

Geologic Characterization of the South Georgia Rift Basin for Source Proximal CO₂ Storage

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Carbon capture and storage, focused on curbing the increase in greenhouse gas emissions into the global atmosphere, is an emerging issue with governments and private industry around the world. Terrestrial and geologic sequestration of carbon dioxide (CO₂) are receiving considerable attention. As evidence of this interest, the University of South Carolina and its research partners, including the South Carolina Geological Survey, have received \$4,950,639 from the U.S. Department of Energy's National Energy Technology Laboratory for geologic characterization of the South Georgia Rift basin (SGR) for source proximal CO₂ storage. This three year research effort is being led by the Earth Sciences and Resources Institute (ESRI-SC) and the Department of Earth and Ocean Sciences (EOS) at the university. Members of the research team, in addition to the South Carolina Geological Survey, are the University of Illinois, Weatherford Laboratories (Houston, TX), and Bay Geophysical, Inc. (Traverse City, MI).



The Department of Energy is funding 10 projects (see above map and note that the Michigan project was not undertaken) valued at \$75.5 million aimed at increasing scientific understanding about the potential of promising geologic formations to safely and permanently store carbon dioxide deep underground. The research is being managed by the Office of Fossil Energy's National Energy Technology Laboratory and includes projects in Illinois, Colorado, Texas, South Carolina, California, Alabama, Kansas, Utah, and Wyoming. The selected projects are examining the usefulness of potential geologic storage sites; augmenting existing data through coordination with a public database; and participating in technical working groups on best practices for site characterization and approving storage site selection. The information gained from these projects will further DOE's effort to develop a national assessment of CO₂ storage capacity in deep geologic formations. Additionally, the results of this research will be accessible to the public and industry looking to understand future opportunities for building U.S. commercial sequestration projects.

Our study is evaluating the feasibility of CO₂ storage in the Jurassic/Triassic (J/T_R) saline formations of the buried SGR and providing all data and analyses associated with this determination to the NATCARB database. The J/T_R sequence, based on preliminary assessment of limited geological and geophysical data, has both the appropriate areal extent and multiple horizons where significant amounts of CO₂ may potentially be stored permanently and safely. The presence of several igneous rock layers within the sequence may provide adequate seals to prevent upward migration of CO₂ into the Coastal Plain aquifer systems. A thick (~250 m) basalt layer exists at approximately 600 m to 850 m below ground surface over a wide area of potentially promising CO₂ storage capacity with many additional mafic igneous rock layers beneath it. Clastic sediments occupy the intervals between the mafic igneous rocks that are believed capable of storing large amounts of CO₂. Further, the target storage depth is well below the 1 km critical depth to maintain CO₂ as a supercritical fluid. Given the significant number of CO₂ sources in the southeastern U.S., particularly in southeastern South Carolina, and the positive geologic characteristics of the SGR, we believe that the SGR is a significant CO₂ storage site that can be commercially developed. The possibility of storing CO₂ deep underground in South Carolina holds promising opportunities for economic develop and enhancement of a green economy in the state.