Coalbed Methane in Kansas

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Kansas CBM

• Expect CBM Production Increase to Continue
• Continued Exploration Expected
  – Extent Dependent on Outcome of Pilots
    • Geological Survey Working to Provide Information
  – Northward Spread
  – Significant Impact on SE Kansas Economy
  – Potential Significant Impact on Kansas Economy
• A Substantial Boost in US and Kansas Supplies Will Take Time
• Potential for ECBM/Carbon Sequestration
Coalbed Methane Production from U.S. Basins

Emerging Basins
Midcontinent
Eastern States
Wyoming
Utah
Colorado & New Mexico
Alabama

CBM Production ( Billion Cubic Feet)

CBM represents approximately 10% of US gas reserves

Year

EIA 2003 Annual Report, September 2004
U.S. Crude Oil, Natural Gas, and Natural Gas Liquids

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Unconventional Reservoir

Fractured Reservoir

Micropores

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Methane Production from Micropores

Desorption

Replacement

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Conventional Gas and Coal Bed Gas

PRODUCTION DECLINE

- coalbed gas
- conventional gas

Adapted from Rice, 1997
Production Stages of a Coalbed Gas Well

- Dewatering Stage
- Stable Production Stage
- Decline Stage

Adapted from Rice, 1997
SE Kansas CBM Production

2004 Production Through June
2004 Wellhead Value through September

Estimated Annual 2004 Value & Production
Based on Simple Extrapolation
Wilson County Gas Production

2004 Production Through June
2004 Wellhead Value through September

Estimated Annual 2004 Value & Production
Based on Simple Extrapolation

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Neosho County CBM Production

2004 Production Through June
2004 Wellhead Value through September

Estimated Annual 2004 Value & Production
Based on Simple Extrapolation
Montgomery County CBM Production

2004 Production Through June
2004 Wellhead Value through September

Estimated Annual 2004 Value & Production
Based on Simple Extrapolation

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Labette County CBM Production

2004 Production Through June
2004 Wellhead Value through September

Estimated Annual 2004 Value & Production
Based on Simple Extrapolation

Kansas Geological Survey
Coalbed Methane Activity

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Coalbed Methane Activity

CBM Rotary Total Depth

Total Number of Wells with TD's = 1710
Coalbed Methane Activity

Kansas Coalbed Methane Producing Horizons

- Weir-Pitt 49%
- Mulky 20%
- Riverton 26%
- Bevier 3%
- Summit 1%
- Rowe 1%
- Fleming <1%
- Crowberg <1%

Total 383 Known Completions
Coalbed Methane Program

Kansas Geological Survey
Coalbed Methane Program
Coalbed Methane Program

Kansas Geological Survey
Pre-Pennsylvanian Topography
Desorption Characteristics

GAS CONTENT (scf/ton)

TIME (square root of hours since bottom hole time of core)

WEIR-PITT

RIVERTON

TEBO

MINERAL

MULKY

ROWE

SUMMIT

SCAMMON

Montgomery County, KS

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Desorption Characteristics

GAS CONTENT (scf/ton)

Montgomery County, KS

TIME (square root of hours since bottom hole time of core)

WEIR-PITT

RIVERTON

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Desorption Characteristics

![Graph showing desorption characteristics with data points from different locations.]

- 138 SCF/ton, Cass Co., MO
- 106 SCF/ton, Miami Co., KS
- 49 SCF/ton, Cass Co., MO
- 32 SCF/ton, Cass Co., MO
- 20 SCF/ton, Miami Co., KS

GAS CONTENT (SCF/ton, maf)

TIME (square root of hours since bottom hole time of core)
Coalbed Methane Production

Coal Bed Methane Production

Includes Wells That Average More than 50MCF/Day For at Least 3 Years (N=22)

Cumulative Production MMCF

Months Since Initial Production

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Coalbed Methane Production

Kansas Coal Bed Methane Production

Includes Wells That Average More than 50 MCF/Day For at Least 3 Years (N=22)

Average Monthly Production

Month After First Sales

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Devon/Quest CBM Production

Maximum Wells Reporting Production prior to April 2003 was 35
Maximum Wells Reporting Production in April 2003 was 154
Current Wells Reporting Production is 169

Data is Pipeline Sales

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Dart CBM Production

Current Wells Reporting Production is 307

Data is Pipeline Sales

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Partially miscible and immiscible CO₂ EOR

- El Dorado
- Salyards Trend,

Enhanced Coalbed Methane (N₂ and CO₂)

Cement plant gas stream may be best suited for ECBM
Cement Production

Calcination Process

CaCO₃ → CaO + CO₂

0.51 tons CO₂ / ton cement

CO₂ and N₂ kiln gas mix may be suitable for ECBM with little processing
Landfill Gas

Landfill Gas (LFG)
CH₄, CO₂, NMOC

Pipeline

Unmineable Coals
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Additional Information

Kansas Geological Survey Web Site

- Reports
  - http://www.kgs.ku.edu/CBM/reports.html

- Wells
  - http://www.kgs.ku.edu/Magellan/Qualified/index.html
  - Select “Coal-bed Methane Wells” for Well Type
  - Link to Production for Wells

- Call/Email

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