Estimates of CO_2 Storage Capacity for Stacked Brine Formations in the North Dakota Portion of the Williston Basin

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Abstract

As part of its ongoing regional characterization efforts, the Plains CO_2 Reduction (PCOR) Partnership has conducted a detailed evaluation of the potential CO_2 storage capacity of several stacked brine-saturated formations. The study area in central North Dakota, referred to as the Washburn area, encompasses 7500 square miles and is home to seven coal-fired stationary industrial sources which combine for annual emissions of over 36 million tons of CO_2. The stratigraphy of the Washburn area includes several thick and laterally continuous formations of brine-saturated clastics and carbonates of moderate to high porosity and permeability, many of which are separated by extensive shales and evaporites. The potential injection target formations include carbonates of the Ordovician Red River Formation and the Mississippian Mission Canyon Formation and sandstones of the Pennsylvanian–Permian Broom Creek Formation and the Cretaceous Dakota Group. Formations that could act as seals were also evaluated for thickness and extent. Characterization of the sink and seal formations in the Washburn area was accomplished using an approach that integrated publicly available well log data from over 50 wells, core analyses, drill stem test data, water analyses, and other published data to construct detailed petrophysical models. Results indicate that brine-saturated formations in the Washburn area of North Dakota have a CO_2 storage capacity greater than 13 billion tons.