Major Oil Plays in Utah--An Overview

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ABSTRACT

One of the benefits of Utah's diverse geology is a wealth of petroleum resources. Utah oil fields have produced over 1.6 billion bbls of oil and hold 510 million bbls of proved reserves at current prices, indicating significant oil remains to be produced. Three main oil- producing provinces exist in Utah--the thrust belt, Uinta Basin, and Paradox Basin, in the northern, eastern, and southeastern parts of the state, respectively. Oil is produced from eight major "plays" within these provinces, where we define a play as a geographic area with known oil accumulations or potential, sharing similar favorable combinations of source rocks, migration paths, reservoir characteristics, trapping mechanisms, and hydrocarbon types. Utah is also unique because there are outcrop analogs for most of the producing oil reservoirs in the state. The most prolific oil plays in the thrust belt produce from the eolian Triassic-Jurassic Nugget Sandstone and marine Jurassic Twin Creek Limestone. Traps are discrete subsidiary closures along large ramp anticlines formed during the Sevier orogeny. These heterogeneous reservoirs are also extensively fractured. Hydrocarbons were generated from sub-thrust Cretaceous source rocks. The Laramide-age (Late Cretaceous-Oligocene) Uinta Basin represents Utah's greatest petroleum province and has the best potential for adding new reserves, especially with the advancement of horizontal drilling techniques. Oil is mostly produced from stratigraphic traps in fluvial- deltaic sandstones and lacustrine carbonate reservoirs in the Paleocene and Eocene Green River and Colton/Wasatch Formations, which were deposited in and around ancestral Lake Uinta. The source rock for the Uinta Basin plays is kerogen-rich shale of the Green River Formation. The Paradox Basin includes Utah's largest oil field, Greater Aneth, and numerous smaller fields that produce oil from the Pennsylvanian Paradox Formation. The cyclic Paradox Formation was deposited on a shallow-water carbonate shelf (often restricted) that locally contained carbonate buildups, commonly phylloid-algal mounds and ooid banks. Trap types are typically stratigraphic, some having structural or diagenetic influences. The Paradox Formation has heterogeneous reservoir properties due to lithofacies of varying porosity and permeability, and a variety of positive and negative diagenetic effects. The fractured organic-rich Cane Creek shale in the Paradox Formation has the potential to add significant reserves using horizontal drilling. The Cane Creek and other organic-rich shales in the Paradox are the source for the hydrocarbons in the formation.