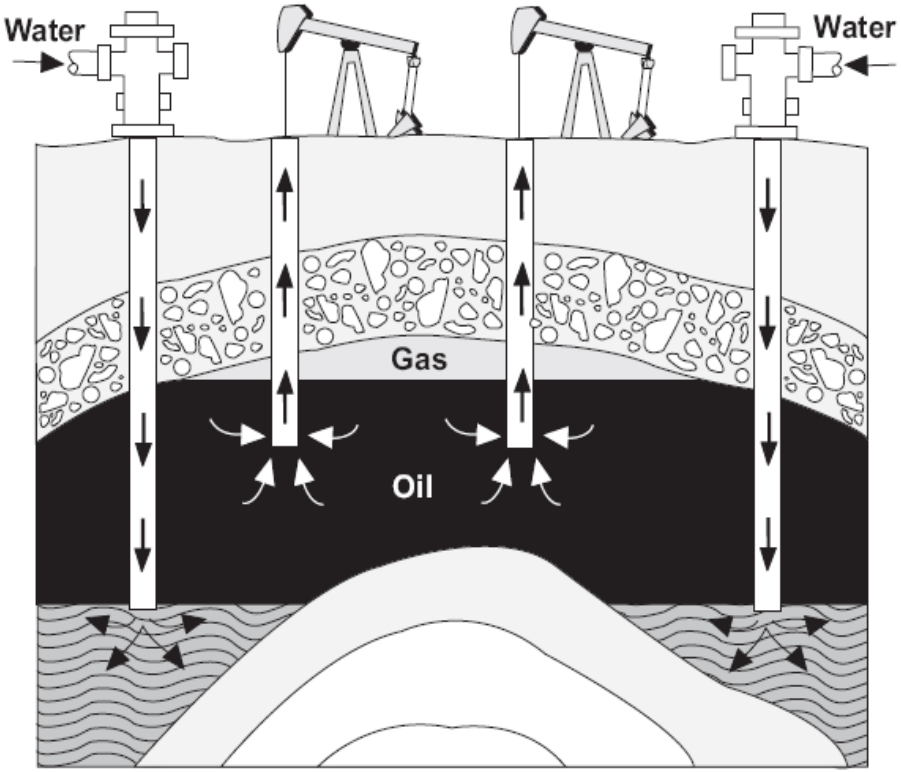


Source: Department of Natural Resources, State of Louisiana

Artificial lift: secondary recovery methods.

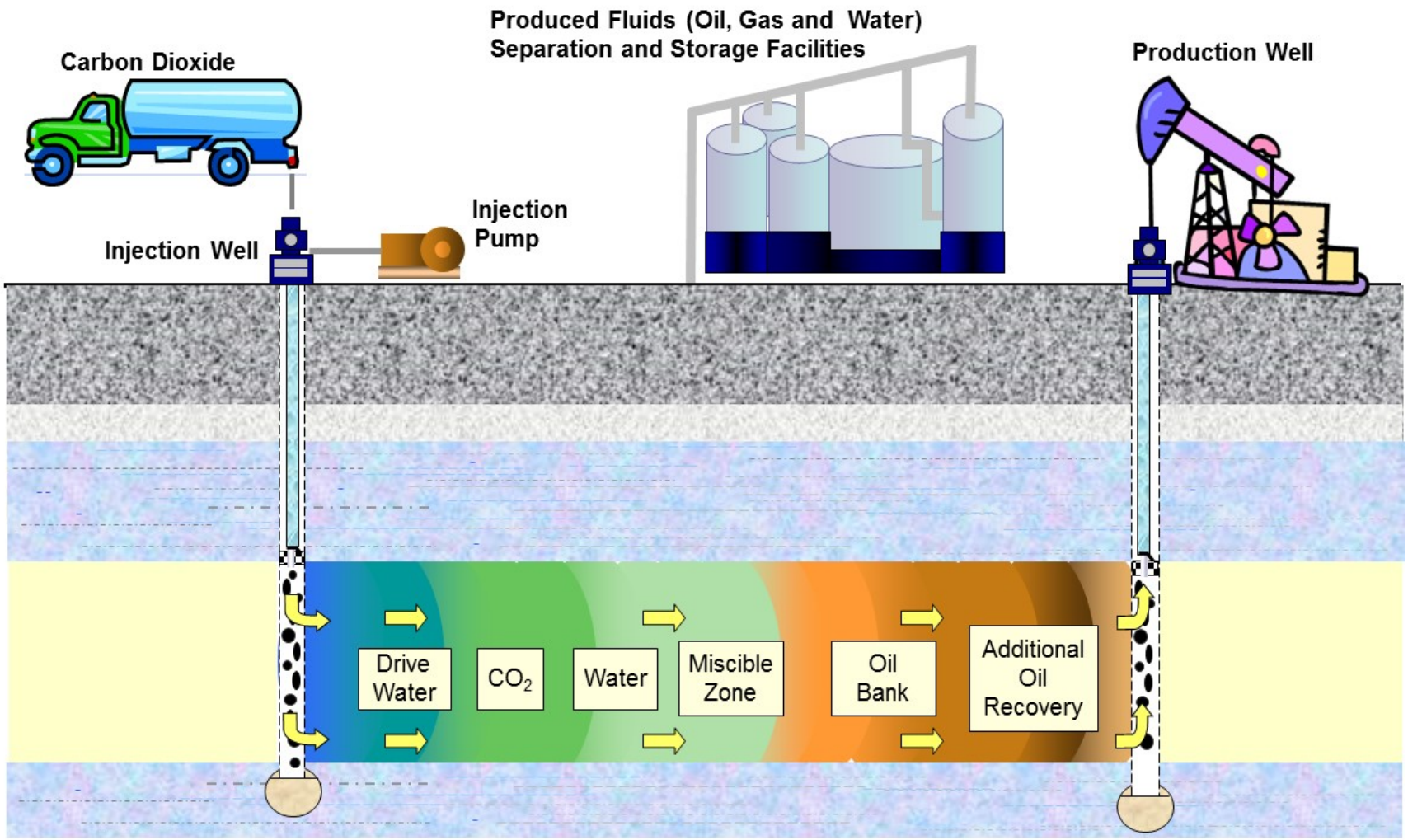
There are a variety of artificial lift methods used for Louisiana's mature fields.





Source: Dover Energy

Enhanced oil recovery methods (CO2).



Source: Melzer Consulting; Enhanced Oil Recovery Institute, University of Wyoming

Louisiana EOR pilots programs.

Weeks Island: a CO_2 gravity stable pilot project at the "S" Sand Reservoir B of Weeks Island field, conducted by Shell and U.S. DOE

- Initial gas injection (853 MMcf of CO_2 and 55 MMcf of natural gas) lasted for 16 months. This was followed by re-injection of the produced CO2 and natural gas at 761 Mcf per day through 1987.
- Project began in early 1981 and ran to 1987, mobilized 205,000 barrels of residual oil, equal to 60 percent of the oil left after water displacement.

Bay St. Elane: a gravity-stable miscible CO2 flood, initiated in the Bay St. Elaine (1981). The purpose was to test the effectiveness of CO2 injection into a steeply dipping (36°), low residual oil (20%) sandstone reservoir

- About 433 MMcf of CO_2 solvent was injected and approximately 300 MMcf of nitrogen was then injected as the drive gas.
- The project expected to recover 75,000 barrels of incremental oil. The operator reports that while an oil bank was mobilized and one of the producing wells flowed at 92% oil cut, there was difficulty producing the oil bank with the existing well placements. Final performance results are not available.

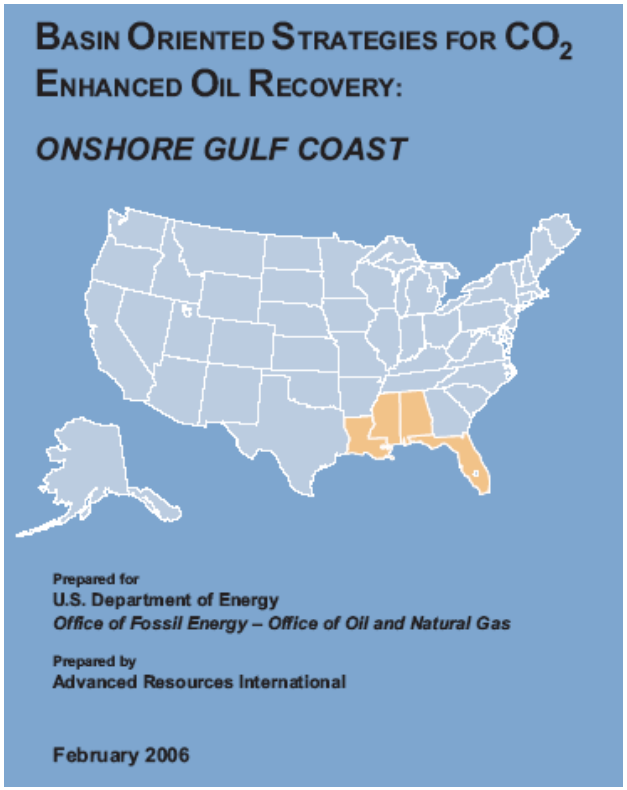
Immiscible CO_2 ("Huff and Puff"): a series of small scale CO_2 well stimulation tests were conducted in the mid-1980s.

- This process, similar to using steam stimulation in heavy oil fields, involves injecting a substantial volume of CO_2 into a producing well, then allowing the CO2 to soak into the oil for a few weeks, and then returning the well to production.
- Operators reported that incremental oil recoveries were achieved at low CO_2/oil ratios.

Source: U.S. Department of Energy and Advanced Resources International

Prior DOE-funded EOR potentials research: onshore GOM.

U.S. DEPARTMENT OF ENERGY



Recent DOE study estimated that Louisiana contains 128 <u>onshore</u> 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 CO_2 Supplies" 1,916 million barrels could be recovered with estimated royalties of $9.0 billion.

Source: Advanced Resources International on behalf of the US Department of Energy

Prior DOE-funded EOR potentials research: offshore GOM.

U.S. DEPARTMENT OF ENERGY


BASIN ORIENTED STRATEGIES FOR CO_2 ENHANCED OIL RECOVERY:

OFFSHORE LOUISIANA

Prepared for:
U.S. Department of Energy
Office of Fossil Energy – Office of Oil and Natural Gas

Prepared by:
Advanced Resources International, Inc.

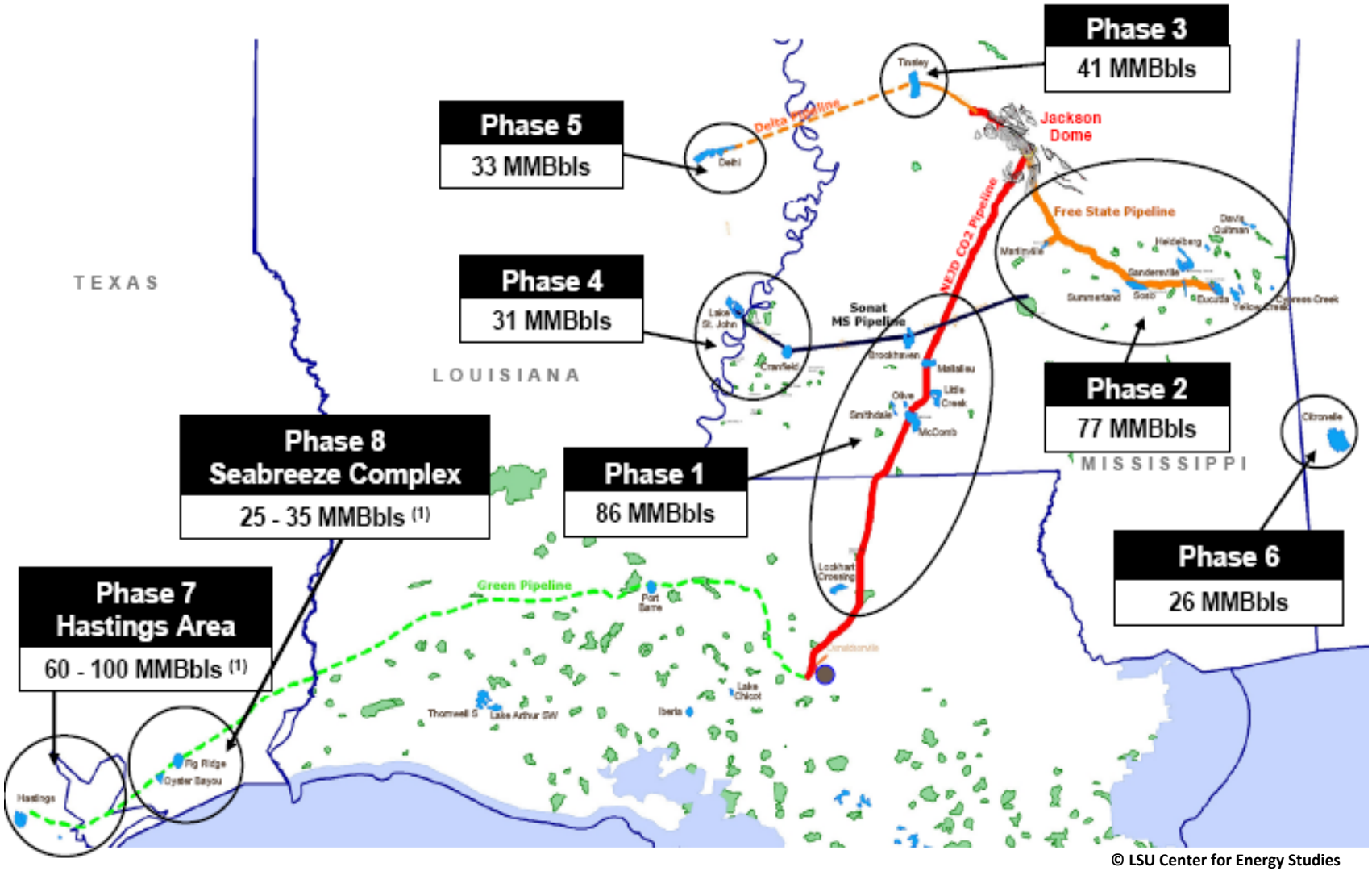
March 2005

Recent DOE study estimated that if 3.6 billion barrels are developed over a 40-year time frame, by 2025 this would amount to:

- Incremental crude production of 200,000 to 250,000 barrels per day.
- Over 8,000 jobs retained by the Louisiana oil and gas industry.
- Increased economic activity in Louisiana amounting to over $500 million per year.
- Increased state and federal revenues of over $250 million per year.

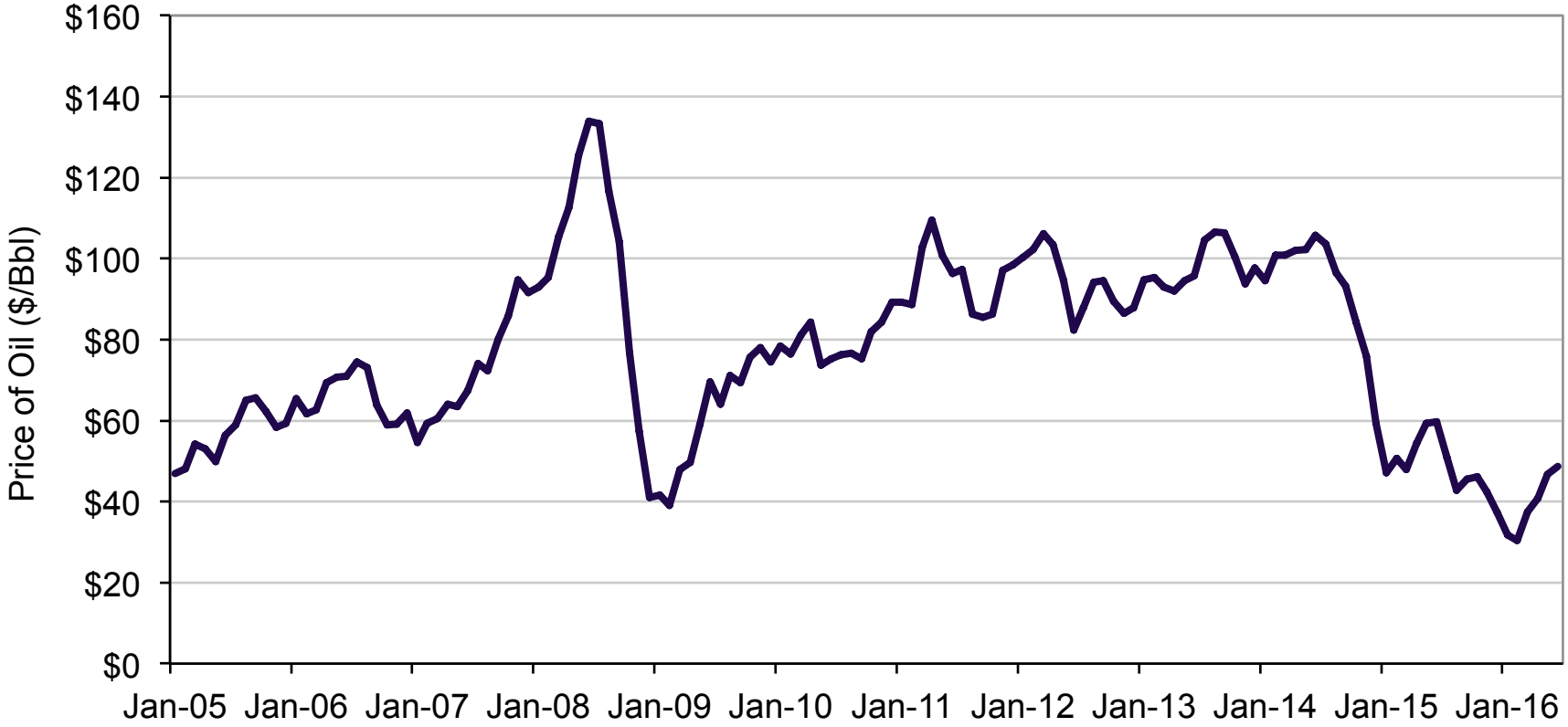
Source: Advanced Resources International on behalf of the US Department of Energy. Resources in water depths of 200 meters or less.

Regional CO2/EOR transportation development.



Recent crude oil price trends.

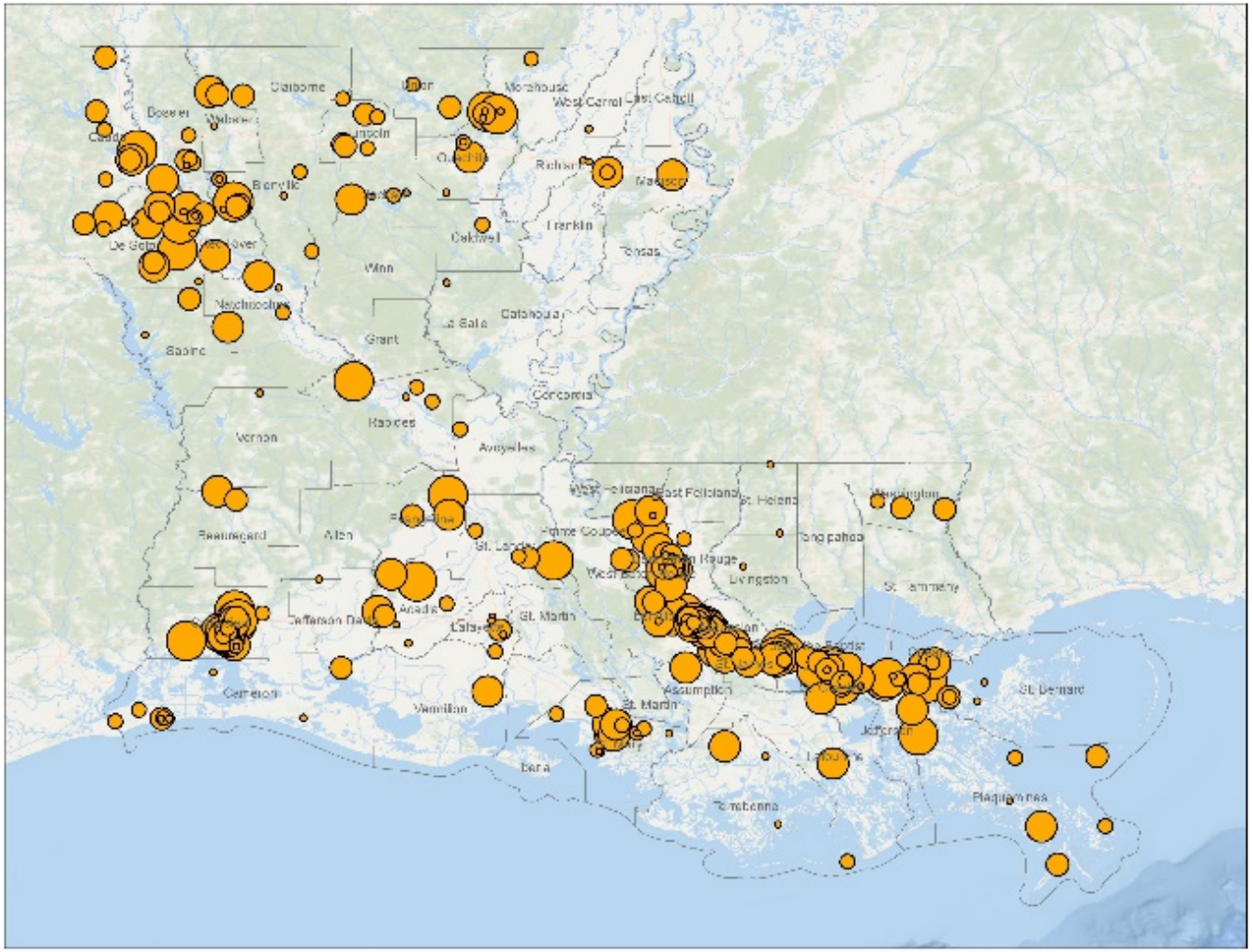
Low crude oil prices, coupled with relatively high start up costs, dampen EOR attractiveness.



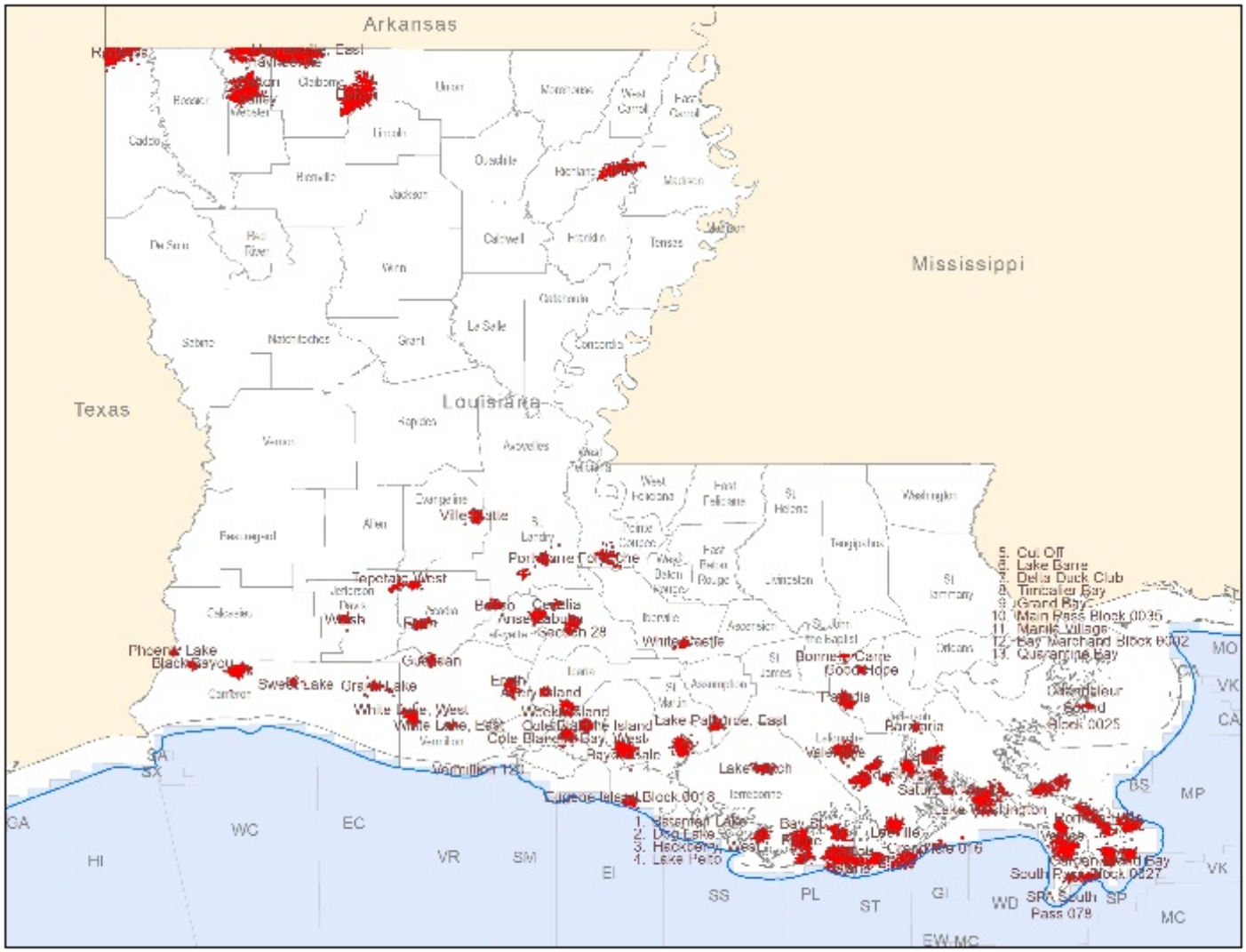
Source: Energy Information Administration, U.S. Department of Energy.

Potentials

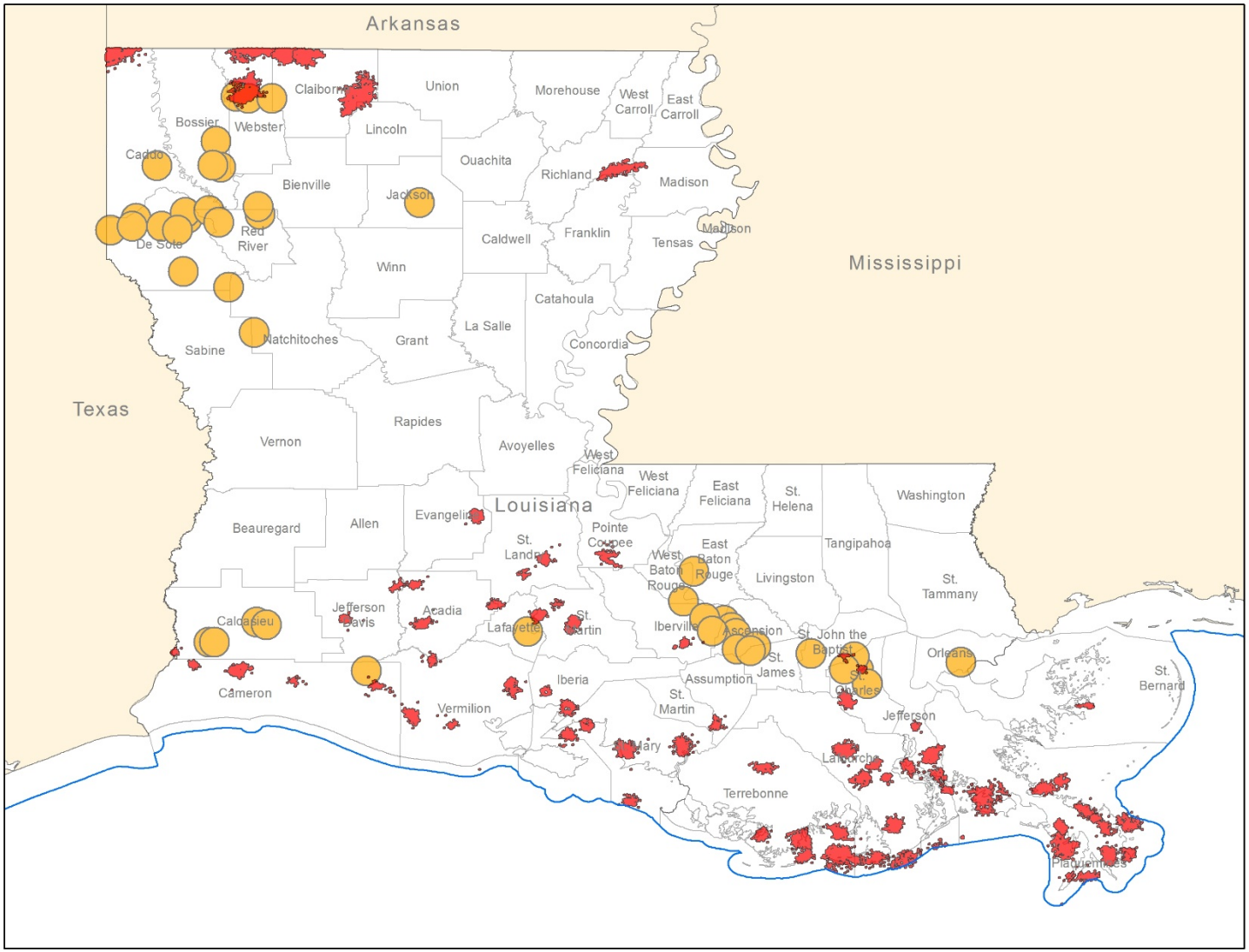
Louisiana industrial emission sources.



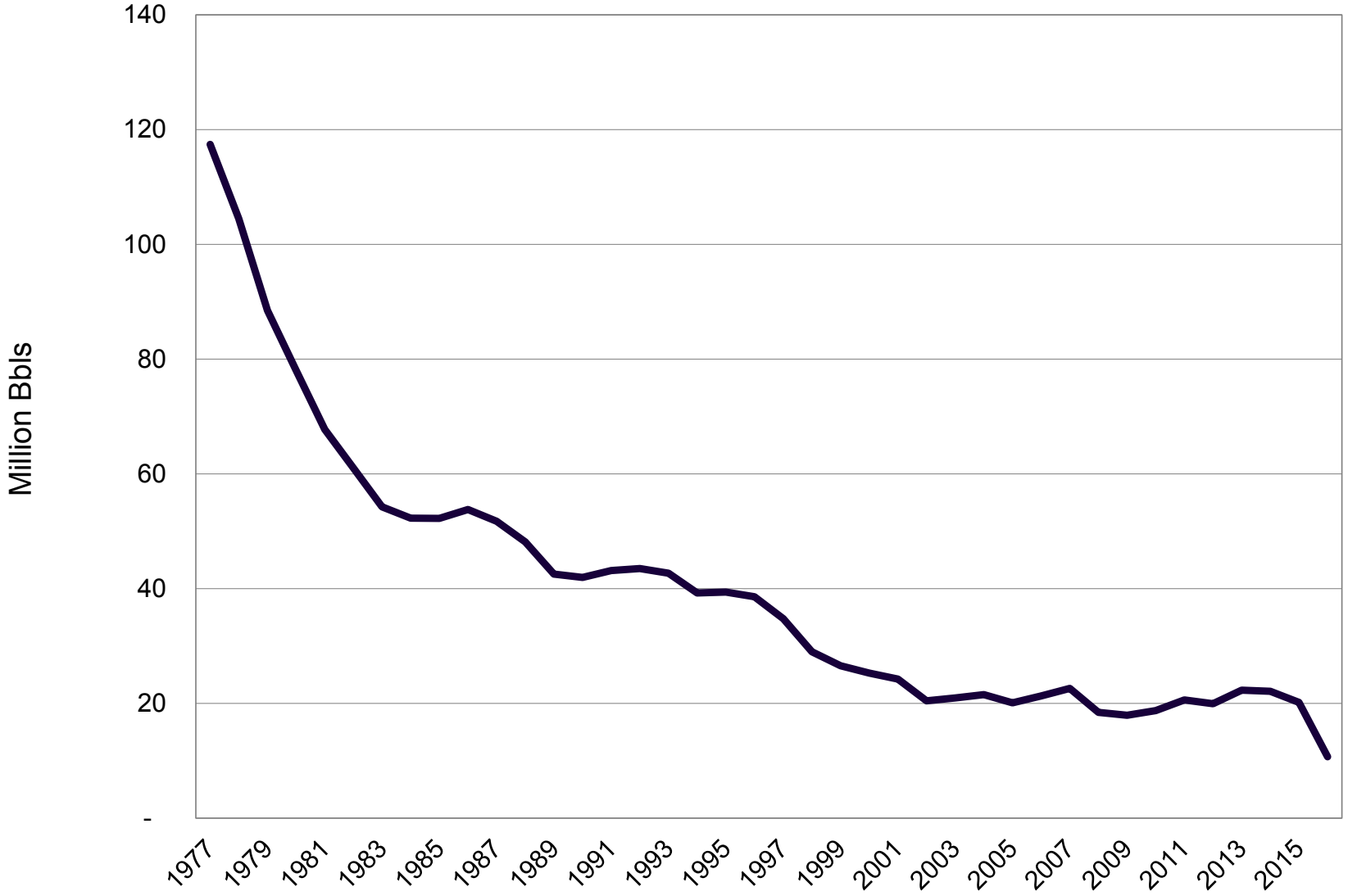
Location of Louisiana candidate fields.



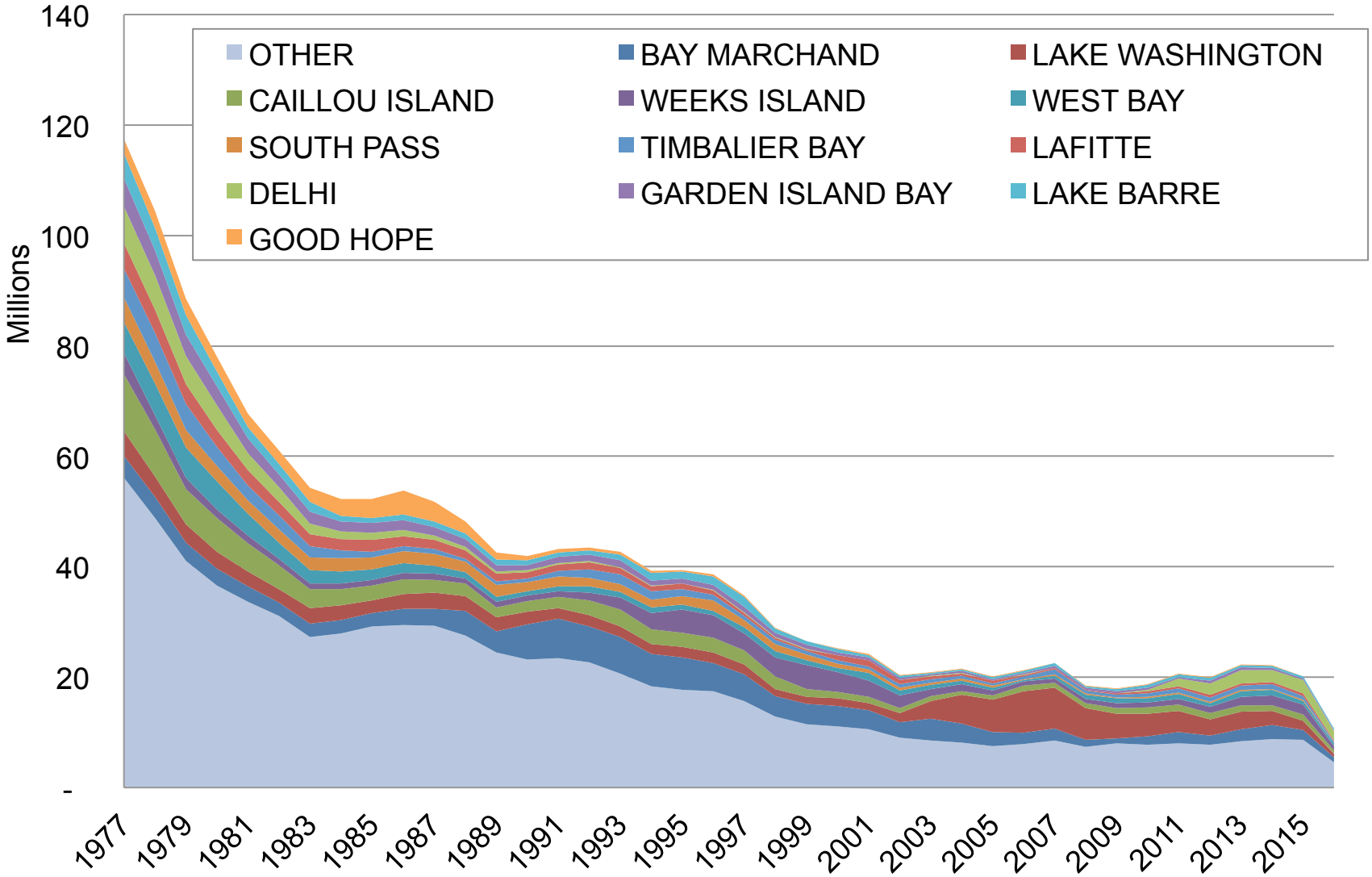
Louisiana industrial source versus candidate EOR fields.



Production history: Louisiana EOR candidate fields.



Production history by major candidate fields.



Conclusions

Conclusions.

- Louisiana is a mature basin and our traditional fields are seeing significant decline. This is important for the state's economy and fiscal resources.
- We have some history with prior EOR pilots and we do have some limited CO2 transportation infrastructure in the state.
- We have large industrial CO2 sources that are in close proximity to candidate locations. So, technically, Louisiana is well-suited.
- However, from an economic perspective, Louisiana is an expensive place to do oil and gas business and EOR projects here will have to compete with other basins, particularly the Permian.
- The proximity advantages for Louisiana EOR projects will have to be evaluated against relative drilling costs, estimated recoverable production differentials, and the basin option value (Permian).

Questions, comments and discussion

dismukes@lsu.edu

www.enrg.lsu.edu