Natural Gas, Liquefied Natural Gas and Oil

Tulane University

Engineering Forum 2010
April 16, 2010
The Shale Revolution

- Shale technology has changed the game in U.S. Gas
  - Production is Up; Per-unit Production Costs are Down; Prices are Down
- U.S. Production Growth has Pushed out Imports
- Application of Shale Technologies is Spreading...
  - To Global Natural Gas Markets
  - To Crude Oil Markets
Historical U.S. Natural Gas Prices

- Energy buyers backed off
- Attracted LNG importers
- Motivated U.S. producers

Source: NYMEX
Natural Gas Prices – 2007 to Today

Avg. 2008 - $8.85
Since 1/1/09 - $4.16
Avg. 2007 - $6.94

Source: ICE
Natural Gas Production Grew 1.8 Bcf/d ‘09 vs. ‘08

Data through December 31, 2009

Source: BENTEK
Weak Prices Have Failed to Curtail Production

**Active Rig Count**

**Average Daily Production (Bcfd)**

Source: BENTEK, RigData
“Shale Technologies”

Horizontal Drilling and Multi-stage Hydraulic Fracturing
Southwestern Energy’s Rig Productivity Gains

Fayetteville Shale

Source: Southwestern Energy Financials

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<th>2007</th>
<th>2008</th>
<th>2009</th>
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<tr>
<td>Time To Drill (Days)</td>
<td>20</td>
<td>18</td>
<td>12</td>
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<tr>
<td>Wells Per Yr Per Rig</td>
<td>30</td>
<td>2,104</td>
<td>1,006</td>
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<td>Average Lateral Length (Feet)</td>
<td>4,303</td>
<td>2,679</td>
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<td>30 Day Ave. Prod Rate (Mcf/d)</td>
<td>1,006</td>
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<tr>
<td>IP Additions Per Rig Per Yr (Mcf/d)</td>
<td>18,360</td>
<td></td>
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<td>Drill &amp; Complete Costs ($MM)</td>
<td>$2.6</td>
<td>$3.0</td>
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-40%  +67%  +105%  +166%  +344%  +15%
Shale Plays are Abundant

Assuming No Significant Regulatory or Legislative Restrictions

Supply will remain long

Prices will remain low

Haynesville

Marcellus
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