

The Oil and Gas Resources of the San Juan Basin - An Overview

James E. Fassett

Independent Geologist, Santa Fe, NM.

The San Juan Basin of northwest New Mexico and southwest Colorado is the second largest gas basin in the United States, second to the greater Hugoton Field of Texas, Oklahoma, and Kansas. Until the 1970s, most of the gas produced in the basin came from the three major fractured-sandstone reservoirs: the Dakota Sandstone, the Mesaverde Group, and the Pictured Cliffs Sandstone; all of Late Cretaceous age. Starting in the late 1970s, and accelerating in the 1980s to the present, production from coal-bed methane (CBM) reservoirs in the basin has gone from virtually none to around one trillion cubic ft of gas (TCFG)/year making the San Juan Basin's Fruitland CBM field the largest CBM field in the world. Through September 2009, the basin's fractured-sandstone reservoirs produced 24.4 trillion cubic ft of gas (TCFG) from 24,000 wells; 7.0 TCFG from the Dakota Sandstone, 12.9 TCFG from the Mesaverde Group, and 4.5 TCFG from the Pictured Cliffs Sandstone. These three reservoirs have also produced 98.2 million barrels of natural-gas liquids (condensate). Fruitland Formation CBM production is 15.7 TCFG from 7,700 wells. Cumulative gas production from these natural-gas reservoirs is 40.1 TCFG. Cumulative gas production from all of the nearly 40,000 wells in the basin totals 42.7 TCFG with the additional 2.6 TCFG coming from the basin's many scattered oil fields and smaller gas fields.

The fractured-sandstone gas reservoirs of the San Juan Basin were once thought to represent a gas-trapping model that came to be called the "basin-centered gas" model. This model was characterized by sheet sandstone bodies with total hydraulic connectivity containing natural gas trapped in the center of a structural basin by water seals around the periphery of the basin holding the gas captive in the basin's center. This model has now been disproven for the San Juan and other Western Interior structural basins, where it has been clearly shown that gas trapped in the central parts of these basins is sealed in conventional stratigraphic traps characterized by stratigraphic-pinch-outs. The term "basin-centered" is the only accurate remaining remnant of the "basin-centered" model, because the gas reservoirs in these basins are indeed located geographically in the central parts of these basins, albeit in conventional stratigraphic traps.

The San Juan Basin has also produced a total of 281 million barrels of oil (MBO) from a large number of relatively small oil fields. Nearly 175 MBO have come from the Tocito Sandstone Lentil of the Mancos Shale (sometimes called "Gallup Sandstone"); these fields are all stratigraphic traps consisting of marine sandstone lenses incased in impervious marine mudstones. The two largest Tocito oil fields are the Bisti and Horseshoe fields that have produced about 42 MBO and 40 MBO, respectively.

Paleozoic rocks have only been tested by about a dozen test holes in the central San Juan Basin thus these rocks may still have gas potential at depths down to 14,000 ft or so.