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Coalbed Methane Development

Coalbed Methane Development in the Intermountain West, Natural Resources Law Center, University of Colorado, August 13, 2003 summary (CD-ROM in pocket at Tab 8)
What is Coalbed Methane?

Coalbed methane (CBM) is a form of natural gas that is trapped within the internal surfaces of coal seams and held in place by hydraulic pressure. When wells are drilled to extract the water holding the gas in place, the methane eventually flows through fractures to the well and is captured. CBM is typically then injected into natural gas pipelines and is ready for use. Most coals contain methane, but it cannot be economically extracted unless there are open fractures that provide the pathway for the desorbed gas to flow to the well.

Classified as an unconventional source of natural gas, CBM is of growing importance as a domestic source of natural gas at a time when demand is rapidly increasing and output from some conventional sources has peaked. Since natural gas is the cleanest burning fossil fuel and virtually all of the gas used in the United States is supplied either domestically or from Canada, it contributes to national energy security. CBM is a plentiful, clean burning natural resource but environmental impacts during production are serious, and legal and political challenges are slowing and in some places prohibiting development because of conflicts over the adverse impacts of CBM development.

CBM was first noticed as a problem in coal mining, when fires or explosions of methane gas threatened miners. To reduce the risk of explosions, coalmine methane has been vented during mining operations. Some companies began capturing coalbed methane as a valuable resource and later, as attention came to be focused on methane as a potent greenhouse gas, coalmine methane production has been pursued as a way to help reduce the threat of climate change.

In 1980, Congress enacted a tax credit to encourage domestic production from unconventional sources, including CBM. Referred to as the Section 29 tax credit (section 29 of the 1980 Crude Oil Windfall Profit Tax Act), the provision has two limits: the gas must be sold to an unrelated party, and the credit only applies to wells placed in service before Dec 31, 1992. The tax credit, worth $3 barrel of oil or Btu equivalent, expired on December 31, 2000 and the tax credit was modified and extended in both the House and Senate energy bills that the two chambers passed in 2001 and 2002.

As shown in the following figures, CBM differs from conventional natural gas development in several ways. Before CBM can be produced in significant quantities, water must be pumped out and disposed of. CBM wells are typically shallow, less than 4,000 feet and sometimes even much less shallow, and drilling costs are lower, on average, than for conventional natural gas wells. The figure of a hypothetical CBM well illustrates the kind of infrastructure usually involved in the extraction of the methane and how CBM wells might be situated near ground water aquifers. Since CBM wells generally produce gas at lower rates than conventional gas wells, the cost of water disposal in CBM development is significant relative to that of conventional development.
CBM versus conventional natural gas development

**Figure 4** Source: William T. Brown, NRLC coalbed methane conference, April 4–5, 2002

Infrastructure typically involved in CBM development
CBM has been produced in commercial quantities since 1981. Production grew rapidly from a few dozen wells in the 1980s to nearly 6,000 wells producing 1.5 billion cubic feet by 1992. Production skyrocketed in the 1990s; by 2000, 14,000 wells produced 1.5 trillion cubic feet (Tcf) of gas, representing seven percent of the total gas production in the United States. The following maps and charts illustrate the location of major CBM basins in the United States and the Rocky Mountains in particular, and compare the characteristics of CBM “plays” in the Intermountain West. The bar chart demonstrates the rapid growth in CBM production in the San Juan basin of Colorado and New Mexico. The cross section of drilling in the Hogback Mountain in Colorado illustrates CBM development in that region. The map of the San Juan basin shows the level of drilling in the most mature CBM basin in the West.
Characteristics of CBM basins

### Coalbed Methane Play Characteristics

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### CBM production from the San Juan Basin

![Bar chart showing CBM production from the San Juan Basin from 1988 to 2001. The chart includes data for Colorado and New Mexico.]
Cross section through the Hogback Mountains along Pine River, La Plata County, Colorado Fruitland Formation and CBM drilling

Note: vertical scale is exaggerated five times relative to horizontal scale
Map of the San Juan basin, showing towns, roads, and county and state lines

Red dots represent the 25,000 conventional oil and gas wells drilled through 1995. Black dots are coalbed methane wells drilled during the same time period.
The Costs and Benefits of CBM Development

CBM is a growing component of the natural gas that is produced in the United States each year. Demand for natural gas is expanding rapidly, particularly for electricity production, because it is a secure, domestic source of energy and is the cleanest burning fossil fuel. The U.S. uses about 23 trillion cubic feet of natural gas/year, and CBM provides about 7% of total U.S. production. Demand for natural gas is growing at about 1 trillion cubic feet/year.

CBM is a particularly valuable economic resource in the Western United States and is an important source of income and jobs to westerners and revenue to local, state, and national governments. Depending on state law, local governments may or may not benefit directly from royalties or severance taxes derived from development, but may receive property tax revenue.

• CBM and other energy sources are a major revenue source for Wyoming; in 1999, the state’s budget was $200 million in the red; when prices rose in 2000, it had a $700 million surplus.

• LaPlata County, Colorado received 43% of its property tax revenues from the CBM industry in 2000.

• New Mexico receives 5-6% of its total general fund revenues from taxes on natural gas.

• The Southern Ute Indian Tribe has, primarily as a result of CBM development during the past decade, seen its net worth increase from $39 million in 1989 to $1.2 billion in 2002.

While CBM development has provided important economic benefits to many communities in the West, it has nevertheless been quite controversial. CBM development may result in significant impacts on communities and their environment, property values, and lifestyle. Environmental impacts associated with CBM development include:

• construction of roads, drill pads, water disposal sites and related facilities;

• noise from pumps, compressors, and traffic that disturb residents and wildlife;

• air pollution from operations, traffic, and associated development;

• disruption of areas that were previously isolated from development or valued for undisturbed vistas and solitude;

• discharged water that may reduce water quality in rivers and streams;

• reduced volume of underground aquifers and declining quality of drinking water supplies.

Although such impacts also occur with other forms of energy extraction, a unique challenge posed by CBM development is the speed in which change is occurring. Parties are forced to deal with issues of produced water, conflicts between landowners and those who lease mineral rights,
impacts of development on communities, demands for governmental and regulatory services, and other issues in a very compact time frame.

While there are many similarities in the challenges facing CBM development throughout the West, each basin is a unique mix of resources, water quality and quantity, existing development, competing land uses and designations, government requirements, and other factors. A number of legal issues surround CBM development and the way in which these issues are addressed will shape the future of development. Several have been particularly important, but many others could be added to this list.

First, given the aridity of the West, minimizing the impact of CBM development on water quality and quantity is a tremendous challenge. Large quantities of water are produced, and disposal of the water includes surface discharge, containment, treatment, and reinjection, depending on the quality of the water.

First, CBM produced water quality varies greatly across basins. In the Powder River, Wyoming basin, for example, the water is generally of high quality, and has been used to water cattle and crops and to recharge shallow aquifers. But more water is produced than can be used by cattle and sheep, and because of the high salinity of the water, although it is clean enough to drink, it reacts poorly with the soils in the area and can’t be use for agriculture. State water law governs CBM produced water, and different states have taken different approaches. In Colorado, for instance, CBM produced water is considered exploration and production waste and producers are not required to show a beneficial use or to obtain a withdrawal permit. In contrast, CBM produced water is defined as a beneficial use in Wyoming and applications for withdrawal granted as a matter of purpose. The future of CBM will, at least in part, depend on the ability of companies and state and local governments to find ways to protect water quality and minimize the waste of increasingly scarce water.

Second, some argue that agencies lack the finances and staff to meet all the demands on them for expeditious processing of applications, timely and comprehensive assessment of environmental impacts, monitoring and enforcement of agreements, and long-term planning. The Department of Interior’s Board of Land Appeals held in April 2002 that the BLM did not conduct adequate pre-lease assessment for three CBM wells in the Powder River. While that decision was overturned by a Federal District Court, other challenges to CBM leases issued by the BLM are pending. EPA Region 8 officials gave the BLM’s draft EIS for the Powder River Basin in Montana and Wyoming released in February 2002 the lowest possible ranking it gives because of inadequate analyses. Future CBM development depends on the ability of the BLM to assess environmental risks and ensure that energy extraction is balanced with conservation values.

Third, as is true in general throughout the West, governance of CBM and other natural resources is fragmented, overlapping, and complex. Federal agencies, tribes, counties, and states all share jurisdiction over CBM development. Of particular importance is the competition between state oil and gas commissions that have responsibility for regulating drilling with counties that have some regulatory authority over land use and development impacts. In Colorado, for example, 11 counties and 15 municipalities have issued rules governing CBM development. LaPlata County has issued noise and location regulations and rules governing issues such as surface owner
control over drilling location; Delta and Gunnison counties placed a nine month moratoriums on
development in 2002. In August 2002: Gallatin County Montana Commissioners, under
authority of a county zoning ordinance, created an emergency zoning district for the Bozeman
Pass area and imposed a 1 year moratorium on CBM wells. State oil and gas commissioners
have enjoyed broad powers over CBM development and clash with local officials who claim
authority over impacts of extraction on communities, and a number of lawsuits between energy
companies, cities and counties and the state oil and gas commission have been filed that cloud
the future of development.

A fourth and related issue of governance is controversy surrounding the composition of oil and
gas commissions. State “conservation statutes” created oil and gas commissions and boards to
regulate well drilling and play a key role in determining how CBM development occurs. These
laws emphasize the efficient development of resources, with minimal waste, and that has been
the traditional focus of commissions. Critics of current laws argue that they were written
decades before CBM began to be extracted and laws should be updated to reflect the differences
between CBM and conventional gas such as the large volumes of produced water.

Fifth, another source of conflict is differences between local landowners and energy companies
over the impacts of development on land use, noise, and property values. In many areas, CBM
development occurs on split estates, where surface owners do not control the mineral rights
below their land. There is great variety in company practices concerning surface use agreements
and consultation with landowners. Some companies have been able to develop cordial relations
and surface owners have been happy with agreements, but many landowner-company
relationships have been mired in conflict. Landowners have complained that CBM development
clashes in fundamental ways with their efforts to protect their lands and make a living. As the
density of wells has increased, consequences of extraction have naturally been magnified.
Landowners fear impacts from development on adjacent lands over which they have no control,
adverse impacts on land values as energy extraction expands, conflicts over the location and
extent of energy infrastructure, the inadequacy of remediation plans and bonding, and the
primacy given to mineral rights.

Sixth, CBM development may conflict with coal mining. At one level, capturing CBM before
coal mining occurs reduces the threat of methane explosions. It also provides the added benefit
of capturing methane, a potent greenhouse gas, before it is released into the atmosphere. But
CBM and coal companies sometimes disagree over how and when extraction of these resources
is to occur.

Finally, in some areas, a balance between energy extraction and other land uses is possible.
CBM may only add a modest increment to roads, noise, and other impacts produced from energy
development. In other areas, the choice is between development or preservation of wilderness
and roadless areas. Colorado’s HD mountains, a target for CBM development and a roadless
area environmental groups are trying to preserve, and Montana’s Rocky Mountain Front, where
380,000 acres of forests were protected from any development in 1997 for 10-15 years, are
examples of where proponents of wild lands have argued that development and preservation are
mutually exclusive.