Assessment of Undiscovered Oil and Gas Resources in the Heath Formation, Central Montana and Western North Dakota

Ronald M. Drake II[1]

[1]U.S. Geological Survey, Lakewood, CO

ABSTRACT

The Mississippian Heath Formation occurs across north-central Montana and western North Dakota and was deposited in a mostly-marine depositional environment. The Heath Formation is a heterogeneous mix of lithologies that includes grey to black mudstones, dolomite, limestone, anhydrite, and coal. The primary source rock, informally called the Cox Ranch oil shale bed, lies within the middle section of the Heath Formation and has total organic carbon contents as high as 26 weight percent. Production from the Heath Formation began in 1919 when oil was discovered in the Devil's Basin oil field on the Central Montana Uplift. Currently, oil and gas are being produced mostly from horizontal drilling within the Heath Formation. The U.S. Geological Survey (USGS) recently completed a geology- based assessment of the undiscovered, technically recoverable petroleum resources in the Heath Formation. For this assessment, two continuous (unconventional) assessment units (AUs) were defined: (1) the North-Central Montana Heath Continuous Oil AU; and (2) the Williston Heath Continuous Oil AU. The North-Central Montana Heath Continuous Oil AU lies within the Big Snowy trough of central and eastern Montana. The AU boundary extends west to the lateral extent of the Heath Formation near Judith Gap, Montana and to the Cedar Creek anticline to the east. Within the AU, the Heath Formation is thermally mature and occurs at depths of 300 to 7400 ft. The Williston Heath Continuous Oil AU is located along the eastern side of the Cedar Creek anticline in the western Williston Basin. The Heath Formation is present only in a limited area and is thickest (>300 ft) along the east side of the Cedar Creek anticline; it was eroded during the Early Pennsylvanian on the west side of the Cedar Creek anticline. These newly defined AUs were used in a recently completed USGS quantitative assessment of technically recoverable, continuous oil and gas resources of the Heath Formation and results are expected to be released in mid-2017.