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"Controls on gas and liquids production in the Devonian Marcellus Shale gas giant, Appalachian Basin, U.S.A."

Abstract

Cumulative production from the Middle Devonian Marcellus Shale is more than 29.2 trillion cubic feet of gas, 51.4 million barrels of natural gas liquids, and 142 million barrels of water from about 12,000 wells, based on IHS MarkitTM* data current to January, 2018. The Marcellus Shale is a gas giant in which exploration and production are concentrated in (a) northeastern Pennsylvania, and in (b) southwestern Pennsylvania and northwestern West Virginia. The areas of best production and potential within the Marcellus Shale are characterized by (1) 40 ft and greater thickness of quartz-rich fissile brittle and (2) organic-rich shale; (3) average total organic carbon greater than 2% by weight; (4) a measured vitrinite reflectance of 1% and higher, based also on temperature and maturation data and 1D models; (5) depths greater than or equal to 4,500 feet; (6) subtle and complex mostly northwest-trending folds and faults caused by the Alleghanian orogeny and movement of the underlying Silurian Salina Salt; and that (7) the long laterals in horizontal wells are oriented perpendicular to these structures and located in the (8) normally to overpressured area of the Marcellus Shale. Exploration and development are also impacted by variable data distribution and quality, drilling moratoriums such as the state of New York, length and spacing of horizontal well laterals, access to gas pipelines, and costs of drilling and development relative to the price of natural gas. This last factor is one reason for increased exploration and development in southwest Pennsylvania and northwestern West Virginia; this is the area of the basin with the greatest production of and potential for natural gas liquids.

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Our Presenter

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Debra Higley is a research geologist with the Central Energy Resources Science Center of the U.S. Geological Survey in Denver, Colorado. Debra's more than 35 years of research combines conventional and unconventional oil and gas resource assessment with petroleum system modeling for basins in North and South America. 1-D and 4-D petroleum system models include the Anadarko, Appalachian, Denver, and Western Canada Sedimentary basins. She has an M.S. in geochemistry and Ph.D. in geology from the Colorado School of Mines, and a B.S. in geology from Colorado Mesa University.