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Day 3: Friday, August 6, 2004: CBM and Unconventional Gas Development

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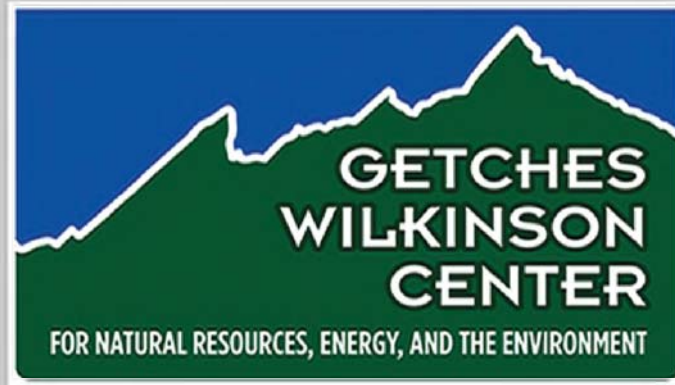
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Day 3: Friday, August 6, 2004: CBM and Unconventional Gas Development, in ENERGY FIELD TOUR 2004 (Natural Res. Law Ctr., Univ. of Colo. Sch. of Law 2004).

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CBM and Unconventional Gas Development

COALBED METHANE DEVELOPMENT IN THE INTERMOUNTAIN WEST:

PRIMER

Coalbed methane is one of the most important and valuable natural resources in the Western United States. The natural gas that results from CBM development is the cleanest burning fossil fuel, and the extensive domestic supply makes it a central element of the national goal of a secure supply of energy. Demand for natural gas will continue to grow and CBM will play an increasingly larger role in meeting that demand. CBM production has expanded tremendously over the past decade, and the rapidity with which development has expanded has resulted in stresses and tension in affected communities. Development of this important energy resource must be balanced with a number of other important goals of protecting water, land, and other resources in the West. The primary purposes of the report are to: provide an overview of where CBM resources are located and how they are extracted, provide some background for understanding the issues surrounding CBM development and the role that it plays in the nation's energy policy, review the public policies affecting the production of CBM, assess the major issues that have arisen in the West concerning CBM development and its impact on local communities and other natural resources, examine lessons that might be learned from different basins and that might be applied elsewhere, and suggest some basic principles and practical steps that might serve to address some of the conflicts that have arisen in CBM basins and that might be applied to shape future development in other basins.

GARY BRYNER, *Natural Resources Law Center, University of Colorado School of Law*

OVERVIEW

Coalbed methane (CBM) is a form of natural gas that is trapped within coal seams and held in place by hydraulic pressure. The gas is adsorbed to the internal surfaces of the coal; when wells are drilled that extract the water holding the gas in place, the methane eventually flows through fractures to the well and is captured for use. Coalbed methane extraction began as an effort to reduce the threat of methane explosions in coal mines, and has been produced in commercial quantities since 1981. CBM development in the United States has grown rapidly from a few dozen wells in the 1980s to some 14,000 wells in 2000. In 1989, the United States produced 91 billion cubic feet of coalbed methane; ten years later, the total produced had grown to nearly 1.3 trillion cubic feet, representing seven percent of the total natural gas production in the United States.¹

Some 56 percent of the total CBM production in the United States has come from the Rocky Mountains. The San Juan basin in Southern Colorado/Northern New Mexico has been the major source of CBM. Development began in 1988 and rapidly expanded by the end of the 1990s. Production has now begun to decline and companies are trying to maintain output by more intensive

development. The Powder River Basin in Northeast Wyoming is the fastest growing CBM play. In 1997, the basin produced 54 million cubic feet of gas/day from 360 wells. Four years later, 5,854 wells were producing 656 million cubic feet/day. CBM resources are also being developed in the Uinta Basin in Eastern Utah, the Raton Basin in south-central Colorado, and the Piceance Basin in northwest Colorado, and major expansions of coalbed development are expected in Montana, the Green River basin in Wyoming, and perhaps other areas in the West. Colorado, New Mexico, Utah, and Wyoming may contain as much as 47 trillion cubic feet of coalbed methane, one third of the total estimated recoverable amount in the United States. According to the US Geological Survey, the United States may contain more than 700 trillion cubic feet (Tcf) of coalbed methane in place, with more than 100 Tcf economically recoverable with existing technology.²

The tremendous and rapid growth in coalbed methane development has posed daunting challenges for the communities in which it has occurred. The construction of new roads, pipelines, compressors, and other facilities have transformed landscapes. Air and noise pollu-

tion have become sources of conflict. Some land owners possess only surface rights; government agencies have leased the subsurface mineral rights to companies, and those rights clash with the interests of some ranchers, farmers, homeowners, and others who seek different kinds of land uses. Just as difficult as land use issues have been conflicts over the water produced from CBM development. CBM development may affect underground water quantity and contaminate aquifers, underground water supply may be diminished as dewatering occurs, groundwater may be contaminated by mineral-laden discharged water, and local ecosystems may be adversely affected by the surface release of large quantities of water. Produced water may also be a valuable source of fresh water in arid regions.

CBM development is a major issue facing federal land agencies, state governments, county commissions, energy companies, and citizens throughout the Intermountain West. Another major challenge is that of governance—how to coordinate the efforts of federal, tribal, state, and local governments that have varying interests and responsibilities for regulating CBM production.

This primer seeks to contribute to public discussion and policy making for CBM development by providing a non-technical, accessible, reference tool that explains what CBM is, examines and compares the experience of CBM development throughout the mountain West, explores options for resolving conflicts and improving policies that govern CBM development, and identifies lessons that can be learned from different areas that might help other regions better deal with the challenges posed by development. The sections of the primer focus on four major questions.

First, what is CBM, where is it located, and how is it developed? This section provides background and context for framing the issues surrounding CBM development, including the nature of CBM, its role in meeting national energy needs; the location of major CBM resources in the Interior West, including the relationship of reserves to private and public lands, including split estates and sensitive public lands, such as wilderness study areas, National Forest roadless areas, and national monuments; and the role of CBM in national energy policy.

Second, what are the problems, conflicts, and challenges associated with CBM development? Section two examines the environmental and other impacts associated

with CBM development, particularly the impacts of production and distribution of CBM on local landscapes and residents and the conflicts between competing land uses and users, and the impact of CBM extraction on water quality and quantity.

Third, how is CBM development regulated? This section examines current public policies governing CBM development, including Federal clean water, natural gas, and other laws and regulations; Federal tax incentives and its implications for CBM development; state regulatory programs; and local land use, zoning, and other regulatory programs in the Intermountain states where CBM development is occurring.

Fourth, how can conflicts surrounding CBM development be reduced? This section focuses on suggestions that have been made to minimize the environmental and other impacts of CBM extraction and actions that communities, governments, and companies might take to reduce conflicts over land use and water impacts from development.

I. WHAT IS CBM, WHERE IS IT LOCATED, AND HOW IS IT DEVELOPED?

WHAT IS COALBED METHANE?

Coalbed methane is a form of natural gas that is trapped within coal seams. Coalbed gas is primarily made up of methane (typically 95 percent), with varying amounts of heavier fractions and, in some cases, traces of carbon dioxide. Coals have a tremendous amount of surface area and can hold massive quantities of methane. Since coalbeds have large internal surfaces, they can store six to seven times more gas than the equivalent volume of rock in a conventional gas reservoir.³ Coal varies considerably in terms of its chemical composition, its permeability, and other characteristics. Some kinds of organic matter are more suited to produce CBM than are others. Permeability is a key characteristic, since the coalbed must allow the gas to move once the water pressure is reduced. The gas in higher rank coals is produced as heat and pressure transform organic material in the coal; gas in low rank coals results from the decomposition of organic matter by bacteria. Figure 1 provides a simplified view of how CBM is formed.

Coalbeds are both the source of the gas that is generated and the storage reservoir once it is produced.⁴ Gas

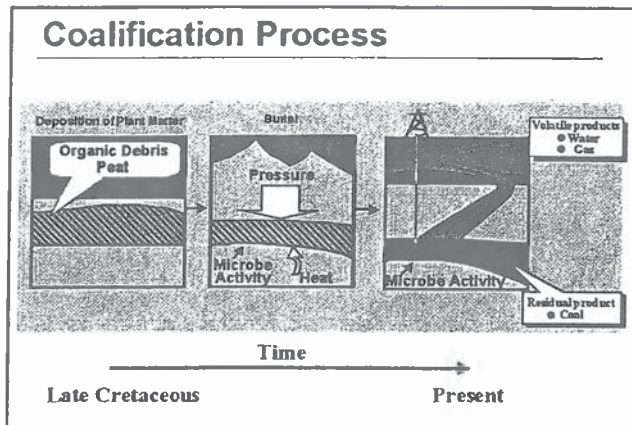


FIGURE 1 Source: William T. Brown, NRLC coalbed methane conference, April 4-5, 2002.

molecules adhere to the surface of the coal. Most of the coalbed methane is stored within the molecular structure of the coal; some is stored in the fractures or cleats of the coal or dissolved in the water trapped in the fractures. Coals can generally generate more gas than they can absorb and store. Basins that contain 500–600 standard cubic feet (SCF) of methane per ton are considered to be “very favorable for commercial coalbed gas production,” as long as there is sufficient reservoir permeability and rate of desorption. Some coals have generated more than 8,000 SCF of methane per ton of coal.⁵ The most pro-

ductive coalbeds are highly permeable, saturated with gas, and fractured.⁶

Coalbed methane is produced either through chemical reactions or bacterial action. Chemical action occurs over time as heat and pressure are applied to coal in a sedimentary basin. Bacteria that obtain nutrition from coal produce methane as a by-product.⁷ Methane attaches to the surface areas of coal and throughout fractures, and is held in place by water pressure. When the water is released, the gas flows through the fractures into a well bore or migrates to the surface. Figure 2 illustrates the different kinds of coal, the production of coalbed methane, and the kinds of coal found in the major CBM basins in the West.

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. Methane remains in a coalbed as long as the water table is higher than the coal.⁸ These cleats and fractures are typically saturated with water, and the coal must be dewatered (usually pumped out) before the gas will flow.⁹ Some coals never produce methane if they cannot be dewatered economically. Some coal beds may produce gas but be too deep to feasibility drill to release the gas. CBM wells are typically no more than 5000’ in depth, although some deeper wells have been drilled to extract the gas.

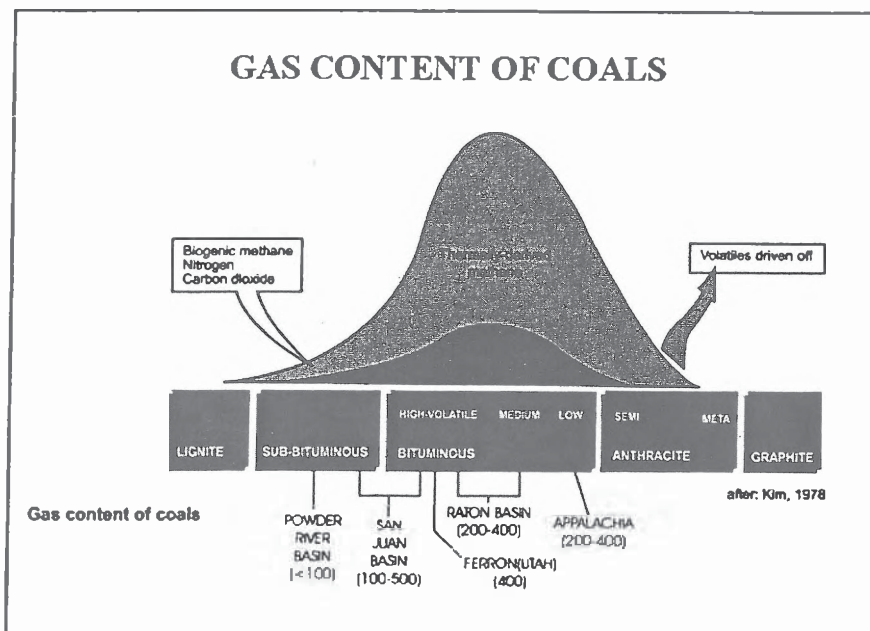


FIGURE 2 Source: William T. Brown, NRLC coalbed methane conference, April 4-5, 2002.

The deeper the coalbed, the less the volume of water in the fractures, but the more saline it becomes. The volume of gas typically increases with coal rank, how far underground the coalbed is located, and the reservoir pressure.¹⁰

As the fracture system produces water, the adsorptive capacity of the coals is exceeded, pressure falls, and the gas trapped in the coal matrix begins to desorb and move to the empty spaces in the fracture system. The gas remains stored in nearby non-coal reservoirs until it is extracted.¹¹ Drilling dewateres the coal and accelerates the desorption process. Drilling initially produces water primarily; gas production eventually increases and water

production declines. Some wells do not produce any water and begin producing gas immediately, depending on the nature of the fracture system. Once the gas is released, it is free of sulfur and usually of sufficient quality to be directly pumped into pipelines.¹²

WHAT ROLE DOES CBM PLAY IN U.S. ENERGY POLICY?

Oil and natural gas are the dominant fuels in the U.S. energy supply, providing 62 percent of the total energy supply.¹³ Natural gas provides 24 percent of the energy used in the United States and 27 percent of total domestic production.¹⁴ The United States produces 85% of the gas it uses and imports the rest from Canada. Natural gas is used to produce 16 percent of the electricity generated in the United States, and the fastest growing use of natural gas is to produce electricity.¹⁵ It is also used for space and

water heating, cooking, fueling industrial processes, vehicle fuel, and other purposes. Natural gas prices have fluctuated considerably in recent years, affecting incentives to explore for new reserves. Prices were stable throughout the late 1980s and 1990s, and low prices in 1998 and 1999 resulted in cutbacks in exploration. In 2000, prices quadrupled, reaching an all-time high of \$9.98 per million Btus in December 2000, and exploratory activity expanded accordingly.¹⁶ Figure 3 charts the growth in natural gas and other fuels in the United States.

The average household uses about 50,000 cubic feet of natural gas each year. One trillion (1,000,000,000,000) cubic feet of natural gas is enough to meet residential needs for about 75 days. The balance of the natural gas used each year fuels electricity production and industrial and commercial operations. Demand for natural gas is currently growing at about 1 Tcf per year.¹⁷ The Bush administration's national energy policy projects that the United States will need about 50 percent more natural gas to meet demand in 2020 and that demand will eventually outstrip domestic supply, requiring increased imports of natural gas from Canada and elsewhere.¹⁸ The U.S. Department of Energy (DOE) on which the national energy policy projections is based suggests that natural gas use will increase between 2000 and 2020 from 22.8 to 34.7 Trillion cubic feet (Tcf); another estimate suggested consumption will climb to 31 Tcf by 2015.¹⁹ Others project an even more rapid increase in consumption. Many executives of natural gas companies believe that by 2007 the market for gas will reach 30 Tcf.²⁰

Domestic production of natural gas is expected to increase from 19.3 Tcf in 2000 to 29.0 Tcf in 2020, resulting in increased natural gas imports. According to a DOE report,

the most significant long-term challenge relating to natural gas is whether adequate supplies can be provided to meet sharply increased projected demand at reasonable prices. If supplies are not adequate, the high natural gas prices experienced over the past year could become a continuing problem, with consequent impacts on electricity prices, home heating bills, and the cost of industrial production. . . . To meet this long-term challenge, the United States not only needs to boost production, but also must ensure that the natural gas pipeline network is expanded to the extent necessary.²¹

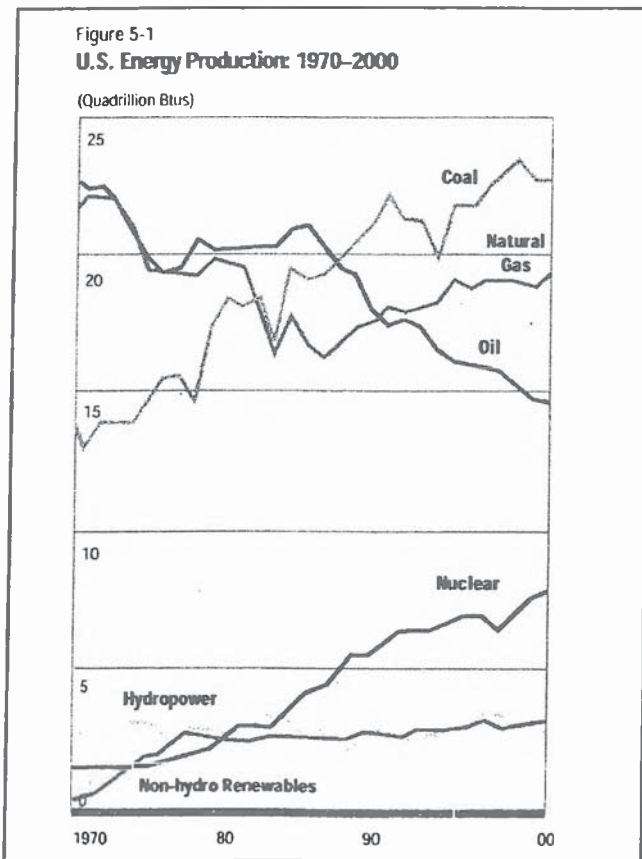


FIGURE 3 Source: National Energy Policy Development Group, *National Energy Policy*, 5-1.

Natural gas, including coalbed methane, and other domestically-produced energy sources play a major role in the Bush administration's energy policy. The administration's National Energy Policy and other policy statements all emphasize expanding U.S. sources of fossil fuels. The report includes 105 specific recommendations, including forty-two suggestions for policies to promote conservation, efficiency, and renewable energy sources and thirty-five that deal with expanding supplies of fossil fuels. The report, however, clearly emphasizes and gives priority to expanding the supply of traditional energy sources by opening new lands for exploration, streamlining the permitting process, easing regulatory requirements, and enlarging the nation's energy infrastructure. It summarizes the energy challenge this way:

Even with improved efficiency, the United States will need more energy supply. . . . The shortfall between projected energy supply and demand in 2020 is nearly 50 percent. That shortfall can be made up in only three ways: import more energy; improve energy efficiency even more than expected; and increase domestic energy supply.²²

The Bush national energy plan argues that in the near term, increase in natural gas production will come from "unconventional sources" in the Rocky Mountain and other regions, and includes a number of recommendations that affect natural gas and CBM development. The plan:²³

- Calls on federal agencies to promote enhanced recovery of oil and gas from existing wells, encourage oil and gas technology through public-private partnerships, reduce impediments to federal oil and gas leases, and reduce royalties and create other financial incentives to encourage environmentally sound offshore oil and gas development.
- Recommends additional oil and gas development in the National Petroleum Reserve in Alaska and the opening of an area (called section 1002) in the Arctic National Wildlife Refuge for exploration.
- Calls for streamlining the regulatory process, providing "greater regulatory certainty" for power plant operators, and reducing the time and cost involved in licensing hydroelectric power plants.
- Urges continued development of clean coal technology through a permanent extension of the research and

development tax credit and investing \$2 billion in research and development over ten years.

- Suggests the President issue an executive order to "rationalize permitting for energy production in an environmentally sound manner" and federal agencies "expedite permits and other federal actions necessary for energy-related project approvals."²⁴
- Suggests the Interior Department reassess decisions it has made to withdraw certain lands from energy exploration and development, and to simplify its leasing policy so that more oil and natural gas are produced, including in the Outer Continental Shelf.
- Urges Congress to resolve the legal status of eleven million acres of BLM lands and 1.8 million acres managed by the Fish and Wildlife Service that have been designated by the agencies as wilderness study areas, and to determine which lands could be opened up to energy development.

The Bush administration's national energy policy, the energy legislation currently before Congress (passed by the House in 2001 and and Senate in the spring of 2002), and the importance of energy in the American economy and the foreign policy consequences of our reliance on imported oil all raise important and difficult policy questions that have profound implications for the American West. Energy development clashes with other values of preservation of wild lands, protection of ecosystems and wildlife habitat, and recreational and aesthetic interests, and conflicts are inevitable as people throughout the West have greatly differing views about what should happen on public and private lands. Coalbed methane is no different from that of other natural resources, in that respect, but the rapid pace of development in areas has compressed and magnified these conflicts.

HOW IS CBM PRODUCED?

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.

There have been some legal disputes over ownership of coalmine and coalbed methane. In *Amoco Production Company v Southern Ute Indian Tribe*, 526 U.S. 865 (1999), the Supreme Court ruled that CBM is not included in the meaning of coal; CBM is part of the gas estate not the coal estate. The Court indicated that coal companies can vent the gas while mining, but that the right to vent the gas does not imply ownership of it. The ruling is not binding on state law and private contracts. Oil and gas rights, including coalbed methane rights, are generally more senior than coal mining rights, and CBM companies may seek injunctions to ensure mining operations do not adversely affect methane extraction. In some cases, coal companies have bought out CBM leases so mining can continue unobstructed. In other cases, they complain that their operations are being held up unfairly by CBM owners who buy up gas rights and then sell them at above market prices.²⁵

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 is modified and extended in both the House and Senate energy bills that the two chambers passed in 2001 and 2002, respectively, and are the subject of a conference committee convened in May 2002.

CBM has been produced in commercial quantities since 1981.²⁶ CBM development in the United States grew rapidly from a few dozen wells in the 1980s to nearly 6,000 wells producing 1.5 Bcf by 1992. Despite the tax credit no longer being available for new wells after that time, production skyrocketed; the Gas Research Technology Institute reported in 2000 that 14,000 wells produced 1.5 Tcf of gas, representing seven percent of the total gas production in the United States.²⁷ In 1989, the United States produced 91 Bcf of coalbed methane. Ten years later, the total produced had grown to nearly 1.3 Tcf.²⁸ Figures for CBM production in the state of Colorado illustrate the rapid growth of development in the state. In 1990, CBM wells in the state produced 27 Bcf of methane; by 1995, they produced 240 Bcf; and

their output steadily increased throughout the rest of the decade, reaching 417 Bcf in 2000.²⁹

HOW DOES CBM COMPARE WITH OTHER FORMS OF NATURAL GAS?

Methane is a major component of natural gas, and coalbed methane can be used in the same way as conventional gas. Conventional gas is formed in shale and limestone formations; pressure and temperature combine to transform organic matter into hydrocarbons. The gas migrates upward until trapped by a geologic fault or fold and rests in this reservoir rock until it is discovered, drilled, and extracted. The location and extent of conventional gas typically requires exploratory drilling since the location of reservoirs is not apparent from the surface.³⁰

Coalbed methane is sometimes compared with another unconventional gas—"tight" gas—that is found at much deeper depths and in low permeability sandstone. Companies must use hydraulic fracturing, where they inject a fluid into a rock formation that causes cracking, in order to release gas from tight Cretaceous sands.³¹ Fracturing is also used in some CBM plays to increase production, as explained below.

Coalbed methane differs from other gas reservoirs in several ways:³²

- CBM is stored in an adsorbed state on the surface of the coal;
- Before CBM can be produced in significant quantities, the average reservoir pressure must be reduced; and
- Water is usually present in the reservoir and is normally co-produced with the CBM.³³

The competitiveness of coalbed methane with conventional natural gas is a function of four primary variables: the rates of gas production, the production costs, markets, and economies of scale.³⁴

- The rate and volume of gas production from CBM wells vary considerably. Low gas producers yield about 50 thousand cubic feet per day; high yield wells—"sweet spots" in basins produce 5 million cubic feet/day.
- Since coalbed methane wells are typically shallow (less than 4,000 feet) and on land, well costs are low to moderate in comparison with conventional natural gas.

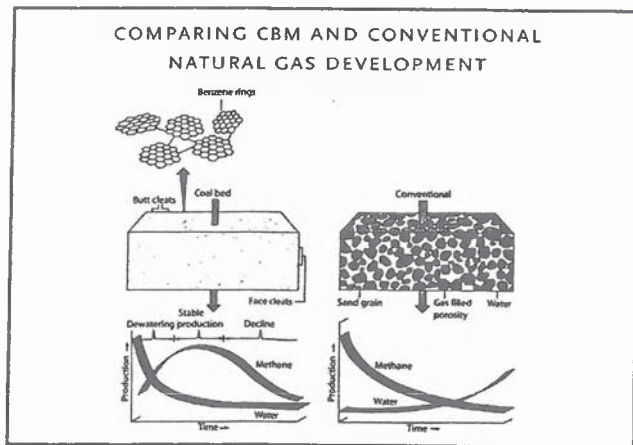


FIGURE 4 Source: William T. Brown, NRLC coalbed methane conference, April 4-5, 2002

- The distance between the producing wells and consumers also shapes the economics of CBM development. The market price, minus transportation and compression costs, equal the wellhead net back price. In some areas, the transportation costs may be as great as the wellhead net back price.
- CBM development needs to reach a critical volume of production in order to be economically viable. Costs include gas treatment, compression, transportation, geologic and engineering services, and field operations. The minimum threshold for a viable project varies depends on a variety of factors, but one estimate is that a new, remote basin requires at least 400 wells or 200 billion cubic feet of production to be viable.

In conventional wells, gas production peaks early and then declines over time, and water production eventually increases, the opposite of CBM extraction. The figure below depicts the stages in production of both kinds of wells. For CBM wells, large quantities of water are produced during the initial phase, then water volume declines as the pressure of the reservoir falls. The actual shape of the production curve is a function of production techniques (well spacing, reservoir permeability, reservoir pressure, and water saturation), and varies considerably by reservoir. In some basins, peak gas production occurs in three or more years. The length of time required to produce peak gas production increases in low permeability reservoirs and increased well density.³⁵ 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.

Further, CBM development cannot simply be shut off when prices fall, since the coal may refill with water: "you don't start and stop wells in response to short-term price swings."³⁶ Figure 4 compares CBM and conventional natural gas development and the differences in the volumes of water produced over time. One of the most important characteristics of CBM development is the relatively short span of time wells produce gas. Wells typically produce gas for 7-10 years, and basins may be relatively quickly pumped and then abandoned.

WHERE ARE CBM RESOURCES LOCATED?

Development of CBM resources has been concentrated in the West, South, and, to a lesser extent, the Midwest. Figure 5 is a map that identifies the major CBM plays in the United States.

Some 56 percent of the total CBM production in the United States has come from the Rocky Mountains. Colorado, New Mexico, Utah, and Wyoming may contain as much as 47 trillion cubic feet of coalbed methane, one third to one-half of the total estimated recoverable reserves in the United States. The San Juan basin in southern Colorado/northern New Mexico has been the major source of CBM. Development began in 1988 and rapidly expanded by the end of the 1990s. Production has now leveled off and companies are trying to maintain

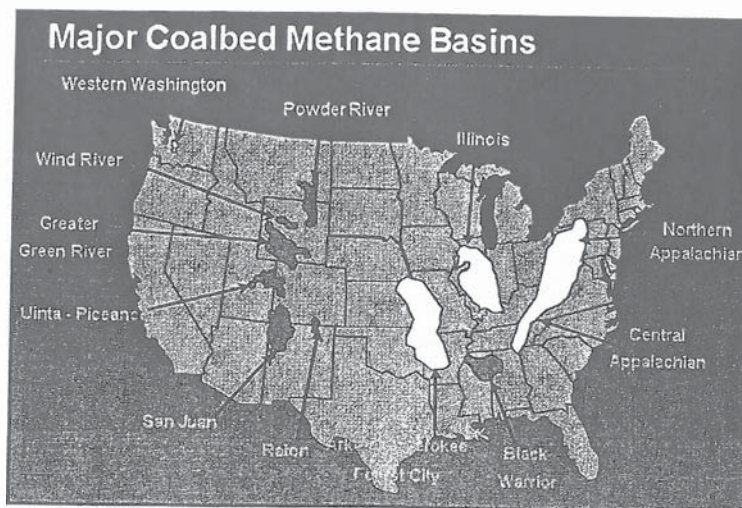


FIGURE 5 Source: Steve de Albuquerque, NRLC coalbed methane conference, April 4-5, 2002

output by more intensive development. The Powder River Basin in northwest Wyoming is the area of CBM production that is growing the most rapidly. In 1997, the basin produced 54 million cubic feet of gas/day from 360 wells. Four years later, 5,854 wells were producing 656 million cubic feet/day. CBM resources are also being developed in the Uinta Basin in eastern Utah, the Raton Basin in south-central Colorado, and the Piceance Basin in northwest Colorado, and major expansions of coalbed development are expected in Montana, the Green River basin in Wyoming, and perhaps other areas in the West.

The Potential Gas Committee estimated in 1991 that the four states contained a "most likely recoverable resource" ("probable, possible, and speculative") of

coalbed methane of 47.2 Tcf. That amount represents about one-third of the estimated 145 Tcf in the United States.³⁷ In addition to those reserves, the Gas Research Institute estimates that between 87 and 110 Tcf may exist but is yet undiscovered. Another 1,000 Tcf of methane may also be located in Alaska.³⁸

A more recent estimate looked at national reserves. The National Petroleum Council reported in 1999 that the United States' "natural resource base" in the lower 48 states was 1,466 trillion cubic feet; an additional 25 Tcf may be located in the Prudhoe Bay area in Alaska. According to Matt Silverman, CBM resources in the Rocky Mountain states are as follows: About 7 Tcf of CBM has been produced; 11 Tcf are the proved reserves that remain, and another 42 Tcf are economically recoverable reserves. Finally, the total resource base may be some 536 Tcf.³⁹ Estimates vary considerably, based on differing assumptions and differences between discovered resources and those that are economically or technically extractable.

Figure 6 is a map of the major coal-bearing regions of the Rocky Mountain states; figures for the estimated coalbed gas-in-place, in Tcf, are indicated in parentheses.

HOW DO CBM BASINS COMPARE?

The major CBM basins in the West include the following:

- Colorado/New Mexico:
 - San Juan Basin (most mature basin 80% of U.S. production)
 - Raton Basin (production for several years)
 - Piceance Basin (potential development)
- Colorado/Utah
 - Piceance (emerging area of development)
 - Uinta Basin (production for several years)
- Wyoming/Montana
 - Powder River Basin (fastest growing area)
- Colorado/Wyoming
 - Green River Basin (potential development)
- There is also potential CBM development in the Denver Basin, Colorado, and in Alaska.

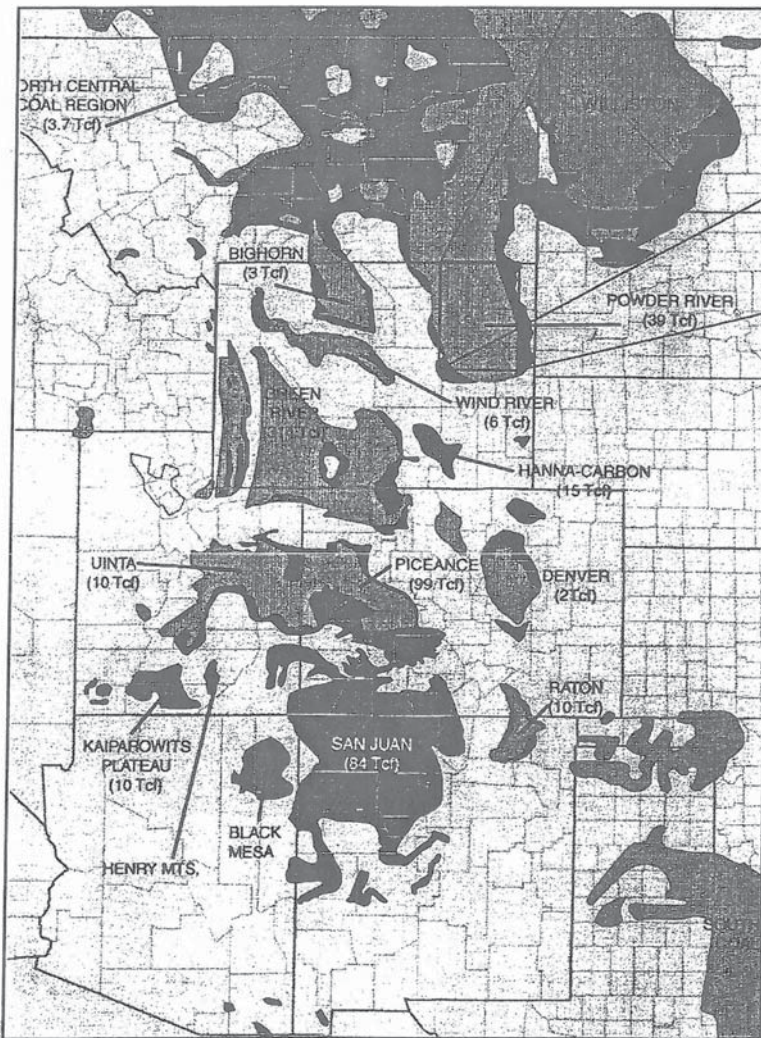


FIGURE 6 Coalbed methane basins of the Rocky Mountains
 Source: Matthew R. Silverman, NRLC conference, April 4-5, 2002

Each coalbed methane basin is unique. Each poses a different set of exploration and development challenges and produces a distinctive set of impacts on surrounding communities and ecosystems. Some basins have reached their peak in production while others are in the early stages of development. In some areas, the water that is produced is of high quality and ready to be used for a variety of human, agricultural, ranching, and other purposes; in other areas, water quality is poor and must be treated or re-injected. According to an engineer with Schlumberger-Holditch Reservoir Technologies, "The one thing coalbed methane plays in the U.S. have in common is that they are all different. You have to consider the

complete package of coal characteristics, regional geology, and infrastructure . . . you can't get locked into one mindset."⁴⁰ The economics of each basin also varies: some basins may not look profitable at first, but innovative technologies are developed that make development feasible. The Powder River Basin, for example, was originally believed to be unsuited for CBM development, but companies experimented with various production and extraction techniques until development became feasible. Table 1 summarizes the main characteristics of CBM basins in the United States.

Basin	States	Producing Wells (1996)	Cummulative CBM Prod. in mmcf (1981-1996)	typical Net Coal Thickness (ft)	Typical Gas Content (scf/ton)	Typical Well Spacing (acres)	Avg. Prod. (mcf/well)	Est. Finding Cost (\$/mcf)
San Juan	CO, NM	3,036	3,857	70	430	320	2,000	0.11
Black Warrior	AL, MS	2,739	728	25	350	80	100	.25
Central Appalachian	WV, VA, KY, TN	814	121	16	na	80	120	na
Piceance	CO	123	36	80	768	40	140	1.23
Powder River	WY, MT	193	17	75	30	80	250	0.25
Uinta	UT	72	14	24	400	160	690	0.25
Raton	CO, NM	59	8	35	300	160	300	0.18

Source: Karl Hart, "Coalbed Methane Trends," Hart Energy Publications, *PTTC Network News*, 2nd quarter, 2000.

TESTIMONY OF THE COLORADO OIL & GAS ASSOCIATION*
Ken Wonstolen, Senior Vice President & General Counsel

To the House Subcommittee on Energy & Mineral Resources
March 3, 2004

Environmental Issues Related to Increasing Natural Gas Production

Natural gas supplies approximately 23% of domestic energy consumption, including 19% of electrical generation. More than 50% of American households use natural gas for space and water heating. Natural gas is also an important feedstock in the chemical and fertilizer industries. The U.S. uses some 23 trillion cubic feet of natural gas annually, and consumption has grown 35% over the last decade. By 2015, the nation is projected to consume over 30 Tcf per year.¹

These new supplies of natural gas will increasingly come from the Intermountain West. The states of Montana, Wyoming, Utah, Colorado and New Mexico are estimated to have about 26% of the nation's gas reserves, and production over the last two decades has climbed 162%. Yet, most of the region's gas reserves are still in the ground. This contrasts with older, more developed gas supply regions such as the Gulf Coast and Midcontinent, where production has dropped from 5-20% over the past twenty years, and the majority of known reserves has already been produced.²

One of the keys to the Intermountain West's ability to meet the nation's growing appetite for natural gas will be development on federal lands. Federal ownership in the five major identified natural gas basins³ ranges from 38-72%, and some 36% (21.2 million acres) is set aside for national parks, monuments, wilderness areas or other special classifications.⁴

The remaining land areas in these basins, while nominally available for oil and gas leasing, present many access issues from an environmental and land use planning perspective. Under the Federal Land Management & Policy Act, the Bureau of Land Management is directed to prepare "Resource Management Plans" (RMP) incorporating the principles of "multiple use" and "sustained yield".⁵ Development or revision of an RMP is considered a major federal action significantly affecting the environment, and therefore requires preparation of an environmental impact statement (EIS).

** COGA wishes to express its gratitude to the Independent Petroleum Association of Mountain States; Laura Lindley, Esq. of the firm of Bjork Lindley Little, P.C.; and Duane Zavadil, Bill Barrett Corporation, for compiling and supplying much of the information summarized in this testimony.*

BLM is engaged in a process to update its entire land use planning base (over 160 plans) by 2012, and has identified a number of “time sensitive” plans related to energy development:

- **Roan Plateau (Colorado)** – 70,000 acre former Naval Oil Shale Reserve transferred from DOE to BLM for leasing by an act of Congress in 1997. May hold 5 Tcf of reserves, enough to heat all of Colorado’s homes (2.5 million) for a quarter century. Draft EIS scheduled for release in June 2003 is still on hold.
- **Powder River Basin plan revisions (Montana & Wyoming)** – amends Buffalo and Platte River RMP’s to authorize coalbed methane production; EIS Record of Decision issued April 30, 2003; lawsuits filed on May 1.
- **Farmington RMP revision (New Mexico)** – San Juan Basin is nation’s largest source of coalbed natural gas. San Juan Citizens Alliance and other groups filed suit 2/4/04 contesting EIS record of decision.
- **Price RMP revision (Utah)** – notice of EIS published November, 2001. Final EIS scheduled for summer of 2004 but draft EIS still uncompleted.
- **Vernal RMP revision (Utah)** – initiated in 2001 to combine Diamond Mountain and Book Cliffs RMP’s; scheduled for 2004 but no draft plan or EIS.
- **Jack Morrow Hills coordinated activity plan (Wyoming)** – Green River RMP, issued 1997, took seven years and deferred leasing decisions on 600,000 acres. Draft EIS released June 2000, but Secretary Babbitt required new process; supplemental Draft EIS issued 2/03; final EIS scheduled for 2004.
- **Pinedale RMP revision (Wyoming)** – highly prospective area; notice issued 2/25/02; 55,000 scoping comments received (mostly form postcards); EIS scheduled for 2004.
- **Great Divide/Rawlins RMP revision (Wyoming)** – significant new development, including Atlantic Rim coalbed methane potential; notice issued 2/25/02; EIS expected 2004.

As indicated, it is taking from three to seven years to accomplish these “time sensitive” plans, and most, if not all, will be litigated. Other opportunities exist to challenge energy development under these plans, once adopted. For instance, the Southern Utah Wilderness Alliance (SUWA) alleged that a proposed well location, road and pipeline right-of way were inconsistent with the Book Cliffs RMP because they were in the vicinity of a roadless area, even though, as the Interior Board of Land Appeals ruled, they were identified in the plan as available for leasing.⁶ This is an example of a challenge to an activity based on plan “conformance”. Challenges are also being made alleging that proposed oil and gas activity exceeds the “reasonably foreseeable development” projected in RMP’s. The IBLA has ruled that these scenarios are planning tools, not caps on the number of wells.⁷

The February BLM lease sale in Colorado saw challenges to parcels in the South Park⁸ and around Dinosaur National Monument.⁹ It is disingenuous for self-proclaimed environmental groups and “citizen alliances” to assert that the majority of federal lands in the Intermountain West are “available for leasing” when they file challenges or lawsuits against RMP’s, lease sales, drilling and seismic permits at every turn. Make no mistake, this effort to delay or reverse measures to permit oil and gas activity on the federal lands are well-financed and well-organized. The environmental obstructionist network has publicly labeled the Roan Plateau “Colorado’s ANWR”.

Region 8 of the Environmental Protection Agency is also contributing to delays in the planning process. Its *modus operandi* has been to wait until the last minute to drop in a letter raising “concerns”. This was especially notable with respect to the Powder River Basin plans, after EPA had declined to participate in the planning process itself.

This behavior has continued. Recently, EPA Region 8 wrote to the supervisors for the Medicine Bow/Routt National Forests and the Thunder Basin National Grassland regarding the *Big Porcupine Coal Bed Methane Project Environmental Assessment*. Region 8 asserted, at the end of a four year process, that additional water management analysis needed to be performed. This despite the existence of the Big Porcupine CBM Project Water Management Plan, and the necessity of obtaining Clean Water Act NPDES permits for actual water discharges. EPA also suggested additional air quality dispersion modeling – a lengthy and expensive proposition – despite the fact that comprehensive air quality analysis was conducted for the Powder River Basin EIS, and the Big Porcupine wells represent 0.5% (232) of the projected total PRB wells (39,367). Additionally, EPA suggested that the Forest Service “should disclose all mitigation for air quality impacts regardless of the USFS’s jurisdiction”. (The Wyoming Department of Environmental Quality “has the authority and responsibility to implement air quality mitigation”¹⁰)

These are examples of “paralysis by analysis” and a coordinated obstructionist strategy. And, it is having an impact on the ability of the Intermountain West to supply the nation’s natural gas needs. The Wyoming Oil and Gas Commission recently indicated that the state may exhibit a production decline in 2004, for the first time in eighteen years. This is a sobering prediction for energy consumers, and should set off alarm bells for public policy makers. Interior Secretary Norton set a goal of issuing 3000 BLM drilling permits in Wyoming this year, but the opportunities for delay and litigation discussed above make achieving that goal highly problematic.

In COGA’s experience, these obstacles to energy development are not restricted to the federal lands. Increasingly, paid “organizers” are mobilizing communities to pressure local elected officials to enact “drilling moratoria”, adopt onerous local regulations that duplicate or conflict with state oil and gas commission rules, or to

outright deny local drilling permits. Colorado courts have overturned local attempts to control well location, regulate water quality and quantity concerns, and to ban drilling. Yet, the Town of Firestone recently denied applications to drill four wells permitted by the state, despite a fresh Court of Appeals ruling against its neighboring town on this very point. As the Firestone mayor admits, this was a political decision. Few, if any, local elected officials can withstand “nimby” pressures -- not if they want to remain in office.

Nor is this problem restricted to oil and gas development. Opposition to a wind project in Nantucket Sound by, among others, Walter Cronkite and Robert Kennedy, Jr., has been highly publicized. The February 25, 2004, *Wall Street Journal* featured an article titled “People Favor Solar Power – but Not in Their Neighborhood”. Perhaps wind farms could all be built on the sparsely populated high plains, and solar power plants in the Nevada deserts. But heaven forbid that a transmission line be constructed to bring that energy to load centers.

It used to be an economic truism that “there’s no such thing as a free lunch.” But American energy consumers, encouraged by anti-development zealots, appear to believe that they can eat for free. It is incumbent on elected leaders to bring a measure of reality – of choices and consequences – to this important public policy debate.

The Colorado Oil & Gas Association is the business trade association for the oil and gas industry in Colorado. Its 300-plus company members include producers, gas processors and pipelines, power generators and gas utilities, a refiner, and allied service and supply businesses. COGA offices are at 1776 Lincoln Street, Suite 1008, Denver, CO 80203. The phone number is 303-861-0362.

¹ Source: DOE, Energy Information Administration.

² Source: National Petroleum Council & 2002 Potential Gas Committee report. Along with Alaska and Alabama, the five Rocky Mountain states are the only states that export more gas than they consume.

³ Montana Thrust Belt, Powder River, Greater Green River, Piceance/Uinta, Paradox/San Juan.

⁴ Energy Policy and Conservation Act study.

⁵ FLPMA Sec. 202

⁶ *Southern Utah Wilderness Alliance* 159 IBLA 220 (2003)

⁷ *Wyoming Outdoor Council* 156 IBLA 377 (2002); *Southern Utah Wilderness Alliance* 159 IBLA 220 (2003).

⁸ By the Center for Native Ecosystems and the Mount Evans Working Group of the Sierra Club.

⁹ By the Wilderness Society, Colorado Environmental Coalition, Biodiversity Conservation Alliance, Natural Resources Defense Council, Coalition of Concerned National Park Service Retirees, and the Campaign to Protect Public Lands.

¹⁰ Attachment to EPA Region 8 letter dated 2/5/04.

CBM SUMMIT REMARKS

Previous speakers have addressed the growing importance of CBM to the national energy supply. Natural gas, overall, supplies about 25% of US energy demand, and CBM represents about 15% of natural gas production. That ratio is climbing quickly, however, especially in the Rocky Mountain states. For instance, CBM represents over half of the gas production of Colorado, the nation's sixth largest producer. And, the Powder River Basin CBM play in Wyoming is one of the most significant natural gas developments underway in the lower 48.

Yet, natural gas development in general, and CBM in particular, face increasing opposition by so-called "citizen alliances" and self-proclaimed "environmentalists" whose real agenda is obstruction.

This problem is summarized in the following slogan:

"Endless pressure, endlessly applied"

This is the motto of the Oil & Gas Accountability Project, an offshoot of the San Juan Citizens Alliance. While the San Juan group focuses on preventing CBM development in the HD Mountains of SW Colorado, the OGAP is a locus for regional opposition to CBM. Recently, the OGAP organized town meetings in Alaska, seeking to impede a new CBM play north of Anchorage. The Project brought a La Plata County Commissioner to its meetings to advocate for local control over CBM development. In some areas of the Mountain West, counties have imposed drilling bans or onerous local regulatory regimes. COGA has been active in combating these efforts in the courts.

The OGAP is only one of a set of similar groups such as the Wyoming Outdoor Council, the Southern Utah Wilderness Alliance, the Citizens Oil & Gas Support Center, and the Northern Plains and Powder River Basin Resource Councils. These groups coordinate efforts. They link through the internet and cross-fertilize each other, and hire community organizers to drum-up localized CBM obstructionism such as "Save the Grand Mesa" (in Colorado). Where does their money come from?

Research conducted by the Center for the Defense of Free Enterprise reveals that virtually all of the financial support for these self-styled "grass roots" alliances comes from large foundations in New York, Connecticut, Florida and California. The same names recur: the Jessie Smith Noyes Foundation; the Educational Foundation of America; the Ford Foundation; the Charles Stewart Mott Foundation; the W.K. Kellogg Foundation; the Foundation for Deep Ecology; Ben & Jerry's Foundation (yes—the ice

cream guys from Vermont); the Turner Foundation. This last one is ironic, since Ted's Vermejo Ranch property on the border of Colorado and New Mexico has a substantial CBM project underway.

In 2001 alone, the cumulative revenue of five of these groups totaled just under \$3 million. Their funders are all members of the Environmental Grantmakers Association, an "affinity group" of foundations that meets to "symphonically arrange" projects and grants. The motif of their symphony is *Agitation, Regulation and Litigation*. These are the tools of "endless pressure, endlessly applied".

We see the results in challenges to virtually every leasing and drilling proposal. No sooner had the "records of decision" for the Powder River Basin EIS's been finalized, than lawsuits were filed – on the very same day! Clearly, these groups were not interested in actually reading the voluminous documentation in these reports, they had boilerplate legal challenges prepared in advance.

These groups like to profess that they don't oppose all natural gas development projects. However, when asked at a public hearing in Denver of the Speakers Task Force on Affordable Natural Gas to identify areas of the intermountain west where they would support drilling activity, Peter Morton of the Wilderness Society refused to do so. He was, however, able to rattle off a laundry list of areas that should be closed to development: the Montana Front; the Jack Morrow Hills/Red Desert of Wyoming; the Book Cliffs of Utah; the Vermillion Basin, Roan Plateau and HD Mountains of Colorado; the Otero Mesa of New Mexico.

These groups, in conjunction with "Earthjustice", the legal arm of the Sierra Club (2002 revenues of \$18,000,000) take advantage of the "citizen suit" provisions of federal land planning and environmental statutes to delay and obstruct at every turn. They allege that "resource management plans" haven't taken the requisite "hard look" at environmental impacts and alternatives. They seek to turn planning tools such as "reasonably foreseeable development" scenarios into hard caps on the number of wells that can be drilled. This litigation threat hangs over every federal land manager decision, leading to redundant studies, behind-schedule land plans and environmental analyses, and an average of 140 days to approve a permit to drill.

And, these groups are not above twisting the facts with outrageous rhetoric. According to the editorial pages of the New York Times and the Denver Post, CBM developers simply dump massive quantities of toxic water onto the ground and into streams. This, of course, is silly. Surface discharges of CBM produced water are subject to the permit requirements of the Clean Water Act, which does not allow releases of toxic substances

or stream degradation. Not to mention that much of the CBM produced water in the Powder River Basin has fewer dissolved solids than many popular – and expensive – bottled mineral waters. There can be issues with salinity effects on certain clay soils; but these can and are being addressed. Nevertheless, this wild allegation has become something of an “urban myth” and is influencing the congressional debate on energy legislation.

Another example is the allegation that “hydraulic fracturing” well completion techniques have caused nearby water wells to ooze smelly, black goo. These complaints have been investigated by EPA and state regulatory agencies and found to involve the formation of iron sulfide slime by bacteria in poorly maintained domestic wells. Once again, however, the misinformation is repeated in the media and surfaces in “Dear Colleague” congressional letters opposing clarification of regulatory authority.

This is not to say that there are never legitimate issues relating to CBM development that must be addressed by a responsible industry and its regulators. In Colorado, for example, it was found that decades-old conventional wells were serving as a conduit for liberated CBM into certain shallow aquifers in the San Juan Basin. The state oil and gas commission required a program of annual testing and remedial cementing to solve this problem. On the other hand, naturally-occurring methane seeps have existed in the basin since long before CDM development started. The state, along with support from the BLM and industry, are undertaking a multi-year, multi-million dollar program of mapping, modeling and monitoring of the CBM reservoir and overlying aquifers.

And, we need to do a better job of landowner relations, especially on the so-called “split estate” lands of the west, where the surface owner does not own and has no stake in the minerals. Industry failures in this area have led to uneasy alliances of some in the ranching and farming community with the obstructionist groups. Industry groups such as the Domestic Petroleum Council and COGA have adopted codes of conduct for their members in a sincere effort to improve our performance in this regard.

Finally, the industry needs to fund public education and awareness. Many citizens do not draw the connection between drilling and development and their standard of living. Often, the debate over opening an area to exploration is portrayed as industry profits versus the environment. This is a false dichotomy. Yes, industry profits are necessary if we are going to develop CBM and other energy resources, and are a feature of our free enterprise system. But the real issue is whether we will meet the energy needs of our people, especially the growing demand for clean-burning natural gas. There is no reason that this goal cannot be achieved while also protecting our natural environment for generations to come.

FUN FACTS ABOUT OIL & GAS IN COLORADO

- **SECOND STATE TO ESTABLISH COMMERCIAL PRODUCTION – CANON CITY FIELD**
- **BOULDER FIELD DRILLED AROUND 1900, PRODUCED UP TO 1990**
- **IPAA FORMED AT THE BROADMOOR IN 1929, COMING BACK IN JUNE FOR 75TH ANNIVERSARY**
- **SIXTH IN NATION IN GAS PRODUCTION**
- **PRODUCTION IN HALF THE COUNTIES, ALL FOUR CORNERS – DJ, RATON, SAN JUAN, PICEANCE**
- **WELLHEAD VALUE \$5 BILLION PER YEAR --HALF OUR GAS IS EXPORTED**
- **WATTENBERG FIELD (WELD) HAS OVER 10,000 OPERATING WELLS – MORE THAN SAUDI ARABIA, IRAQ OR IRAN (2000+ BPD V. 2.5 BPD)**
- **PRODUCED OVER 3 TCF GAS EQUIVALENT AND STILL GROWING**
- **DRILLING & COMPLETION TECHNOLOGY ARE KEY**
- **DIAMOND BITS AND MUD MOTORS SPEED UP DRILLING**
- **HYDRAULIC FRACTURING – SAND SHIPPED FROM GREAT LAKE STATES**
- **REFRACS**
- **COGCC WELL LOCATION RULE – 5 SPOTS, MULTIPLE FORMATIONS**
- **VOC FLASH EMISSION CONTROLS RE OZONE ISSUE**

BIG PICTURE ISSUES

- **GAS IS ABOUT A QUARTER OF OUR ENERGY USE**
- **ABOUT A FIFTH OF OUR ELECTRICAL GENERATION, AND GROWING**
- **GAS-FIRED ELECTRICITY CLEAN AIR BENEFITS**
- **GRID RELIABILITY**
- **MATCH WITH RENEWABLE ENERGY FOR “FIRMING” AND DISPATCHABILITY**
- **BUT GAS DELIVERABILITY HAS BEEN DECLINING**
- **TRADITIONAL MIDCONTINENT AND GULF COAST FIELDS ARE MATURE, MORE THAN HALF THE RESERVES ARE GONE**
- **ROCKY MOUNTAIN GAS RESERVES ARE GROWING, TIGHT SANDS AND COALBED METHANE**
- **INCREASED ROCKY MOUNTAIN PRODUCTION IS KEY TO MEETING ENERGY NEEDS**
- **CONSTRAINTS INCLUDE CAPITAL, PEOPLE AND ACCESS**
- **NIMBY’ISM ACROSS THE BOARD (HDTV, GRAVEL MINE, CELL TOWERS)**
- **FOUNDATION FUNDED “ENVIRONMENTAL” OBSTRUCTIONISM**
- **ROAN PLATEAU (200 MILES OF ROADS, STOCK PONDS = “PRISTINE”?) THIS YEAR’S ANWR**
- **FALSE DICHOTOMY: PRESERVATION V. PROFITS**
- **REAL ISSUE IS ENERGY SUPPLY AND ENVIRONMENTAL RESPONSIBILITY**

Ken Wonstolen
Colorado Oil & Gas Association
2/12/04