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Written Testimony – Images attached as separate file.
All material available as Kansas Geological Survey Open-File Report 2004-9
Online at http://www.kgs.ku.edu/PRS/publication/ofr2004-9/Testimony.pdf

Chairman Clark and Members of the Committee:

My name is Timothy R. Carr. I am Chief of the Energy Research Section of the Kansas Geological Survey, and Co-Director of the Energy Research Center at the University of Kansas. I do not come as an advocate of any legislation before the committee, but to provide background on a segment of the Kansas energy industry, coalbed methane, that has the potential to be an important energy source for Kansas, and contribute to our state's economy and tax base. I will attempt to place the technical, environmental and economic aspects of coalbed methane within a national, state and local perspective

Coal is the most abundant energy source in the world, and it is a major source of hydrocarbons, particularly gas. The coalification process, whereby plant material is progressively converted to coal, generates large quantities of methane-rich gas, which are stored within the coal. The presence of this gas has been long recognized due to explosions and outbursts associated with underground coal mining. Only recently has coal been recognized as a reservoir rock as well as a source rock, thus representing an enormous undeveloped "unconventional" energy resource. But production of coalbed methane (CBM) is accompanied by significant technical and environmental challenges, including disposal of large quantities of water produced with the gas. CBM production was initially spurred by a tax incentive. Internal Revenue Code Section 29 provided a non-refundable tax credit for sale of CBM (as well as other qualified alternative fuels) from wells drilled between 1980 and 1992 inclusive, for sales of fuel between 1980 and 2002 inclusive.

In 2002, natural gas produced from coalbeds totaled 1,614 billion cubic feet (Bcf), representing 8.3 percent of total U.S. dry gas production (19,353 Bcf). In 2002, proved reserves of coalbed methane increased to 18,491 Bcf, a 5 percent increase from the 2001 level (17,531 Bcf). Coalbed methane accounts for 10 percent of all 2002 dry natural gas reserves. EIA estimates that the 2002 proved gas reserves of fields identified as having coalbed methane are now more than quadruple the volume reported in 1989.

Kansas is a major gas producing state. We produce almost twice as much natural gas as we consume. In 2002, Kansas produced more than 450 billion cubic feet, which is down significantly from peak production. However, with increased wellhead prices, the decline in Kansas gas production appears to have slowed significantly. The increased contribution of Kansas coalbed methane production appears to be contributing to stabilizing Kansas natural gas production. While coalbed methane production extends back to wells drilled for the Section 29 tax credits during the late 1980's and 1990's and even to the "shale gas" wells of the early part of the twentieth century, more than ½ of the more than 1,300 coalbed methane wells in eastern Kansas have been drilled during the

last 3 years. This is a remarkable drilling boom that ranges throughout eastern Kansas from Oklahoma to Nebraska. While a small component of total gas production, CBM production in Kansas has doubled from 2002 to 2003, and will increase significantly in 2004.

Coalbed methane is a growing and significant worldwide energy source that is expected to increase for the next several decades. This additional source of methane coupled with additional infrastructure is significant component to address our present natural gas supply challenges. If we are to move within a decade from a 20 trillion cubic foot to a 28 trillion cubic foot natural gas economy (forecast by the Energy Information Agency), we will require significant new unconventional gas supply sources. As we work to address short-term North American natural gas supply challenges and worldwide oil production constraints, we can expect natural gas prices to remain subject to chronic high prices and periodic price spikes.

CBM production is attractive due to several geological factors. Coal stores six or seven times as much gas as a conventional natural gas reservoir of equal rock volume due to the large internal surface area of coal. Much coal is accessible at shallow depths especially in Kansas, making well drilling and completion inexpensive. Finding costs are also low since methane occurs in coal deposits, and the location of coal resources is well known. Gas content generally increases with coal rank, with depth of burial of the coalbed, and with reservoir pressure. Fractures, or cleats, that permeate coalbeds are usually filled with water; the deeper the coalbed, the less water is present, but the more saline it becomes. In order for gas to be released from the coal, its partial pressure must be reduced, so that the methane will desorb from the coal and then flow to the well bore. This is accomplished by removing water from the coalbed. Large amounts of water are produced from coalbed methane wells, especially in the early stages of production. In Kansas, we are fortunate to have a low-cost disposal option in the deep saline aquifer of the Arbuckle Group. Another method to enhance methane production from coals is to inject gases that preferentially replace methane molecules on the coal surfaces (e.g., carbon dioxide).

In a CBM well, after hydraulic fracturing to increase permeability, methane production rises during the dewatering stage of production as water production decreases. In contrast to a conventional gas well, methane production rates increase for a period of time and water production decreases (6 months to 2 years). A significant period of stable gas production and relatively low water production is followed by a slow decline in production rates that can last for decades.

The four-county area of Labette, Montgomery, Neosho and Wilson in southeast Kansas is the center of coalbed methane exploration and production. While there is CBM production as far north as Miami and Johnson counties and to the west in Chautauqua County, the bulk of current CBM production is from these four counties. Also, in the four-county area, conventional gas production was relatively insignificant and the effects of new CBM gas production can be recognized. In the four-county area, gas production has doubled from 2002 to 2003 (4.2 billion cubic feet to 9.06 billion cubic feet. This increase is the result of new CBM production and we should expect continued increases

in the next few years. In 2003, the value at the wellhead of the CBM gas produced in the four counties increased to $45 million from the approximately $12.5 million in 2002.

What will be the impact of this increased revenue to the four-county area? First, a one-eighth royalty to the mineral owner (usually the surface owner in agricultural areas) will amount to $2.25 million pumped directly into the agricultural sector. In addition, the employment impact can be estimated using final demand multipliers as reported in "Regional Multipliers: A User Handbook for the Regional Input-Output Modeling System (RIMS II): US Department of Commerce's Bureau of Economic Analysis, 1992", and the " The Economic Impact of Stripper Wells in the United States: Interstate Oil and Gas Compact Commission, 1998".

The increase in revenue from 2002 to 2003 for gas production is approximately $30 million. Using final demand multipliers, the increased economic activity to the economy of the four-county area is estimated at $45 million with increased earnings of $5.8 million (Table 1a). Using the multipliers, increased employment in the four-county area is estimated at 426 new jobs (Table 1a). Direct effect multipliers can be used to estimate the impact of increased in revenue from coalbed methane production on the local petroleum industry (Table 1b). The local petroleum industry is estimated to have had an increase of almost $3 million in earnings and a potential increase of 273 employees. In an area encompassed by Labette, Montgomery, Neosho and Wilson counties, these indirect and direct effects are very significant numbers.

Change in Value at Wellhead (Million$)	Final Demand Multiplier Output	Final Demand Multiplier Earnings	Final Demand Multiplier Employment	Change in Output (Million$)	Change in Earnings (Million$)	Change in Employment
$30	1.4982	0.1925	14.2	$45	$5.8	426

Table 1a - Estimated indirect effects on the local economy of increased coalbed methane production in the four-county area of southeast Kansas (Labette, Montgomery, Neosho and Wilson).

Direct Effect Multiplier Earnings	Direct Effect Multiplier Employment	Change in Earnings (Million $)	Change in Employment
0.0984	9.1014	$2.95	273

Table 1b - Estimated direct effects on the Kansas oil and gas industry of increased coalbed methane production in the four-county area of southeast Kansas (Labette, Montgomery, Neosho and Wilson).

The four-county area of southeast Kansas has seen a significant increase from 2001 to 2002 in property tax evaluations attributed to coalbed methane activity (Table 2). In 2001, mineral leasehold was assessed at $2.4 million. In 2002, mineral leasehold was

assessed at $4.1 million and actual tax dollars from mineral leasehold taxes increased 76%. These increased assessments and tax dollars do not include the impact of surface facilities and pipelines (e.g. compression stations). I do not have 2003 valuations, but based on the doubling in production and more than tripling in wellhead value, I would expect a very significant increase in tax assessments and revenue (I would think that significant would almost be an understatement).

Southeast Kansas Mineral Leasehold Property Taxes				
	2001		2002	
County	Assessed Value	Tax Dollars	Assessed Value	Tax Dollars
Labette	$118,879	$12,931	$354,821	$38,692
Montgomery	$1,086,517	$137,963	$1,447,388	$189,594
Neosho	$255,075	$34,174	$878,596	$123,342
Wilson	$932,101	$105,450	$1,381,048	$159,449
Total	$2,392,572	$290,517	$4,061,853	$511,077

Table 2 – Assessed value and tax dollars in 2001 and 2002 from mineral leasehold in Labette, Montgomery, Neosho and Wilson counties.

The Kansas Geological Survey is out in the field and in the lab working to better understand the distribution reservoir characteristics and gas quality of coal beds. We are working to provide real-time access to data and research products to all interested private and pubic sector organizations and citizens. This information is required for well-informed decision-making and the wise conservation of our coalbed methane resources. Coalbed methane exploration and development is at a critical stage with numerous pilots are underway across the entire extent of eastern Kansas. The exact quantity and quality of our CBM resources is only now becoming understood. The Survey is also looking to the future of Kansas coalbed methane. We are working to better understand the technical challenges for the next stages of CBM production. Enhanced coalbed methane recovery and the potential of value-added sequestration of greenhouse gases may be as valuable as primary production in a possible carbon constrained world.

Energy production has been a foundation of our Kansas economy for more than 100 years. Based on published forecasts from the International Energy Agency and the Energy Information Administration, hydrocarbons (oil, gas and coal) will remain the primary source of energy through the middle of the 21st century. Kansas has a bright energy future, and unconventional gas resources such as coalbed methane will be major contributors.