Designing a Pilot Project to Test CO_2 Sequestration and Enhanced Gas Recovery in Organic-Rich Shales

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Horizontal drilling and new completion technologies have opened vast domestic gas resources in organic-rich shale plays nationwide. These low-permeability, continuous units are well known as natural gas source rocks and reservoir seals and are expected to play major roles in trapping CO_2 stored in deeper reservoirs. Research indicates the Ohio Shale (Appalachian Basin) and New Albany Shale (Illinois Basin) may also act as a carbon sink with the possibility of enhanced natural gas production.

Advanced geochemical well logs and laboratory data from drill cuttings and core have been acquired to better characterize the organic-rich gas shales in three Kentucky wells: Rosewood 02 Bargo, Blue Flame K-2605 Batten and Baird, and KGS 1 Blan. CO_2 and CH_4 adsorption isotherm data from these and other wells indicate CO_2 is preferentially adsorbed in organic-rich shale. Natural gas production rate, petrographic, porosity, permeability, and other data were compiled to construct a geostatistical reservoir model to test CO_2 injection into a nominated test site, the Interstate 3 Panther Land and surrounding wells, Pike County, eastern Kentucky. Reservoir modeling and simulations compared huff-and-puff and continuous injection scenarios. The huff-and-puff simulation indicated little carbon storage because of rapid flowback and incremental methane recoveries of 1 percent or less. The continuous injection simulation indicated both CO_2 sequestration and incremental natural gas production up to 7 percent. Results indicate that a test volume of 300 tons of CO_2 could increase production in surrounding wells and is being used to design a proof-of-concept injection project.

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