

The Anadarko Basin—A Super Past and Challenging Unconventional Future

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The Anadarko Basin, which lies primarily in Oklahoma, has been identified as a “Super Basin.” To qualify as a super basin two criteria must be met: 1) cumulative production of at least 5 BBOE (billion barrels of oil equivalent) and 2) a future production potential of more than 5 BBOE. The first criterion was surpassed in the middle of the 20th Century. Cumulative production is now close to 50 BBOE. Like most North American basins, the Anadarko Basin was on the downside of the creaming curve when new technology, hydraulic fracturing of horizontal wells, unlocked production from low permeability reservoirs. Since 2010 more than 16,000 horizontal wells have been completed in Oklahoma. This talk tracks the basin’s production history and regulatory events before reviewing the characteristics of the basin’s three principal reservoir-source rock systems (Ordovician-Silurian, Devonian-Mississippian, and Pennsylvanian) to address the following questions: 1) Is there truly an additional 5 BBOE future production? 2) If so, where will this production come from? 3) What are the conditions necessary to achieve an additional 5 BBOE future production.

Assuming no stepwise change in technology and considering global macroeconomic trends in energy (competition from renewables and the electrification of transportation), achieving super basin status is possible, but challenging, especially in light of the steep single-well production declines. The Ordovician-Silurian system (Viola Formation) has insufficient source rock thickness to support robust widespread production. Excluding more structurally challenged domains, the Devonian-Mississippian system (Woodford Shale, Lower Caney shale, Springer black shale, and Mississippi Lime) has largely been drilled out within the oil window. There is, however, sufficient potentially recoverable gas to reach the 5 BBOE hurdle, but to do so will require higher sustained prices to move resources to reserves. The Pennsylvanian system(s) that include the Granite Wash, Morrow, Atoka Red Fork, Skinner, Cleveland, and Tonkawa clastic reservoirs will continue to deliver important oil, gas and NGL volumes, but on a prospect-by-prospect basis. This projected scenario suggests a schism in operators and activity. The deep dry gas plays are suited to long-term LNG players looking to diversify and hedge on supply risk, but require not only higher a gas price, but also expanded egress capacity to LNG export terminals. Regardless of whether these requirements are realized, the shallower liquids-rich plays offer a solid future for those independents with well-honed subsurface skills, good land departments, and excellence in operations.