GEOLOGIC CHARACTERIZATION AND MODELING FOR QUANTIFYING CO_2 STORAGE CAPACITY OF THE HIGH ISLAND 10-L FIELD IN TEXAS STATE WATERS, OFFSHORE GULF OF MEXICO

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ABSTRACT

Carbon dioxide capture and storage (CCS) is a promising technology for mitigating climate change by reducing CO_2 emissions to the atmosphere and injecting captured industrial emissions into deep geologic formations. Deep subsurface storage in geologic formations is similar to trapping natural hydrocarbons is one of the key components of CCS technology. The quantification of the available subsurface storage resource is the subject in this research project.

This study focuses on site-specific geologic characterization, reservoir modeling, and CO_2 storage resource assessment (capacity) of a depleted oil and gas field located on the inner continental shelf of the Gulf of Mexico, the High Island 10L Field. Lower Miocene sands in the Fleming Group beneath the regional transgressive *Amphistegina B* shale have extremely favorable geologic properties (porosity, thickness, extent) and are characterized in this study utilizing 3-D seismic and well logs. Key stratigraphic surfaces between maximum flooding surfaces (MFS-9 to MFS-10) demonstrate how marine regression and transgression impact the stacking pattern of the thick sands and overlying seals, influencing the overall potential for CO_2 storage.

One of the main uncertainties when assessing CO_2 storage resources at different scales is to determine the fraction of the pore space within a formation that is practically accessible for storage. The goal of the modeling section of this project is to address the uncertainty related to the static parameters affecting calculations of available pore space by creating facies and porosity geostatistical models based on the spatial variation of the available data. P50 values for CO_2 storage capacity range from 42 to 44.5 Megatonnes (Mt), showing a narrow distribution of values for different realizations of the geostatistical models.

This research further validates a workflow to quantify CO_2 storage resources in the context of the CO_2 Storage Resources Management System (SRMS, developed by the Society of Petroleum Engineers), as well as an assessment of the impact of the current carbon tax credit program (45Q), applied directly to the storage resources results for the High Island Field 10L using a simple NPV approach based on cash flows.

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