Assessing Suitable Geologic Carbon Storage Sites Across Utah

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Abstract

Utah has a wealth of potential geological reservoirs for carbon dioxide storage (CS) and a long history of geologic research resulting in an abundance of available subsurface data to evaluate CS potential. Reservoirs may include sandstone, carbonate, and basalt; these rock types are plentiful in Utah's subsurface and the complex Phanerozoic history throughout the state requires evaluating each geologic region individually for promising reservoir-seal pairs for CO_2 storage. Classifying Utah by geologic provinces (or "geo-regions") allows for customized thinking about suitable CS reservoir and seal distribution, CO_2 point sources, land use, and existing infrastructure. Preliminary results from this study highlight the geologic CS potential across 15 geo-regions. Four regions stand out as having high CS potential: the Uinta Basin, San Rafael Swell, Paradox Basin, and the southern Basin and Range Province. The Uinta Basin and San Rafael Swell geo-regions are well suited for CS and have several projects ongoing to evaluate Cretaceous Frontier and Naturita Formations, Jurassic Navajo Sandstone and Entrada Sandstone, and Permian Weber Sandstone reservoir units that lie beneath robust sealing units like the ~5000-ft-thick Mancos Shale and Carmel Formation. Reservoirs such as the Navajo and Weber Sandstones have been demonstrated to be suitable reservoirs through a long history of oil and gas exploration in Utah. New areas of interest include the southern Basin and Range in southwest Utah, where the Jurassic Navajo Sandstone is overlain by the sealing Carmel Formation at suitable depths (>3000 ft), and has good porosities based on outcrop analogue data. Just to the north (e.g., central Basin and Range), legacy wells and 2D seismic data show possible salt and subsurface basalt flows that may provide additional possible CS reservoirs and seals. This geo-region also has the advantage of being coupled with geothermal energy resources that may be used to power burgeoning direct air capture technologies. In the Paradox Basin of southeastern Utah, the Leadville Limestone is a potential storage reservoir beneath the thick (4000–5000 ft), salt-bearing Pennsylvanian Paradox Formation. Although the northern and western parts of Utah offer CS potential, these areas typically contain less infrastructure and subsurface penetrations, creating geologic uncertainty associated with subsurface seals and reservoirs due to a lack of data. Overall, this statewide assessment and ranking is the first step to aid in evaluating CS potential across Utah and provides a foundation for future research in the most favorable locations.