SLIDES: U.S. Shale Gas: Resources, Reserves and $$$

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U.S. Shale Gas
Resources, Reserves and $$$

John B. Curtis
Potential Gas Agency
Colorado School of Mines
Location of U.S. Shale Gas Plays

Shale Gas Plays, Lower 48 States

Source: Energy Information Administration based on data from various published studies.
Updated: March 10, 2010
Oil Shale Gas Hydrates

Tight Gas Sands; CBM; Gas Shales

Tight Oil; Heavy Oil; Bituminous Sands

Oil Shale

Gas Shales

Huge Volumes, Difficult to Develop

Increasing Product Price

Conventional Reservoirs:
Small Volumes, Easy to Develop

Unconventional Reservoirs:
Large Volumes, Hard to Develop

Province Resource Size

(S. Sonnenberg, CSM)
Shale Gas Annual Production and Energy Information Administration (EIA) Forecast
Targeted Research – $150 Million
Acquisitions – >$50 Billion

Source: Trollart.com – Ray Troll
Resource Development – >$15 Billion
Hydrocarbons From Shale – Never Say Die

Growth in Barnett Shale - Ft. Worth Basin

- Gas Production
- Well Count

Annual Production, Bcf

Producing Wells

Well Count

Producing Wells
Schematic geology of natural gas resources

- Conventional non-associated gas
- Conventional associated gas
- Coalbed methane
- Gas-rich shale
- Sandstone
- Seal
- Tight sand gas
- Oil

Land surface

U.S. Energy Information Administration
Shale Gas Reservoir Mechanisms

Stage 1: Desorption From Internal Surfaces
Stage 2: Flow Through the Matrix
Stage 3: Flow in the Natural Fracture Network

Natural Fracture Network
Exploration Considerations

- Natural fractures - Friend or Foe?
- Facies changes - greater permeability
- Kerogen type - I,II,IIIS,III
- Microbial or thermogenic gas?
- Thermal maturation history
- MWD - especially w/ gas isotopes
Some Elements of a Successful Shale Gas Play

Productivity

- Organic Richness
- Maturation
- Gas-In-Place
- Permeability
- Pore Pressure
- Brittleness
- Mineralogy
- Thickness
Potential Supply of Natural Gas in the United States

Report of the Potential Gas Committee (December 31, 2008)
Regional Resource Assessment

Data source: Potential Gas Committee (2009)

- Traditional: 1,673.4 Tcf
- Coalbed: 163.0 Tcf
- Total U.S.: 1,836.4 Tcf

Map showing regional resource assessments:

- Rocky Mountain: 374.4 Tcf (51.9%)
- Pacific: 193.8 Tcf (57.0%)
- North Central: 274.9 Tcf (51.9%)
- Mid-Continent: 24.0 Tcf (16.6%)
- Atlantic: 455.2 Tcf (35.3%)
- Gulf Coast: 16.6 Tcf (17.3%)
- ALASKA: 7.5 Tcf (3.4%)
PGC Resource Assessments, 1990-2008

Total Potential Gas Resources (mean values)

Data source: Potential Gas Committee (2009)
Possible Constraints on Future Gas Supply

- Sufficient Supply to Meet Demand
- Resource Base
- Environmental Concerns
- Skilled Workforce
- Technology
- Gas Price
- Regulatory & Land Issues
- Pipeline Capacity
- Rig Availability