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National Assessment of Oil and Gas Fact Sheet

Coal-Bed Gas Resources of the Rocky Mountain Region

*Production of natural gas associated with coal beds accounts for about 7 percent of the total natural gas produced annually in the United States. Several important U.S. coal-bed gas-producing areas are in the Rocky Mountain region, where extensive shallow coal beds have produced or have the potential to produce coal-bed gas (**fig. 1**). We summarize the technically recoverable coal-bed gas resources of six geologic provinces in the Rocky Mountain region herein.*

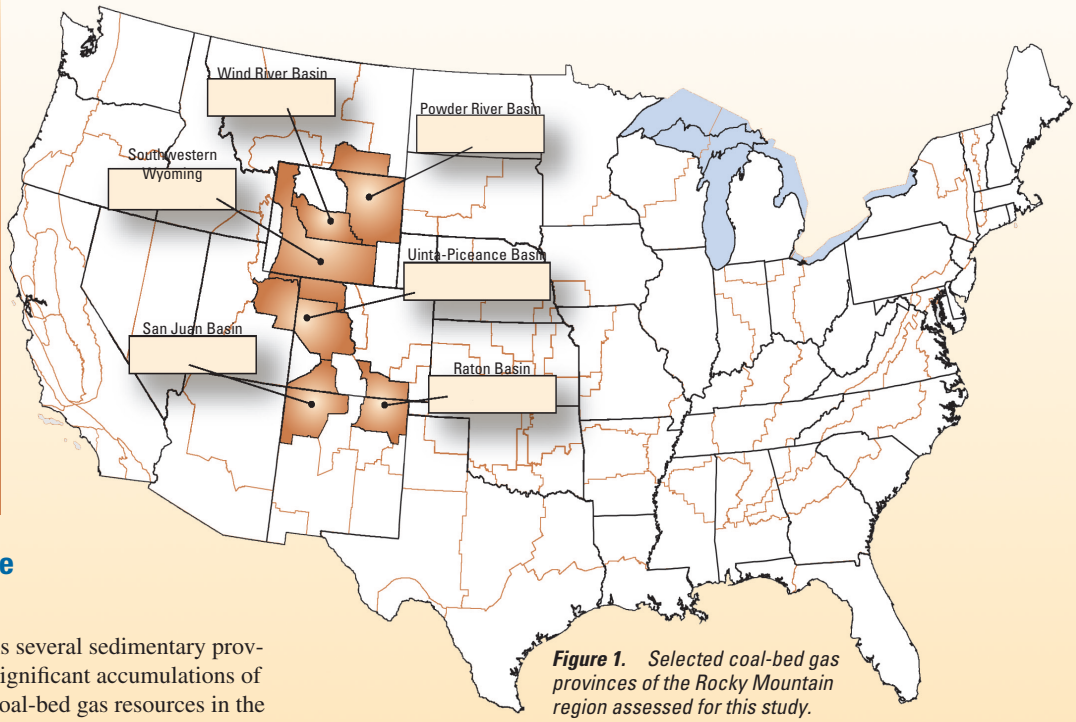

Figure 1. *Selected coal-bed gas provinces of the Rocky Mountain region assessed for this study.*

Coal-Bed Gas Provinces of the Rocky Mountain Region

The Rocky Mountain region contains several sedimentary provinces with extensive coal deposits and significant accumulations of coal-bed gas. This summary includes coal-bed gas resources in the Powder River Basin (Wyoming and Montana), Wind River Basin (Wyoming), Southwest Wyoming (Greater Green River Basin of Wyoming, Colorado, and Utah), Uinta-Piceance Basin (Colorado and Utah), Raton Basin (Colorado and New Mexico), and San Juan Basin (Colorado and New Mexico). Other provinces in the Rocky Mountain region may contain significant coal-bed gas resources, but these resource estimates are not available at this time.

What is Coal-Bed Gas?

Coal-bed gas is natural gas associated with, and sourced by, coal. Coal-bed gas is mainly composed of methane with variable amounts of ethane, nitrogen, and carbon dioxide. Methane can be generated by biogenic (microbial) or thermogenic (thermal) processes. Biogenic methane is formed when microbes act upon coals very near the surface, whereas thermogenic methane is formed as the temperature of a coal bed increases with increasing depth of burial. Generally, the amount of thermogenic gas in a coal increases with higher temperatures. Methane gas occurs as gas adsorbed onto coal surfaces, as free gas in fractures, cleats, or other porosity, and as gas dissolved in ground water within the coal beds. The amount of methane gas generated in a particular coal bed depends upon the depth of burial and related pressure, the temperature to which a coal has been raised, coal thickness, and coal composition. To produce coal-bed gas, the water in the coal must be removed by pumping, allowing the pressure in the coal to drop sufficiently for the gas to flow. Water produced during the coal-bed methane operation varies in quantity and quality among, and within, coal-bed methane plays. In some plays, the produced water may be sufficiently fresh to discharge onto the surface, whereas in other plays the water may require special treatment and (or) reinjection. The necessity of proper disposal of produced water increases the technological complexity of coal-bed gas production and results in water production being a governing factor in the production process.

How is Coal-Bed Gas Recovered?

Once a coal bed is known to contain recoverable coal-bed gas through a program of testing and analysis of exploratory wells, other wells are drilled into the coal to produce the gas (**fig. 2**). Each well is fitted with a pump to first remove water from the coal, a process that may take months or even years to complete. Some wells may require artificial fracturing to induce sufficient permeability for the water and gas to move out of the coal. As the coal is de-watered, methane gas begins to be produced with the water, and the gas is separated from the water at the surface. A coal bed may extend beneath a large area of a province, and because a single well only recovers the gas from a small part of the coal bed, many hundreds to thousands of wells may be required to recover the gas.

Assessment of Coal-Bed Gas

The U.S. Geological Survey National Oil and Gas Resource Assessment Team (1995) and Gautier and others (1996) defined and assessed the major coal-bed gas accumulations of the United States. The USGS has an ongoing effort to reassess the coal-bed gas resources of the United States. The Powder River Basin and Uinta-Piceance Basin provinces were reassessed most recently in 2001. In

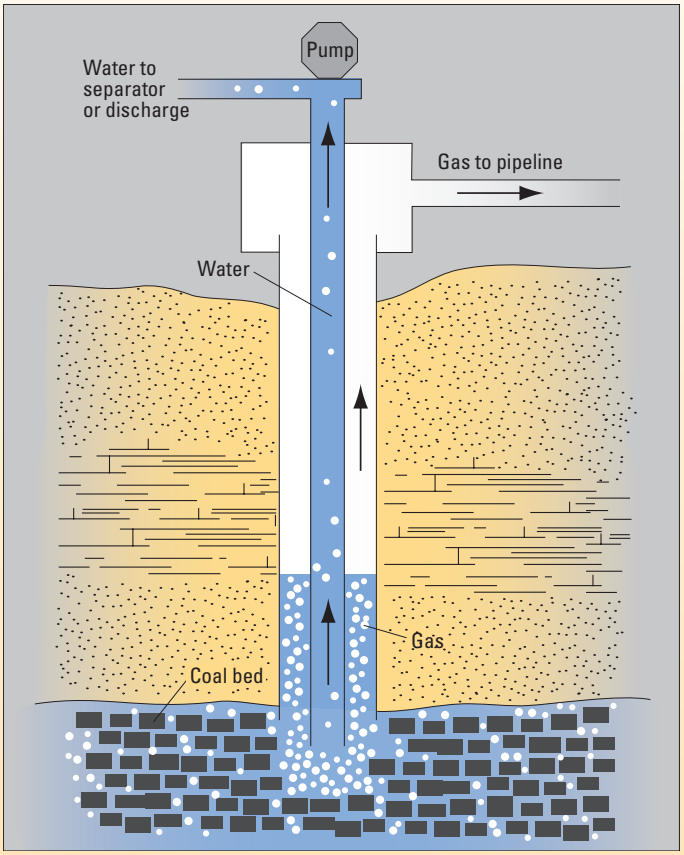

Figure 2. *Diagram illustrating the production of water (blue) and gas (white) from a coal bed (black) in a typical coal-bed methane well. Other rock types are shown in yellow. Coal-bed gas and water are separated at the surface.*

Table 1. *Coal-bed gas resources of selected Rocky Mountain provinces. The year signifies the date of the latest USGS assessment of each province.*

[TCFG, trillion cubic feet of gas. F95 represents a 95 percent chance of at least the amount of resource tabulated; F05 represents a 5 percent chance of at least the amount of resource tabulated]

Province	Coal-Bed Gas (TCFG)		
	F95	F05	Mean
Uinta-Piceance (2001)	**1.16**	**4.07**	**2.32**
San Juan (1995)	**5.76**	**9.67**	**7.53**
Powder River (2001)	**8.24**	**22.42**	**14.26**
Wind River (1995)	**0.22**	**0.72**	**0.43**
SW. Wyoming (1995)	**0.83**	**7.66**	**3.89**
Raton Basin (1995)	**1.39**	**2.23**	**1.78**
Total	**17.60**	**46.77**	**30.21**

the six geologic provinces assessed for this study, the assessment at present indicates that about 30 trillion cubic feet (TCF) of technically recoverable coal-bed gas (mean estimate) exists (**table 1**). The Powder River Basin is estimated to contain nearly half (14.2 TCF at the mean) of the undiscovered coal-bed gas resource. The San Juan Basin, where coal-bed gas has been produced for 20 years, is estimated to contain about 7.5 TCF of undiscovered coal-bed gas at the mean. In a national perspective, coal-bed gas production accounts for about 1.3 TCFG of the 18.5 TCFG of total natural gas produced annually in the U.S. Although the production of coal-bed gas is minor compared to natural gas production from conventional oil and gas fields, coal-bed gas production is important regionally, as in provinces of the Rocky Mountain region.

Summary

A significant portion of the undiscovered coal-bed gas resource of the U.S. occurs in Rocky Mountain provinces. If the demand for natural gas increases significantly through the next few decades, as expected, coal-bed gas will continue to be an important regional source of natural gas.

References Cited

Gautier, D.L., Dolton, G.L., Takahashi, K.I., and Varnes, K.L., 1996, 1995 National assessment of United States oil and gas resources—Results, methodology, and supporting data: U.S. Geological Survey Digital Data Series DDS-30, Version 2, one CD-ROM.

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For More Information on Coal-Bed Methane:

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