Introduction

The U.S. Geological Survey (USGS) recently assessed undiscovered, technically recoverable oil and gas resources of the Denver Basin Province (fig. 1) that have the potential to be added to reserves in the next 30 years. Both conventional and continuous resources were assessed.

In assessing the potential for resources of low permeability gas and low-permeability gas and fractured shales, which differ from conventional accumulations in that they are not significantly affected by hydrodynamics, there is no discrete gas/ water contact, and conventional methods of assessing sizes and number of accumulations are not appropriate (modified from Klett and others, 2000).

Using a total petroleum systems method of analysis, the USGS defined structural petroleum systems (TPS) and 12 assessment units (AU) in the province. TPS and AU are defined in Magoon and Dow (1994) and Klett and others (2000). Sources of information include published reports and the USGS Assessment, Inc. (2000) and PI/Dwights (1999a, 1999b) databases.

Resource Summary

Estimates of the oil, gas, and natural gas liquids (NGL) potential for the Denver Basin Province are presented in table 1. Coal-bed gas resources (CBG) of the Denver Formation are discussed in table 1. Oil and gas (OG) resources are discussed in table 1 (North Dakota, Texas, and Kansas). Petroleum provinces are defined in table 1 (Colorado). Some CBG potential in the Dakota Group Basin-Centered Gas AU (1,094.70 BCFG) and the Niobrara Group-Depleted CBG Resources AU (57.04 BCFG) are associated with CBG, and the remaining CBG potential in the Dakota Group Basin-Centered Gas AU (1,094.70 BCFG) and the Niobrara Group-Depleted CBG Resources AU (57.04 BCFG) are associated with CBG. Fractured shales occur in the Niobrara Group-Depleted CBG Resources AU (57.04 BCFG) and the Dakota Group Basin-Centered Gas AU (1,094.70 BCFG).

More than 99 percent of the oil volumes are in continuous (unconventional) assessment units (AU). More than 99 percent of the gas volume is in continuous (unconventional) assessment units (AU). Mean estimates of the remaining five TPSs are 104.23 million barrels of oil (MMBO), 2,519 billion cubic feet of gas (BCFG), and 51.81 million barrels of NGL (MMBNGL) (table 1). The following are generalized descriptions of the assessment units.

Figure 1. The Denver Basin Province (red line) of Colorado, Kansas, Nebraska, South Dakota, and Wyoming. Shown are oil (green), gas (red), oil and gas (yellow) and nonproductive (black) wells.
Coal-Bed Methane TPS 503901
2. Laramie Formation Coals AU 50390182—Hypothetical continuous coal-bed gas from the Upper Cretaceous Laramie Formation in the central Denver Basin Province.

Upper Cretaceous Fractured/Intraformational TPS 503902
2. Fractured Niobrara Limestone (Silo field area) AU 50390261—Continuous; mostly oil production from the Upper Cretaceous Niobrara Formation in the Silo field area (fig. 1).

Fractured Niobrara Limestone
Transitional AU 50390201 Oil 0.00 0.00 2.08 0.58 0.00 0.00 0.21 0.06
Gas N/A N/A N/A N/A 0.00 0.00 0.00 0.00
Fractured Niobrara Limestone (Silo field area) AU 50390261 Oil 4.32 7.29 12.27 7.66 4.09 7.34 13.17 7.82
Gas N/A N/A N/A N/A 0.00 0.00 0.00 0.00

Upper Cretaceous Pierre Shale (Florence field) TPS 503903
1. Fractured Pierre Shale AU 50390361—Continuous; oil production from the Upper Cretaceous Pierre Shale in the Florence field area (fig. 1).

Permian-Pennsylvanian TPS 503905
1. Niobrara Chalk AU 50390761—Continuous; biogenic gas from the Niobrara Formation is located in the eastern third of the province and extends eastward into Kansas and northward into South Dakota.

Niobrara Chalk AU 50390761 Oil 16.41 30.07 55.08 32.17 157.71 298.43 564.71 321.73
Gas 0.00 0.00 0.00 0.00 793.09 1,076.03 1,459.92 1,094.70

TOTAL RESOURCES
Oil 15.02 44.69 157.57 64.40 19.81 62.73 312.66 110.41
Gas 0.00 0.00 0.00 0.00 9.66 28.13 61.64 30.95

Table 1. Denver Basin Province assessment results listed by name and code of total petroleum system and assessment unit.

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<th>Type</th>
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TOTAL CONVENTIONAL RESOURCES
Oil 15.02 44.69 157.57 64.40 19.81 62.73 312.66 110.41
Gas 0.00 0.00 0.00 0.00 9.66 28.13 61.64 30.95

TOTAL CONTINUOUS RESOURCES
Oil 20.74 37.35 67.35 39.83 1,292.52 2,224.81 4,142.64 2,408.33
Gas 0.00 0.00 0.00 0.00 1,822.02 2,234.81 3,144.82 1,880.33

TOTAL RESOURCES
Oil 35.75 82.04 224.92 104.23 1,312.33 2,287.53 4,455.30 2,518.74
Gas 0.00 0.00 0.00 0.00 3,424.04 4,459.62 7,586.04 4,390.66

Note: N/A indicates not quantitatively assessed or not applicable.
Denver Basin Province Assessment Team


For Further Information

Supporting geologic studies of total petroleum systems and assessment units for the Denver Basin Province are in progress. Assessment results from the 1995 National Oil and Gas Assessment project are located at

http://energy.cr.usgs.gov/oilgas/noga/

References Cited


PI/Dwights Well History Control System database, 1999a, [available from IHS Energy, 4100 Dry Creek Road, Littleton, CO 80122].

PI/Dwights Well History Control System database, 1999b, [available from IHS Energy, 4100 Dry Creek Road, Littleton, CO 80122].