EOR Potential from CO_2 Captured from Coal-Fired Power Plants in the Upper Cretaceous (Cenomanian) Woodbine Group, East Texas Basin, and Southeastern Texas Gulf Coast, USA

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Abstract

The East Texas Basin and southeastern Texas Gulf Coast contain a variety of co-located CO_2 sources and sinks that may facilitate development of new clean-coal facilities. These facilities can be linked to mature oil fields with potential for enhanced oil recovery (EOR) from miscible CO_2 floods. Twenty-three reservoirs in the East Texas Basin and southeastern Texas Gulf Coast, assuming a 15% recovery factor of original oil in place (OOIP), have a CO_2-EOR potential for recovery of ~9,697,000 m^3 [~62.2 million stock tank barrels] of oil. A network of new CO_2 pipelines can link these fields to existing power plants near lignite mine mouths in east and southeast Texas. Representative oil fields in the Woodbine Group illustrate fluvial and deltaic facies variability and different sandstone-body architectures with varying controls on potential CO_2 capacity. Reservoir heterogeneity, fluid flow, hydrocarbon production, and potential CO_2 capacity in the Woodbine Group in the structurally simple East Texas field are mainly a function of facies architecture. The Woodbine Group in East Texas field contains a lower section of narrow and lenticular sandstone bodies in a fluvially dominated deltaic system. Pressure and production data indicate that additional oil recovery in the lower Woodbine deltaic section in East Texas field is low in muddy, low-permeability prodelta, and distal-delta-front facies. In contrast, oil recovery is greater in sandy distributary-channel sandstones. Core-plug data show that distributary-channel and channel-mouth-bar sandstones in the field have high median-permeability values, and therefore a greater potential for CO_2 capacity. These deltaic deposits are overlain disconformably by an upper section of continuous, coarse-grained fluvial deposits that favor high CO_2 capacity owing to Darcy-class permeability and extensive vertical and lateral reservoir continuity. In contrast, Woodbine fields in southeast Texas represent distal-deltaic facies. CO_2 capacity and EOR potential in these fields are limited by thin distributary-channel and crevasse-splay deposits that contain abundant mudstone beds that may serve to segregate-injected CO_2 into small reservoir compartments.