Assessment of CO_2 Storage Resources in Depleted Oil and Gas Fields in the Ship Shoal Area, Gulf of Mexico

GeoMechanics Technologies

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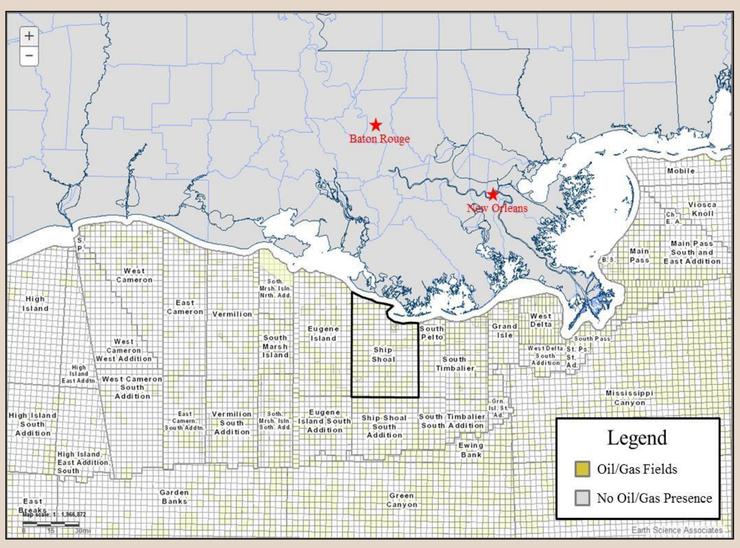
Project Overview

Primary goal of the project is to characterize the Plio-Miocene sediments of the depleted oil/gas fields of the Ship Shoal Area for high volume CO_2 storage.

The Ship Shoal area is located on the continental shelf offshore Louisiana in the federal waters within the northern Gulf of Mexico.



Modified from GOMsmart.com; Earth Science Associates

Project Objectives

The project will proceed over two years.

Objectives of Phase I-

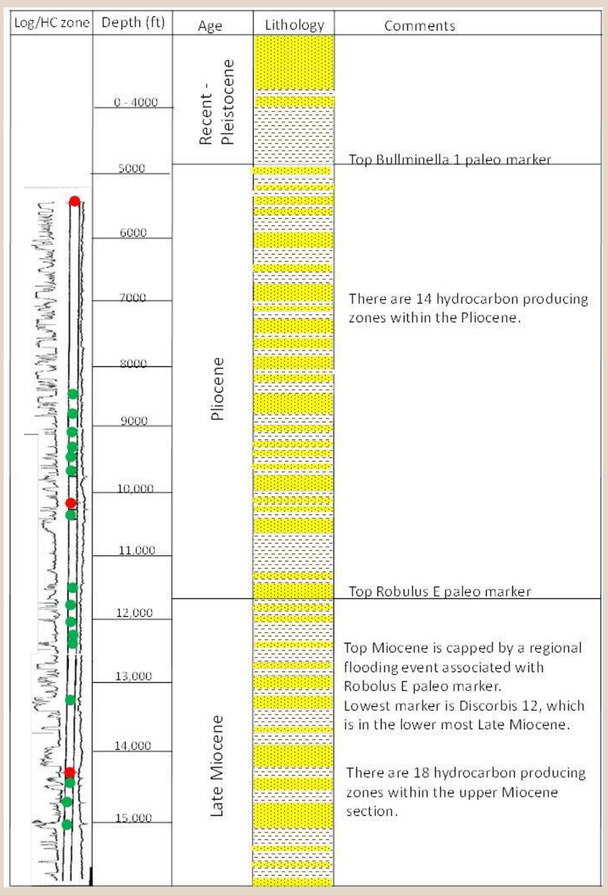
- Complete detailed review and interpretation of publically available geologic data to identify targets and seals.
- Provide preliminary estimation of storage volume for each oil/gas field using NETL approved calculation.
- Produce Pliocene and Miocene structure maps of northern Ship Shoal.
- Develop detailed geologic model of Ship Shoal (SS) Block 107 field.

Objectives of Phase II-

- Develop integrated 3D fluid-flow and geomechanics model of SS Block 107 field to simulate long-term injectivity, migration, storage permanence, and induced fault reactivation.
- Complete a risk assessment to evaluate the potential of leakage during CO_2 injection.
- Analyze existing infrastructure of oil and gas for CO_2 transport.
- Provide a refined storage capacity estimation for SS Block 107 field based on modeling and risk assessment.

Findings To Date

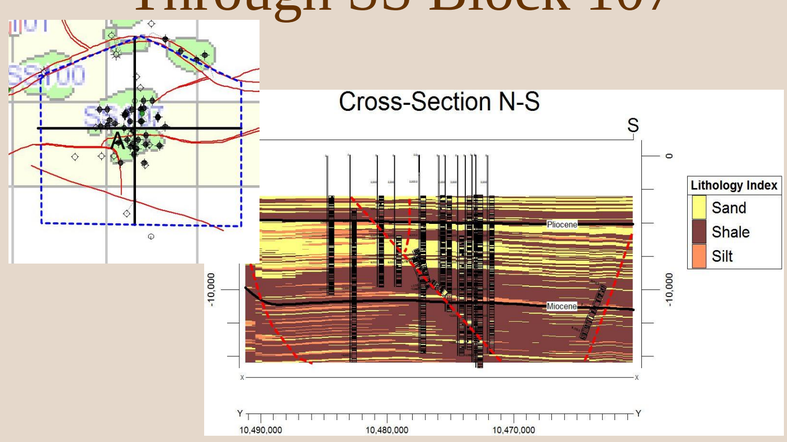
Geological Review

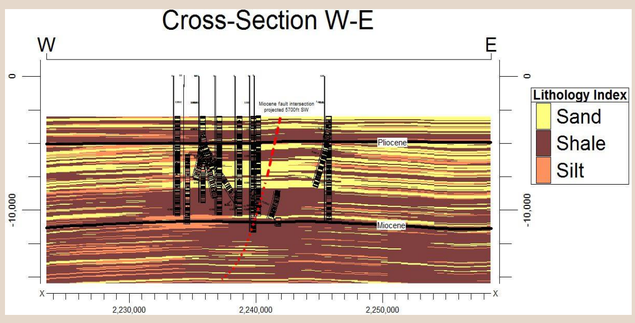


Modified from Russell, 1973

Generalized stratigraphic column and type log for SS Block 107 field. Green dots indicate oil reservoirs, red dots are gas reservoirs.

Lithology Cross Sections Through SS Block 107





Resource Estimation

NETL Equation: $G_{CO2} = A_t h_g \emptyset_{tot} \rho E_{saline}$

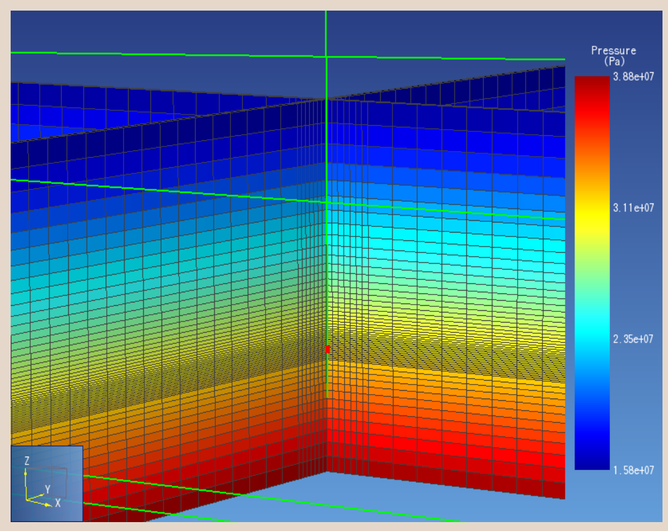
where, G_{CO2}=CO_2 storage mass estimate, A_t= Total area, H_g= Gross thickness, $\emptyset_{tot}$= Total porosity, ρ=Density of CO_2 at depth, and E_{saline}= Storage efficiency factor. [1]

Using BOEM reservoir data, the existing oil/gas fields in northern Ship Shoal have the potential to store:

P10= 12 million tons,
P50= 47 million tons, and
P90= 127 million tons of CO_2

Findings To Date

CO_2 Migration Model



CO_2 fluid flow model mesh and pressure initialization for target injection zone at base of Pliocene.

Anticipated Benefits

GeoMechanics Technologies plans to provide a more extensive and detailed geologic review and analysis of the Ship Shoal Area in the northern GOM. The improved prediction of CO_2 storage capacity for this near-shore region may allow it to be considered as a potential commercial sequestration site by the 2025-2035 timeframe.

The development and description of a combined CO_2 migration model and geomechanical simulation approach will allow for the evaluation of induced stresses and potential fault reactivation due to CO_2 injection. The results of the modeling will be useful for the research community to inform, compare, and validate future CO_2 sequestration developments.

Acknowledgements

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References

[1] From *2015 Carbon Storage Atlas*, Appendix B, p. 108 (DOE).

[2] Mineral Management Service, June 1999, Assessment of Conventionally Recoverable Hydrocarbon Resources of the Gulf of Mexico and Atlantic Outer Continental Shelf, OCS Report MMS 00-0034

[3] Russell, E. L., 1973 Ship Shoal Block 107 Field, Offshore Louisiana, Chevron Oil Company, pp. 75-79