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The Application of Horizontal and Deviated Wellbores as a Means of Increasing Gas Productivity from Cretaceous Shales Along the Western Interior Seaway: Example from the Lewis Shale, San Juan Basin, Colorado and New Mexico, USA

A significant number of Lewis Shale (Campanian) completions in vertical wellbores have yielded variable results. Although coarsening-upward "pay zones" have been recognized within the ~ 1200 foot-thick interval, induced fracture half-lengths usually measure less than 200 feet. Fracture half-length is relatively small due to lack of overlying confining units, resulting in vertical fracture growth. Calculated drainage area associated with this effort is less than 80 acres. Consequently, production from these vertical wells recovers less than 5% of original gas-in-place (20Bcf/ 160 acres). Vertical completions consist of limited entry, one or two stage, nitrogen-foam fracture stimulations and ~ 200,000 lbs. proppant. Perforations target three sand/silt-rich pulses (microdarcy permeability) that attain combined thickness of approximately 400 feet.

In 1991, a horizontal well determined that potential recovery could be increased in these naturally fractured reservoirs. A 2,100-foot lateral was drilled in the uppermost fractured pay, called the Navajo City interval. While known fracture azimuth (NE) resulted in a wellbore appropriately drilled to the SE, results indicate that the interval was pressure-depleted due to a nearby highly productive vertical completion. In spite of this and other technical problems, this unstimulated horizontal leg has already yielded 0.9 Bcf during an ongoing ten-year production history, with future significant reserves.

Results suggest that horizontal or highly deviated wells could substantially increase ultimate recovery. Therefore, thousands of similar applications not only exist for Lewis Shale in the San Juan Basin, but also occur for specific coarsening-upward sequences found in Cretaceous shales along the entire length of the Western Interior.