

Undiscovered Petroleum Resources for the Woodford Shale and Thirteen Finger Limestone-Atoka Shale, Anadarko Basin

Debra K. Higley

USGS, Box 25046, MS 939, Denver Federal Center, Denver, CO 80225. (303) 236-5791

higley@usgs.gov

In 2010 the U.S. Geological Survey assessed undiscovered oil and gas resources for the Anadarko Basin province of Colorado, Kansas, Oklahoma, and Texas. The assessment included two continuous (unconventional) assessment units (AU): the Devonian Woodford Shale Gas AU, and the Pennsylvanian Thirteen Finger Limestone- Atoka Shale AU of the lower Atoka Group. Both AUs are mature for gas generation within the deep basin of Oklahoma and Texas. Gas generation from the Woodford Shale source rock started about 300 Ma, and from the Thirteen Finger Limestone-Atoka Shale about 250 Ma. Maturation results are based on vitrinite reflectance data, and on 1-D and 3-D petroleum system models that calculated vitrinite reflectance (R_o), and Rock-Eval and hydrous pyrolysis transformation ratios through time of petroleum source rocks. The Woodford Shale AU sweet spot and boundary were defined primarily on (1) isopach thickness from well-log analysis and published sources; (2) estimated ultimate recoverable production from existing, mainly horizontal, wells, and (3) degrees of thermal maturation. Measured and modeled R_o ranges from about 1% to 5% in the AU, which represents marginally mature to overmature for gas generation. The sweet spot included most of the Woodford that was deposited within eroded channels in the unconformably underlying Hunton Group. The Thirteen Finger Limestone-Atoka Shale AU has no known production in the deep basin. This AU boundary is based primarily on the gas generation window, and on thickness and distribution of organic-rich facies from these mainly thin shale and limestone beds. Estimates of organic richness were based on well-log signatures and published data.