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Natural Gas Exploration Associated with Alleghenian Thrust Faults in the Greenbrier Formation, Southern West Virginia

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A hydrocarbon play has been identified in southern West Virginia targeting the intersection of thrust faults with specific Mississippian reservoir intervals. Late Paleozoic sandstone and limestone reservoirs are traditional plays in the study area, often yielding economic natural gas production, with rates ranging between 100 to 200 Mcfd. In contrast, production from fault wells often exceeds 500 Mcfd. We believe this prolific production comes from fracture zones associated with thrust faults that provide a conduit to the Union Oolite member of the Greenbrier Limestone. Studies are in progress to test this hypothesis.

Thrust faults and associated folds in southern West Virginia were formed during the Alleghenian Orogeny. Within the study area, several thrust faults are laterally extensive, spanning tens of miles along strike. Vertical displacements ranging up to 240 feet have been observed where thrust faults displace the Mississippian Greenbrier Formation. Detailed fault-plane modeling based on well log correlation, structural mapping, thickness isopachs, and cross sections demonstrates the relationship between excellent production and proximity with abrupt changes of fault dip. We believe this relationship is due to enhanced fracture density in these zones of high strain.

To the author's knowledge, little if any research has been published on drilling targets of this type in the Appalachian Basin, however, due to the abundance of faults near the Allegheny Structural Front, this exploration concept is widely applicable and is likely to result in enhanced gas production from this mature basin.