**Framing the Debate: A Cyclical Trough or a Secular Shift?**

Is today’s unconventional gas volume growth due to high returns and a secular shift in the cost base or is excess liquidity in the capital markets driving irrational operator behavior?

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<td>Cost Structure</td>
<td>Low cost and declining Economic at $4–$5/mcf. IRR’s of 30%–40%</td>
<td>Full range of Costs Marginal cost of $6–$7/mfc. Real returns of 0%–10%</td>
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<td>Variation between wells</td>
<td>Little. Manufacturing play</td>
<td>High between core and outer tiers Same issues as conventional plays</td>
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<td>LNG</td>
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<td>Conclusion</td>
<td>Supply is growing due to strong returns and the lower cost of production of unconventional gas. Long term prices will be lower (in the $4–$5/mcf range).</td>
<td>Supply is growing due to operators focusing on growth over returns. A Rebound to the marginal cost ($7/mcf) is likely when liquidity declines</td>
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Since the beginning of the unregulated gas market, prices have cycled around the marginal cost, rising to the price of demand destruction (15%–20% return for operators) and falling to the cash cost (0% return for operators).
Cycles around the marginal cost have been driven by near term supply/demand dynamics, most easily measured by inventories.

Source: Bloomberg, EIA and AllianceBernstein Estimates

$R^2 = 0.43$
The Cost Structure of Shale Gas: Public Perception

- "The Haynesville shale, which extends from Texas into Louisiana, is seeing costs as low as $3 per million British thermal units, down from $5 or more in the Barnett shale in the 1990s. And more cost-cutting developments are likely on the way as major oil companies get into the game. If they need to do shale for $2, I am willing to bet they can."—Amy Myers Jaffe, Wall Street Journal, May 10, 2010

- "Gas prices, while low, remain economic for large tracts of shale gas: half of the 1,800 trillion cubic feet of discovered resource can be developed at present prices" —IHS Cera's chief energy strategist, David Hobbs

- "The recent shale gas boom has been called a ‘game changer’ in the North American energy picture. It promises to deliver abundant, cheap natural gas for decades to come."—Natural Gas for America

- Abundant, Affordable, Clean, Reliable—EnCana 2010
Despite the claims of low costs, in 2009 the majority of public E&Ps had returns that failed to meet their cost of capital (even excluding write downs) at a $6.18/mcfe realized price.
Despite the emergence of shale gas corporate PD F&D has not materially fallen. While it dropped in 2009 due to cyclical service cost inflation this is now reversing.
Perception vs. Reality: Why Rising IPs Look Good, but are Coming at a Cost

Much of the “hype” around shale gas has come from ever increasing IP rates. However these are largely the result of bigger, more expensive wells. As a result PD F&D hasn’t fallen.

Source: State Filings and corporate reports
The Trend Is Particularly Apparent in Mature Shales Like the Barnett

In almost all plays the number of fracs per well has risen. However in many mature plays this has not been associated with an increase in IPs or EUR.

Source: State Filings and HPDI. Data is for DVN only.
But Is Evident in Even the Youngest Shale Plays

- Early on in the Haynesville IPs rose with fracs. Now they appear to have topped out even on a choke-adjusted basis

Source: State Filings and HPDI
Shale Plays: Far from Homogeneous

Despite operator claims, very few shale plays are homogenous. Instead they tend to have a small highly economic core, and large amounts of more marginal tier 1 and tier 2 acreage. In addition the correlation of performance between adjacent wells is low, and many wells fail.

Haynesville Well Performance by 30 Day IP

Correlation of IPs Between Adjacent Wells in the Fayetteville

Source: HPDI

\[ R^2 = 0.2341 \]
LNG: Spare Capacity Is in Decline with Cargoes Going to the Highest Price Market (not the US)

Despite concerns over a flood of LNG, strong demand from the Non-OECD and continued project delays have meant spare capacity is now contracting again.

**Spare LNG Export Capacity**

% of Global LND Demand

Increased demand growth and limited supply of new liquifaction capacity

Source: AllianceBernstein Estimates
The Liquidity Problem in a Nutshell: A Publicly Listed US E&P

- First half of 2010 production growth was +15%
- First half of 2010 cashflow was $21 million
- YTD CAPEX was $112 million and the company is planning to spend $175 million this year and $150 million next year
- The company’s debt is equal to 182% of its market value (10/11/2010)
- The average realized price in the first half of 2010 was $6.10/mcfe, due to hedging
- The company says its hedging ensures IRR of 25-30%
- YTD annualized return on PP&E was 6% and return on equity was 2%

Source: corporate reports and Yahoo Finance
The Liquidity Problem in a Nutshell II: A Larger Public US E&P

- 2010 production growth was +15% yoy (target to double production over five years)

- YTD 2010 operating cashflow was $1.5 billion

- YTD capex was $3.7 billion

- Debt/(Debt + Equity): 30%

- YTD realized price of $5.63/mcfe, due to hedging

- Forecast IRR on development program is >20%

- YTD annualized return on PP&E was 4.6%

Source: corporate reports and Yahoo Finance
Conclusions

- Unconventional gas is not changing the cost structure of US gas production. Much of the production is high cost outside of the core of new plays and the cost base is continuing to rise.

- Operators are prolonging the downcycle by their focus on volume growth, not returns.

- Ultimately this is a losing strategy and will continue to prolong the suffering of gas producers. For the market to correct, operators will have to show discipline or the marginal player will have to go Chapter 11.

- If the cost of debt rises from its current low levels, many E&Ps will find themselves in a difficult situation.

- Eventually, providers of capital (banks or equity investors) may impose discipline on the gas producers but in the meantime, the steady parade of foreign buyers continues.
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