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Abstract

1 Panel: 84"x48"

Evaluation of Potential Stacked Shale-Gas Reservoirs Across Northern and North-Central West Virginia

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Three shale-gas units underlying northern and north-central West Virginia create opportunity for one horizontal well pad to produce from multiple zones. The Upper Ordovician Utica/Point Pleasant, Middle Devonian Marcellus, and Upper Devonian Burket/Geneseo shales yield significant quantities of hydrocarbons in this area, and comparison of individual reservoir characteristics enables construction of fairway maps for each play.

Current drilling activity focuses on the Marcellus, with more than 1,000 horizontal completions reported through mid-2015. Across northern West Virginia, the Marcellus is 40 to 60 ft thick with a depth range between 5,000 and 8,000 ft. Total Organic Carbon (TOC) is generally 10% or greater. Quartz content is relatively high (~60%) and clay content is low (~30%). Reservoir pressure estimates range from 0.3 to 0.7 psi/ft and generally increase to the north. Volumetric assessment of the Marcellus in this area yields preliminary original gas-in-place estimates of 9 to 24 Bcf/mi².

The Burket /Geneseo interval is approximately 15 to 40 ft thick across the fairway. The underlying Tully Limestone and Mahantango Formation thin significantly to the west; in places, less than 50 feet separate the Burket/Geneseo from the Marcellus, creating potential to simultaneously complete both formations. This interval may be less conducive to fracture stimulation with relatively high clay (~60%) and low quartz content (~20%). TOC content in this section is generally less than 5%. Seventeen wells report a cumulative volume of 13.2 Bcf of gas and nearly 7,000 bbl of liquids through 2014.

Finally, two recent deep tests of the Utica/Point Pleasant interval in this area each yielded a highly promising 1.0 Bcf of gas in the first three months of production. Reservoir depths range from 10,000 to 12,000 ft and estimates suggest the area is highly over-pressured, with gradients from 0.5 to 0.9 psi/ft. TOC content generally ranges from 1 to 4% and organic-rich shale beds are often thinly interbedded with more carbonate-rich strata. Clay content is typically around 50% in the Utica/Point Pleasant interval; carbonate constitutes 20 to 30% and quartz content is 10 to 20%.