CO_2 Sequestration Capacity Sectors in Miocene Strata of the Offshore Texas State Waters

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ABSTRACT

It was previously shown by the authors that the P_{50} static net CO_2 sequestration capacity estimated for Miocene strata beneath offshore Texas State Waters (OTSW) is 30.1 gigatonnes (Gt) of CO_2. The OTSW is the 16 km (10 mi) wide swath of Gulf of Mexico waters lying immediately seaward of the 590 km (367 mi) long Texas shoreline. This paper provides high-level decision-makers with further detail on CO_2 sequestration potential of the OTSW. We accomplished this by dividing the OTSW into seven sectors that are on the order of a Texas county in areal extent. For each sector we have calculated the CO_2 capacity, written a brief narrative pertaining to the geology and source-sink relationships, and created an informal (qualitative) rating as to the overall favorability (i.e., CO_2 sequestration potential) of the sector.

Our intent here is to provide broad guidance for understanding the distribution of the potential CO_2 capacity resource. Although there are many geologic details controlling the actual CO_2 capacity of a given reservoir, (e.g., fluid saturations, internal heterogeneity, top seal characteristics, and presence/degree of faulting), for our high-level result, the key factors controlling static CO_2 capacity estimates were the volume of net reservoir sandstone, the depth of reservoir occurrence, and the depth of geopressure.

The average area of each OTSW sector is 1395 km^2 (539 mi_2), and ranges from 815–1871 km^2 (315–722 mi^2). On average, sectors contain 4.3 Gt CO_2 (14% of Total OTSW) capacity, and range from 1.2–8.0 Gt CO_2. CO_2 capacity per unit area averages 3.0 megatonnes per square kilometer (Mt/km^2) or 7.8 megatonnes per square mile (Mt/mi^2) and varies geographically, ranging from 2.0–5.4 Mt/km^2 (5.1–14.1 Mt/mi^2).

Upper Texas coast sectors—Houston (8.0 Gt CO_2), Galveston (3.7 Gt CO_2), and Brazos (2.7 Gt CO_2)—together comprise almost half (47.8%) of the CO_2 capacity we estimated for the entire OTSW. These sectors have highly favorable carbon sequestration potential due to the presence of high net-to-gross (sandstone), relatively deep geopressure, and their occurrence in close proximity to a large number of CO_2 point sources. The Houston sector alone contains an estimated 80 yr of CO_2 storage of adjacent point-source emission at present rates. Central coast sectors—Matagorda, Corpus

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Christi, and South Padre—have moderate to good favorability. The Rio Grande sector of the southernmost Texas coast has the least favorable potential for CO_2 sequestration due to low sandstone content and shallow overpressure. If commercial-scale carbon sequestration operations commence in the United States, the OTSW appears to contain excellent sequestration targets.