11-12-2010

SLIDES: Transforming and Disrupting: Shale Gas and Oil in U.S. Energy Supply

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TRANSFORMING AND DISRUPTING SHALE GAS AND OIL IN U.S. ENERGY SUPPLY

RICHARD NEHRING
SHALE PLAYS IN THE MOUNTAIN WEST
DENVER, NOVEMBER 12, 2010
Annual U.S. Natural Gas Production by Category (1950-2008)
Composition of U.S. Unconventional Natural Gas Production by Type, 1970-2008

- Shale Gas
- Tight Sandstones
- Tight Carbonates

Tcf


Tight Sandstones
CBM
Shale Gas
Tight Carbonates
KNOWN AND ESTIMATED U.S. GAS RESOURCES

• Proved (EIA) - 237
  Probable (PGC mean) - 419
• Possible (PGC mean) - 745
• Speculative (PGC mean) - 429
• Total 1830 TCF
HIGH UNCERTAINTY

- Range of remaining resources:
  - 1190 – 1830 – 2885 TCF
IMPLICATIONS FOR FUTURE SUPPLY

• Years remaining

  - @ 23 TCF/YR:  52 – 80 – 125
  
  - @ 30 TCF/YR:  40 – 61 -- 96
VERY LARGE RESOURCE

- PGC estimates c. 375-1050 TCF

- Concentrated in six potential megaplays

- Marcellus and Haynesville/Bossier plays are likely world class (100+ TCF each)
RELATIVELY LOW COST

• Rapid growth of production drove price down
• Price has remained low despite many predictions of a rebound
• Amount of low cost resource is uncertain
• Signs of drilling cutbacks recently
OUTSIDE OF ROCKIES

• Only 10% of PGC shale gas potential in Rockies

• Most shale gas megaplays replacing declining GOM production

• Marcellus is displacing other sources of supply to Northeast
ECONOMICS OF THE GAS RESOURCE

• Published resource estimates are for **technically recoverable**
• **Costs** of recovery are also crucial
• Three conflicting economic considerations
  – Very large resources drive price down
  – Operators are reducing costs
  – Maximizing unconventional recovery rate drives cost up
KEY CONCLUSIONS

• Are U.S. gas resources large? - Yes, with high confidence

• How large are they? – Highly uncertain, 90% probability of 1600-1800 TCF range

• How long will it take to reduce this uncertainty significantly? – 10-30 years
IMPLICATIONS FOR POLICY

• Basic outlook: Cautious optimism

• Supply continuity for current markets

• Expansion of current markets
  – Electrical generation
  – Displace fuel oil for heating

• Evaluate new markets
  – CNG for transportation
“SHALE OIL” -- A MISLEADING CONCEPT

• Pure shales unlikely to have major impact on oil production

• Promising plays are not shales, but other rock types

• More accurate and useful to speak of poor reservoir quality oil plays
POOR RESERVOIR OIL PLAYS

• Middle Bakken (Williston Basin)
  – Undergoing rapid development
  – Likely to peak by 2015
  – Could reach 10% of U.S. crude oil production

• Permian Basin
  – Several plays
  – Undergoing substantial and accelerating development
  – Likely to provide 5-10% of U.S. crude, 2015-2020
PROGNOSIS

• Very large in-place resources (larger than Prudhoe Bay)

• Low recovery rates (10-20%) place substantial restraint on recoverable resource size

• Main impact – stabilizes U.S. oil production by offsetting declines elsewhere