Shale Gas Plays: Development, Economics, and the Future

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Yes, There Is a Lot of Gas Resource:
The Recognition Started with the American Clean Skies Foundation

Proved Reserves Plus Assessed Resources—Life of the Gas Resource

- In 2006, the Potential Gas Committee (PGC) estimated 1,530 Tcf of total Recoverable Resource.

- In 2008, the American Clean Skies Foundation had Navigant perform the North American Natural Gas Supply Assessment. This study found that shale and other unconventional supplies had increased the resource to as much as 2,247 Tcf, including 842 Tcf of shale gas. This would be 118 years of production at 2007 levels.

- In June 2009, PGC issued its 2008 updated study—2,076 Tcf, including 616 Tcf of shale, also over 100 years’ worth.

U.S. Total Gas Supply (Tcf)
U.S. Shale Gas Basins Align with the Nationwide Pipeline Grid

Sources: EIA, US Natural Gas Pipeline Network

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Total Gas Supply: For 15 years, Domestic Production was Flat, with Growing Imports—

Sources of U.S. Gas Supply, 1990 to 2010

- Net Dry Gas Production
- Net Pipeline Imports
- Net LNG Imports

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The Last Five Years Have Been Very Different—Thanks to Domestic Growth, Supply Now Exceeds Demand, and Imports are Shrinking

The Rapid Change from 2005

- Net Dry Gas Production
- Net Pipeline Imports
- Total Consumption
- Net LNG Imports

Bcf per Day

2005 2006 2007 2008 2009 2010

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The Really Dramatic Story is Onshore, where Between 2005 and 2008, Enough Production Was Added to Replace Offshore

From 2005 to 2008, the daily energy added from onshore sources exceeds the thermal content of all the oil we import from Saudi Arabia.
What about Shale Gas? EIA Developed a Robust Forecast in 2010

EIA Projected Shale Production Estimates

- **Actuals to 2006**
- **AEO 2008 Forecast**
- **AEO 2010 Forecast**

Bcf per Day, Dry


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But Actual Production has Far Exceeded Even the Aggressive 2010 Forecast
Why? Didn’t drilling drop off a lot since 2008?

Yes, in total—but horizontal drilling is going strong...
Producers Expect the Trend to Continue if There’s a Demand for the Gas—2010 Actuals Exceeded Even the Producers’ 2009 Forecast
Based on that Producer Forecast, There Would Be Enough Additional Supply by 2020 to Displace Over Half of All U.S. Coal-Fired Generation

Total Supply per EIA and with Producer Estimate

Bcf per Day, Dry

Actuals to 2010

With Producer 2009 Shale Forecast

AEO 2010 Forecast

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The Break-Even Price Varies a Lot by Play

Required Prices for a 20 Pct IRR, by

- Woodford: $8.96
- Barnett: $7.08
- Fayetteville: $5.80
- Haynesville: $5.58
- Eagle Ford Dry: $5.38
- Eagle Ford Oil: $4.96
- Eagle Ford Wet: $4.51
- Bakken: $4.36
- Marcellus: $3.55

5-Year NYMEX: $5.12

Provided by Jeffries & Company
Schlumberger Sees a Steady Decline in Break-even Costs Because of Technological Advances

Technology Has Enabled Reduction in Breakeven Prices

- Capital influx is a response to improving asset economics in major plays

Break even price trend across major US shale gas plays

Source: Schlumberger Business Consulting Analysis
Not the Result of Big Tech Breakthroughs—Just Getting Very Good at Using the Existing Tools

Use the tools you already have

If only someone would invent something to keep the sun out of our eyes…
What Has All this Meant for the Competitive Position of Gas?

Delivered Eastern Coal vs. Appalachian Gas

Delivered Price per MMBtu

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Gas Has Gained Market Share vs. Coal, A Little Over 2 Percent

Gas and Coal Generation Market Share
Rolling 12-Month Totals 2008 - 2010

Gas Generation

Coal Generation

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Challenges Faced in the United States

Market and Development Impact

• The Market is oversupplied—So prices have been in the $3 to $4 range, when most think it takes $6 for full development—We need more demand.
  — Until now, lease retention, NGL production, and being in the “Sweet Spots” has kept development going at a high pace.
  — But without a stronger market, the industry will redirect toward oil, slowing the pace of development.

• The added supply, on top of EIA’s highest estimates, is enough to replace half of all coal use by 2020! This is a huge opportunity, but it is also a huge amount of supply to find a home for.

• Meanwhile, land impact, water questions around hydraulic fracturing, and road impacts are causing opposition to development.

• Of all those issues, hydraulic fracturing has been the most controversial—water supply and produced-water handling are the biggest environmental issues faced by the industry.
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