

Integrated Characterization of Utica and Marcellus Black Shale Gas Plays, New York State

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The Ordovician Utica and Devonian Marcellus Shales have the potential to produce economic quantities of gas across much of south central New York State. The Marcellus Shale unconformably overlies the Onondaga Limestone and is composed of a basal black shale member called the Union Springs, a widespread limestone unit called the Cherry Valley Limestone and an upper black shale called the Oatka Creek. The Union Springs Shale, Cherry Valley Limestone and basal Oatka Creek Shales onlap and pinch out on a tectonic high to the west. Organic-rich shale thickness increases from 20 feet in the west to 250 feet in the eastern part of the basin. Burial depths range from zero at the outcrop belt to as much as 7000 feet in the southeastern part of the basin. Thermal maturity ranges from submature in the west, through the oil and gas windows to supermature values in the east. TOC values generally increase from east to west but mostly range from 4-13%.

The Ordovician Utica Shale was deposited in an area of extensive active normal faulting and the most of the organic-rich units are preserved in tectonic lows. The Flat Creek Member of the Utica is an organic-rich calcareous shale that immediately overlies a subaerial unconformity and is time-equivalent to the Trenton Limestone. The upper Flat Creek grades laterally into an interbedded limestone and organic-rich black shale called the Dolgeville Formation that then grades laterally into an organic-rich member of the shallow marine Trenton Limestone. The Trenton and Dolgeville are eroded and capped by an angular unconformity that is overlain by the organic-rich Lower Indian Castle Member of the Utica which thickens and is best developed in fault-bounded lows. Total thickness of the organic-rich strata ranges from zero in the west to as much as 700 feet in the east with TOC values of 1.5-3.5%. The shales are supermature throughout the fairway. Current burial depths range from zero at the outcrop belt to as much as 9000 feet.

There are common faults and natural fractures that extend from the basement to the surface that offset both the Utica and Marcellus but the Utica is probably more heavily fractured. The natural faults and fractures may be beneficial or problematic but should be characterized.