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

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Composition of U.S. Unconventional Natural Gas Production by Type, 1970-2008

- Shale Gas
- CBM
- Tight Carbonates
- Tight Sandstones

Tcf

12
10
8
6
4
2
0

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