Evaluation of Jurassic-Cretaceous Cotton Valley-Travis Peak Gas Systems in Gulf Coast Region for Petroleum Resource Assessment

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Abstract

The U.S. Geological Survey (USGS) is currently assessing the undiscovered resource potential of 25 priority provinces in onshore areas of the U.S. that contain 95% of the known and undiscovered gas resources. The USGS is re-evaluating the potential for continuous-type basin-center (BC) gas systems in these high priority basins in order to accommodate changing views and new data since the last USGS assessment in 1995. Continuous-type BC gas systems are characterized by abnormal reservoir pressures, presence of gas in extensive low-permeability (tight) reservoirs, absence of traditional traps and seals, and lack of conventional gas-water contacts. Jurassic-Cretaceous Cotton Valley Group-Travis Peak Formation sandstones in the northern Gulf Coast basin are high-priority reservoirs that are currently being re-evaluated.

Two Cotton Valley (CV) sandstone trends are identified based on reservoir properties and gas-production characteristics: a high-permeability blanket sandstone trend across northern Louisiana and east Texas, and a down-dip low-permeability massive sandstone trend. Pressure gradients throughout most of both trends are normal, which is not characteristic of BC gas. Presence of gas-water contacts in at least seven fields across the blanket-sandstone trend together with relatively high permeabilities and high gas-production rates without fracture stimulation also indicate that fields in this trend are conventional. Within the massive-sandstone trend, however, permeability is sufficiently low that gas-water transition zones are vertically extensive and gas-water contacts poorly defined. Interpreted presence of gas-water contacts within the tight, massive Cotton Valley sandstone trend, however, suggests that accumulations in this trend are also conventional, and that a BC gas accumulation does not exist in CV sandstones in the northern Gulf basin.

Matrix permeability of many Travis Peak sandstones is low because of pervasive quartz cementation, but abundant natural fractures impart significant fracture permeability. In east Texas, oil and gas are concentrated in meandering-channel and coastal sandstones in the upper 300 feet of the formation. This probably occurs because these sandstones are encased in thick shales that provide conventional seals. Significant overpressure was found in only one Travis Peak sandstone reservoir in one of 24 oil and gas fields examined across east Texas and north Louisiana. Hydrocarbon-water contacts within Travis Peak sandstone reservoirs were documented in 17 fields, and probably occur in considerably more fields, across the productive Travis Peak trend in east Texas and north Louisiana suggesting that a BC gas accumulation does not exist within Travis Peak reservoirs in the northern Gulf basin.