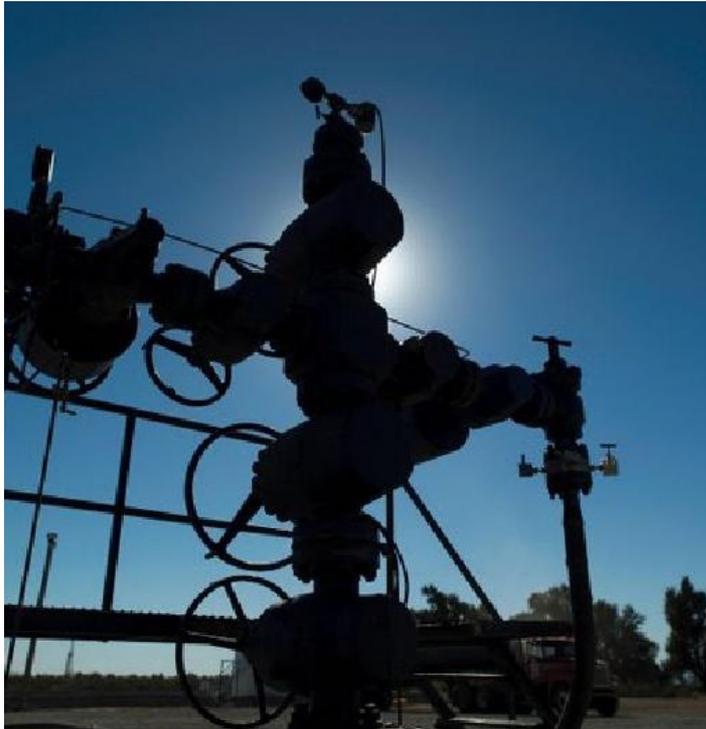


# **North American Shale Gas**

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***Shale Gas—Abundance or Mirage?***

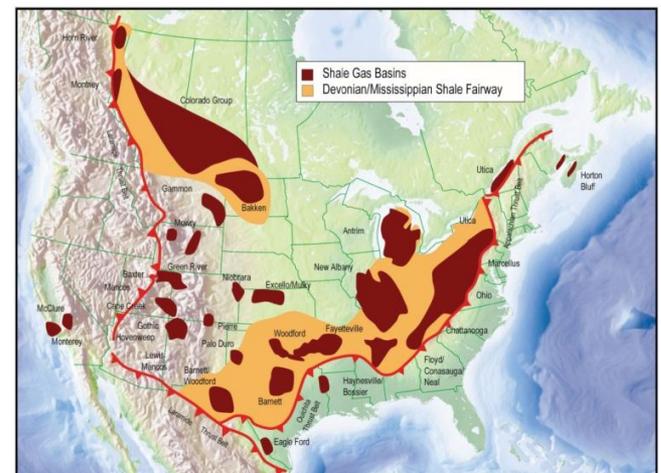
***Why The Marcellus Shale Will  
Disappoint Expectations***

**Arthur E. Berman  
Labyrinth Consulting Services, Inc.**

**Washington, D.C. October 8, 2010**

## Can shale plays be commercial?

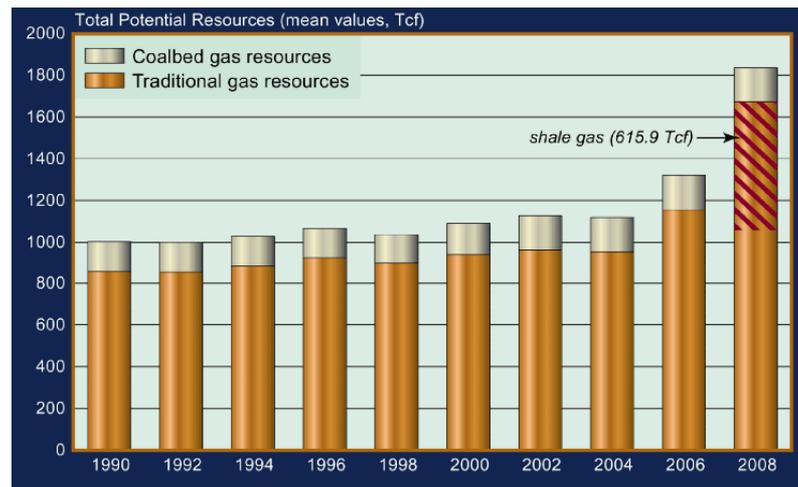
- Shale gas plays are marginally commercial at best.
- The plays have consistently contracted to a core area that represents 10-20% of the resource that was initially claimed. The manufacturing model has failed.
- These are not low-cost plays: the marginal cost of production for most companies is \$7.50/Mcf based on SEC 10-K filings over the past 5 years.
- Reserves have been greatly over-stated & 80% of booked reserves are undeveloped.
- The value of undeveloped reserves is low.
- Shareholder equity has been consistently destroyed.
- Because of good hedge positions, the cost environment has been favorable. This has changed.
- The move to liquid-rich shale plays has resulted in poor results so far.
- The Marcellus Shale will disappoint expectations.



# There never was 100 years of natural gas because of shale plays

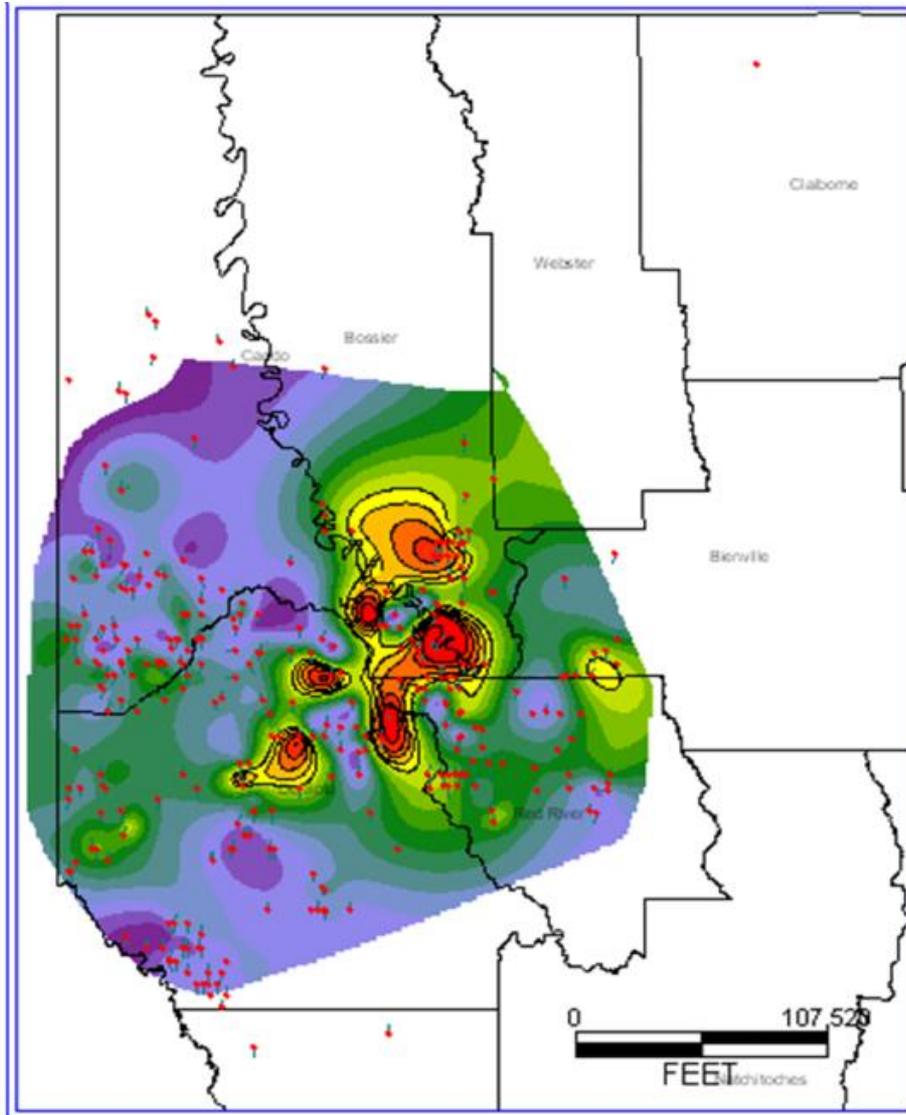
- Potential Gas Committee June 2009 Report misinterpreted.
- Technically recoverable resources are not reserves.
- Probable shale gas component is 147 tcf.
- That's a lot of gas but it is not 100-year supply.

Potential Gas Committee 2009 Report	
	TCF
U.S. Technically Recoverable Resources	1,836
Shale Gas Component	616
"Probable" (P <sub>2</sub> ) Technically Recoverable Resources	441
Shale Gas Component	147



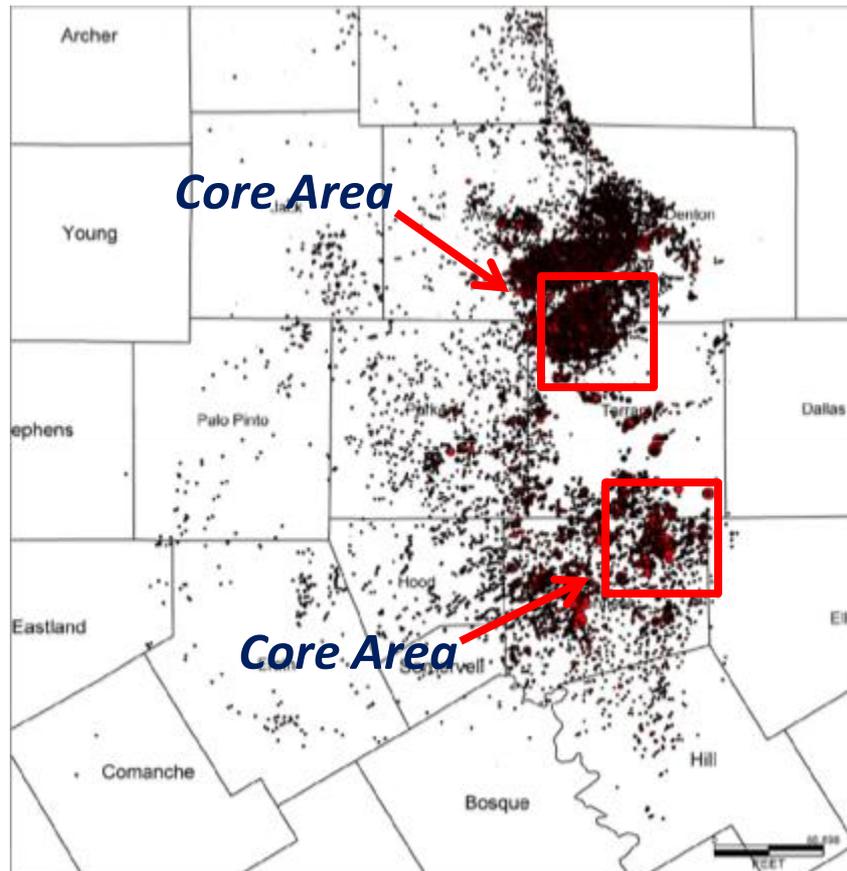
## Shale plays have contracted to a fairway or core area: Haynesville Shale example

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- The emerging core area includes ~110,000 acres or about 5 Townships.
- This represents approximately 10% of the play area in Louisiana defined by limits of drilling (1.5 million acres or 65 Townships).
- 2 years ago, this was promoted as the 4<sup>th</sup> largest gas field in the world, and the largest in North America.
- Trust us, the next time it will be different.

## The Barnett Shale core areas

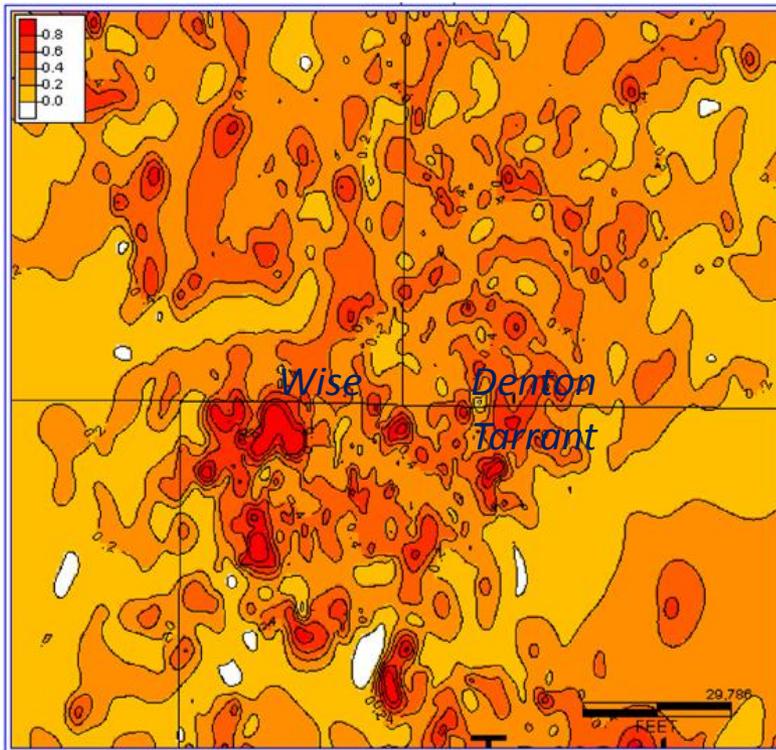


***"There was a time you all were told that any of the 17 counties in the Barnett Shale play would be just as good as any other county," McClendon said. "We found out there are about two or two and a half counties where you really want to be."***

***--Bloomberg News October 14, 2009***

## What defines a core? An area where conditions provide the potential for *commercial success*

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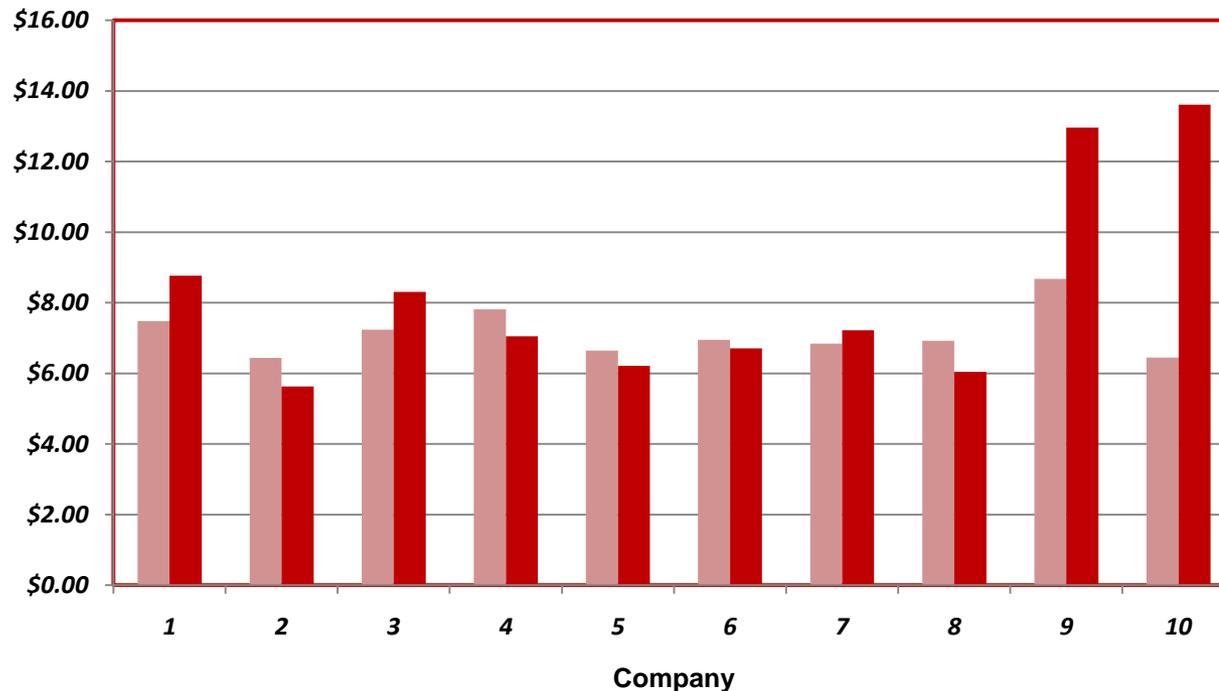
Barnett H Wells 1<sup>st</sup> Year Cumulative Production

- Even within the core, well performance is not uniform.
- Repeatability is a problem.
- Results have improved but costs have increased.
- Complex natural system, not a factory.

## These are not low-cost plays

### Selected Company 5 Year Imputed Production Costs/Mcfe

■ *Weighted Realized Price/Mcfe with Hedges*     ■ *5 Year Calculated "Break-Even" Price*



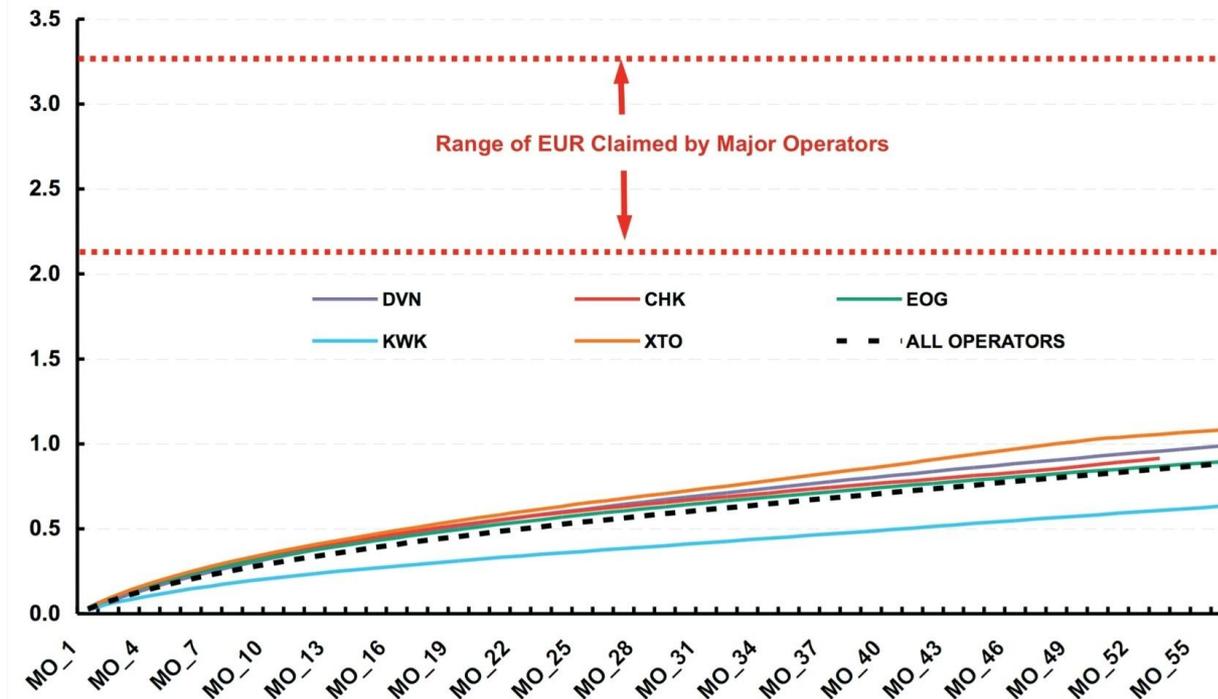
- Operator claims of profitability at sub-\$5/Mcf gas prices exclude many costs.
- Excluded costs include interest expense and G&A (overhead), dry hole cost, P&A expense.
- Huge operating costs related to operating thousands of wells.

# Reserves have been over-stated

Average Barnett Shale Horizontal Well Cumulative Production by Operator

Data is normalized to the first month of production

Cumulative Production (Bcf)

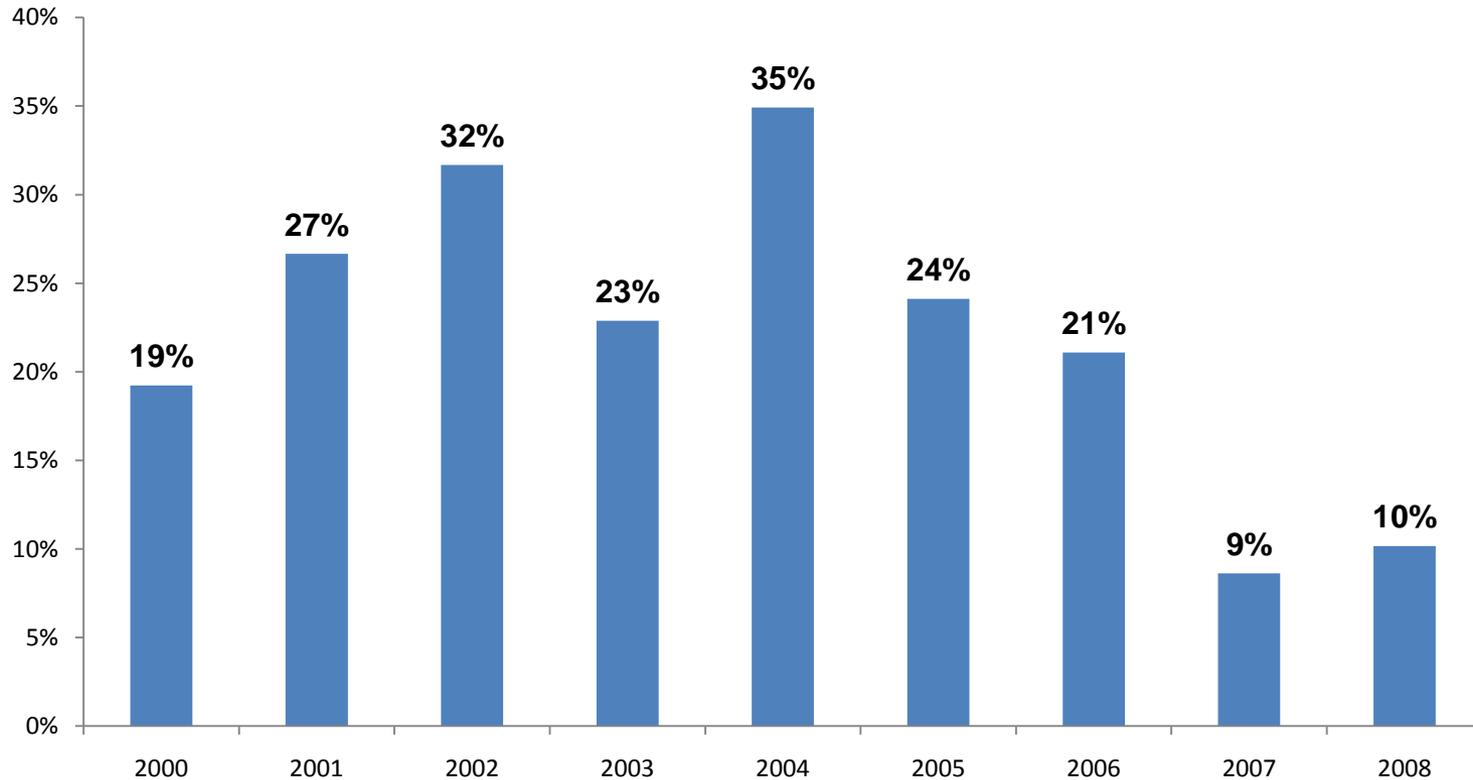


Source: Art Berman from IHS data (2010)

- Average of major operators' cumulative production will not reach advertized EUR in a time frame that adds value.
- Why do operators' EURs differ so much in the same manufacturing play?

## Barnett Shale: testing the 40- To 65-year production life claim

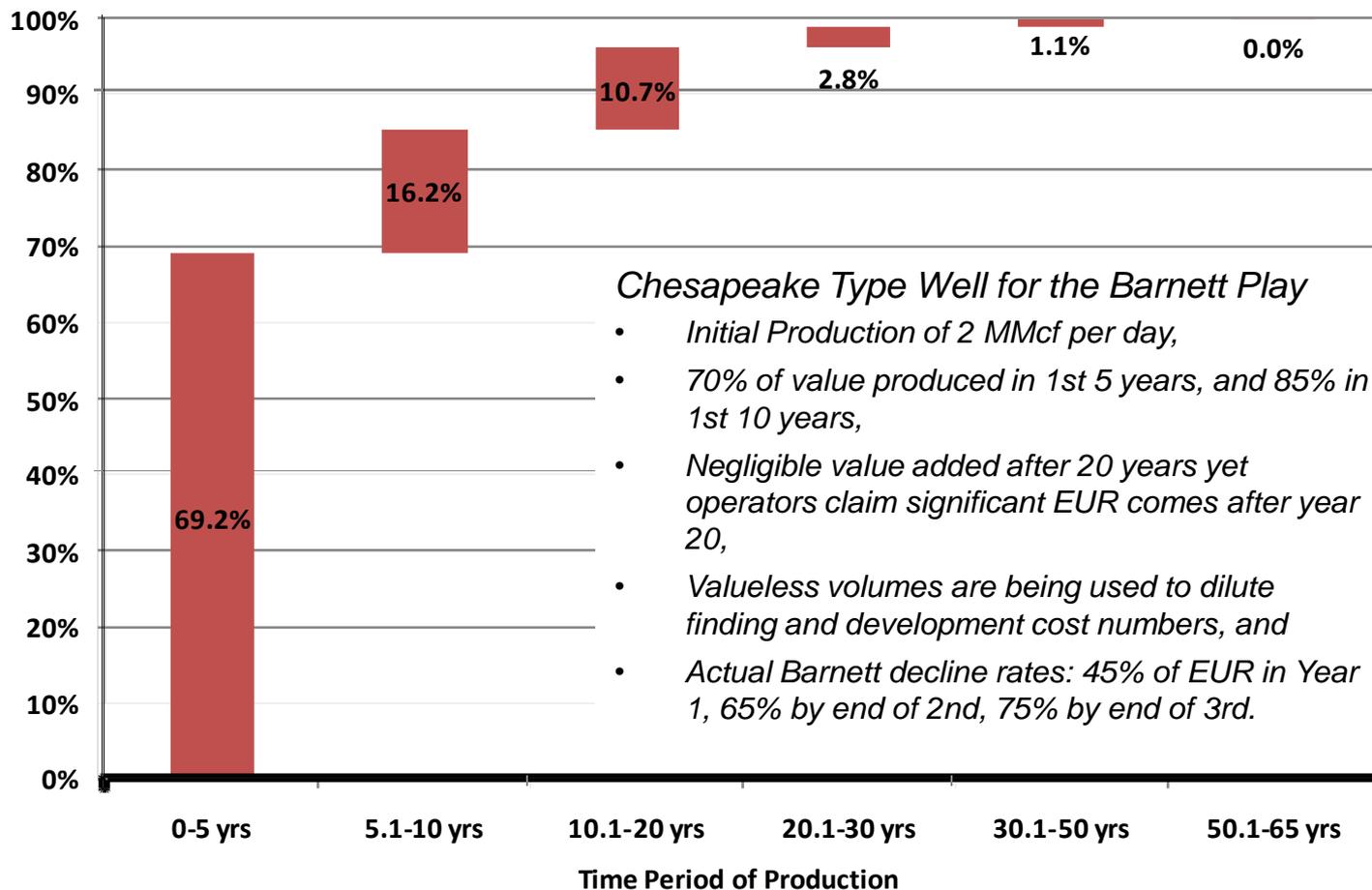
### Barnett Wells Producing < 1 MMcf/month or Dry



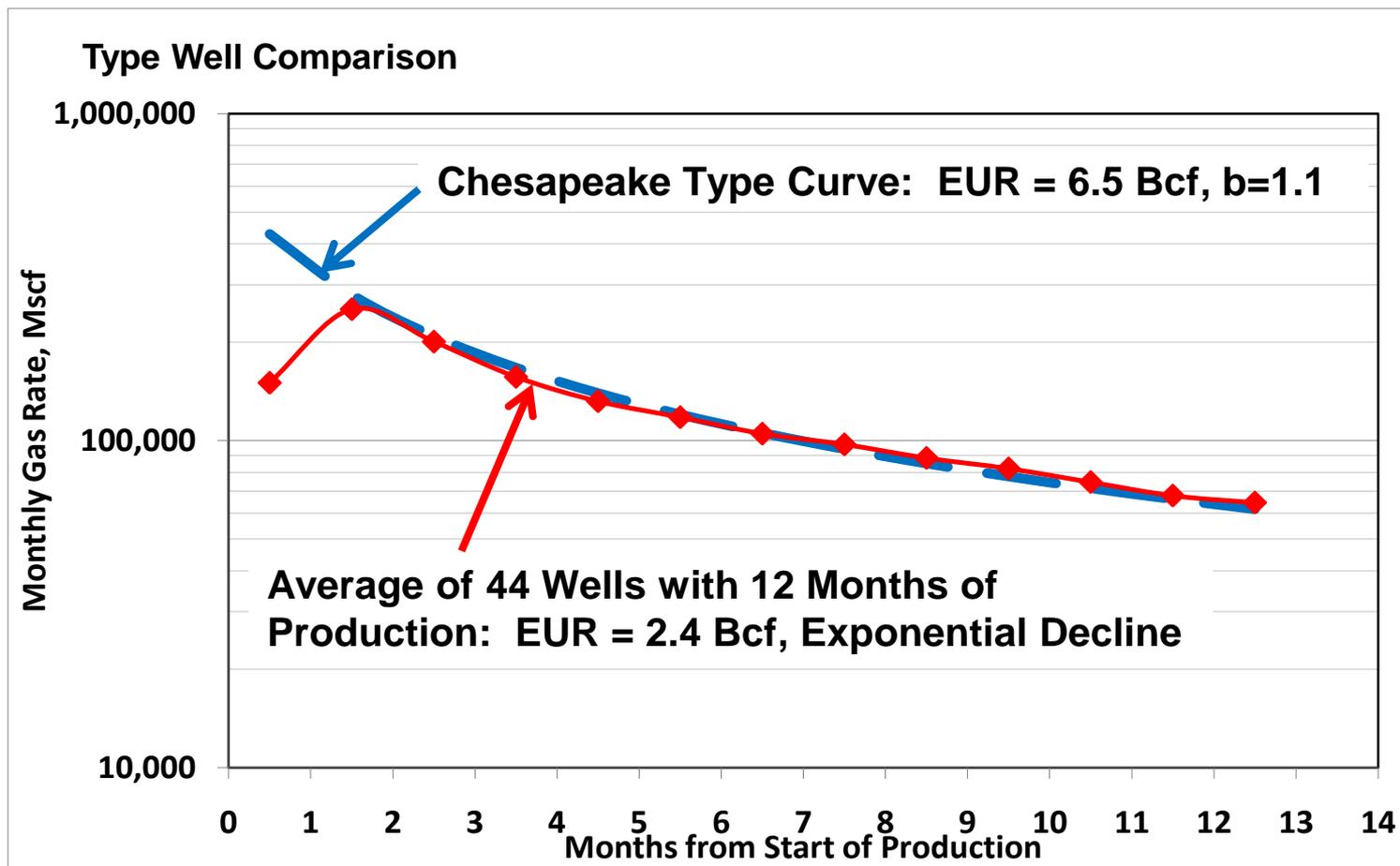
- This cut-off only covers the cost of compression.
- True operating costs are approximately double.

# Barnett Shale: it's about NPV, not estimated ultimate recovery

Barnett Type Well: Incremental NPV10 By Production Period

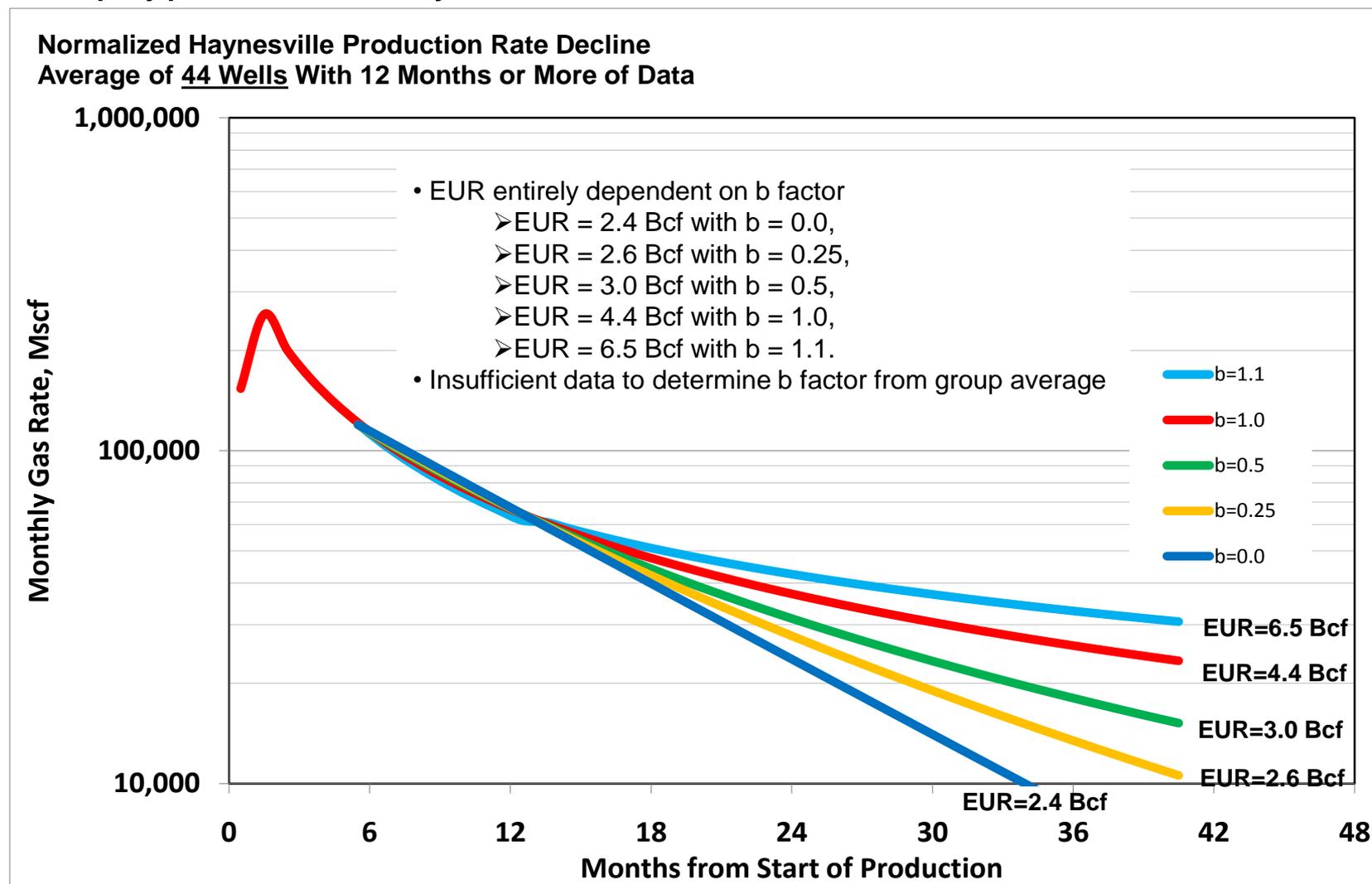


## Type curve comparison: Haynesville Shale



- The Difference Lies in Forecasting Future Decline Trends.
- Particularly the hyperbolic  $b$  exponent.

## Group type curve analysis



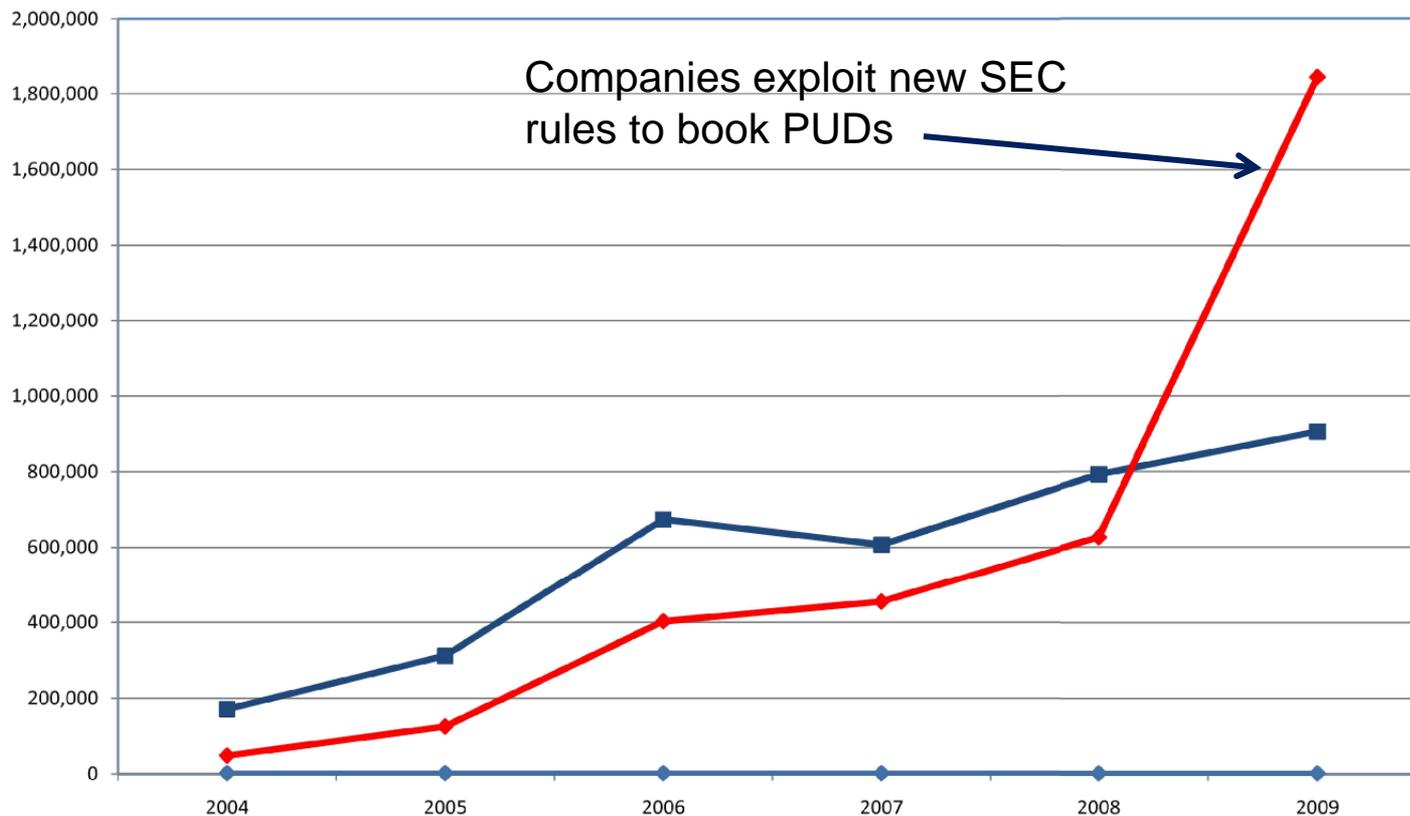
Trust us that the P<sub>5</sub>—6.5 bcf—case will be the average EUR!

## An increase in proved undeveloped reserves (PUD) thanks to SEC changes

### U.S. Shale Operator A

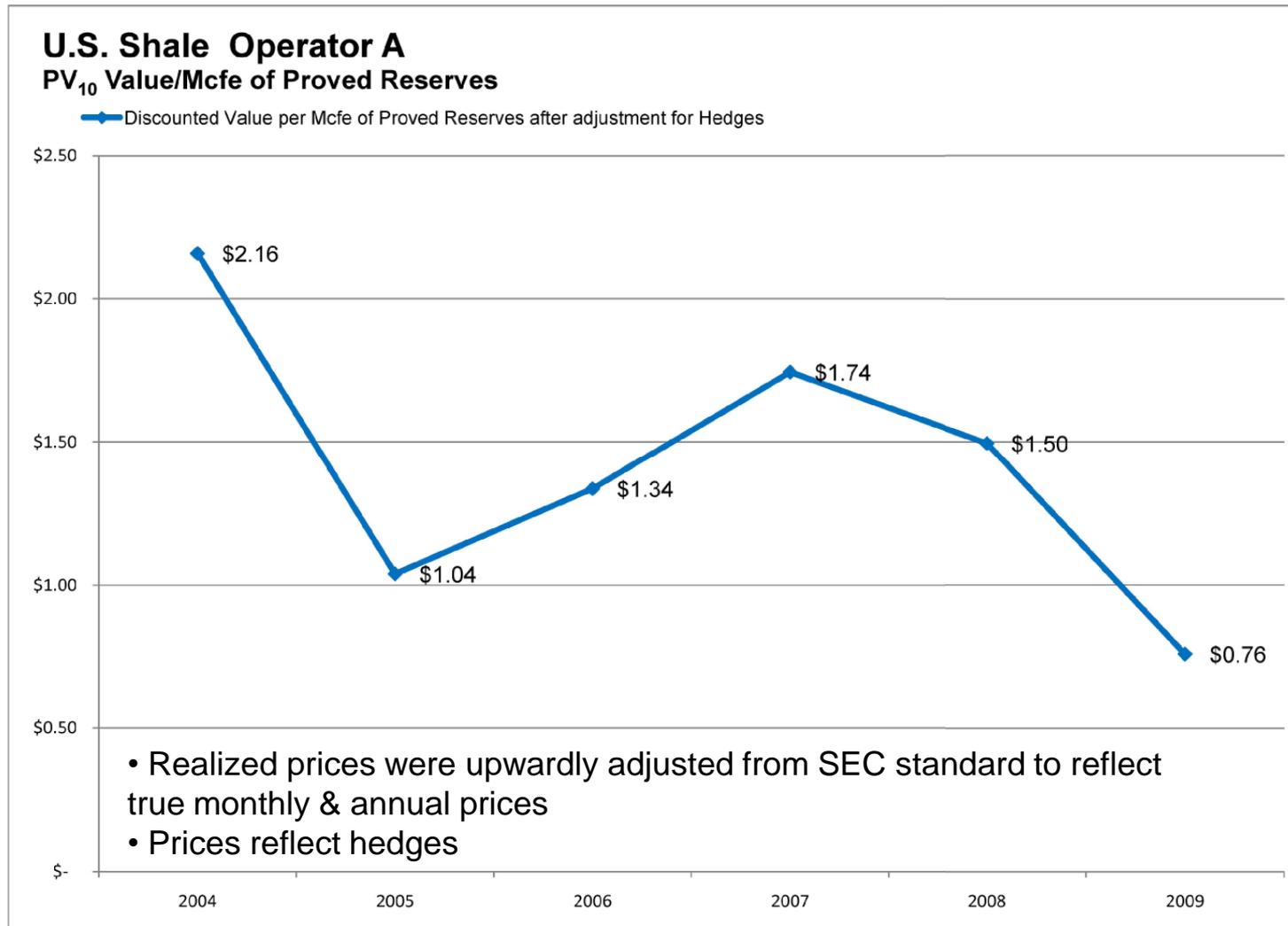
#### Proved Developed & Proved Undeveloped Reserves

- Proved Developed Reserves Mmcfe
- ◆ Proved Undeveloped Reserves Mmcfe



80% of reserves are undeveloped

## Discounted value of proved reserves has decreased over time



Do they have sufficient value to warrant development costs?

# Pursuit of low-value assets has hurt the shareholder

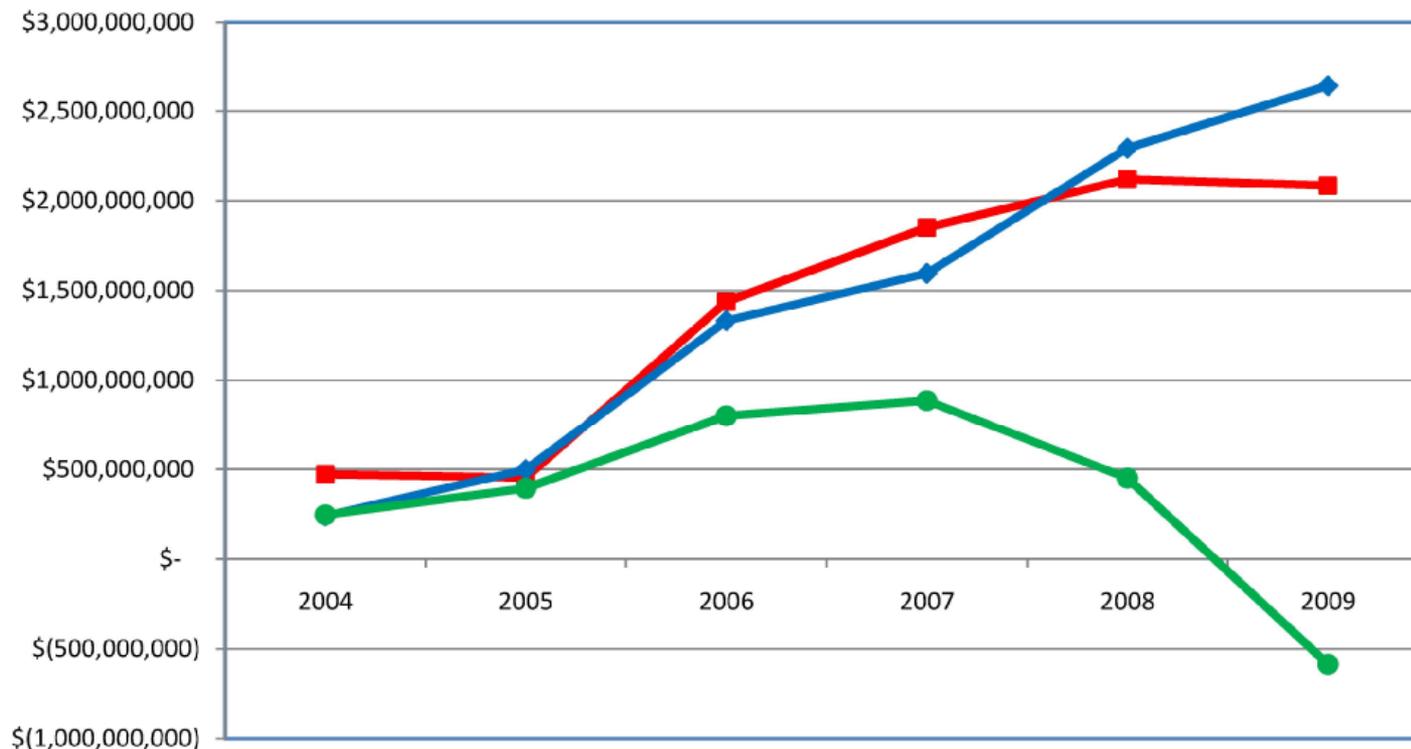
## U.S. Shale Operator A

### Six Year Operating Highlights (2004 - 2009)

■ Discounted Value of Proved Reserves after adjustment for Hedges

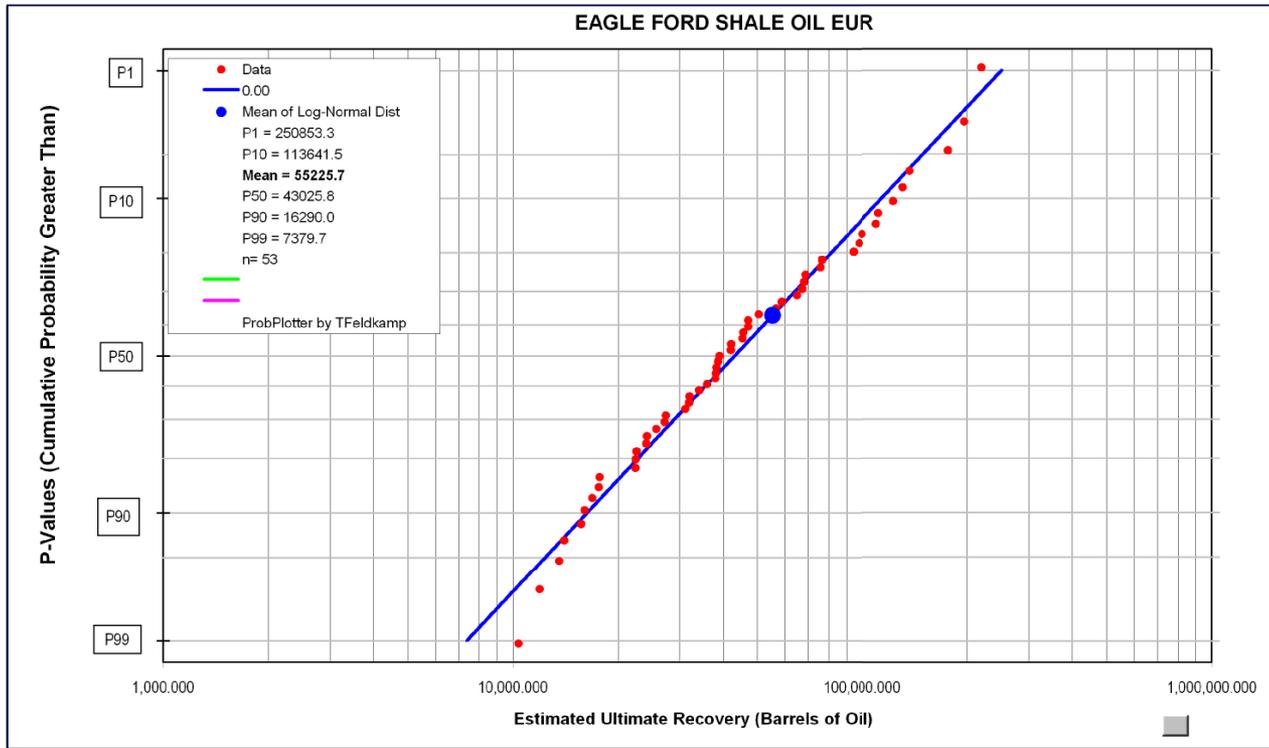
◆ Debt

● Stated Shareholder Equity less Goodwill and Shareholder Contributions during Period



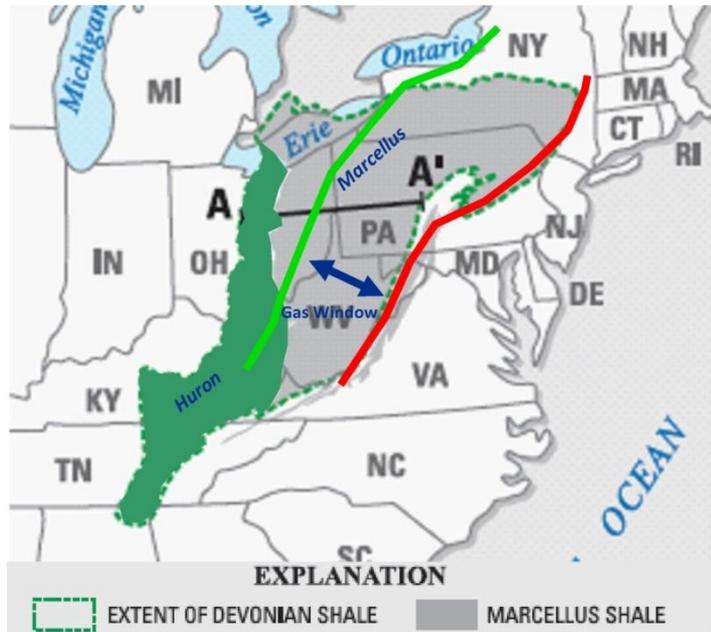
Why is there enthusiasm for growth with no earnings?

# Liquid-rich plays have been disappointing: Eagle Ford Shale example



- Mean EUR of 53 wells is 55,000 barrels of oil.
- $P_{50}$  is 43,000 barrels of oil,  $P_{90}$  is 16,000 barrels of oil.
- Well cost is \$6 million.
- Less than 20% of wells will be commercial based on early assessment.

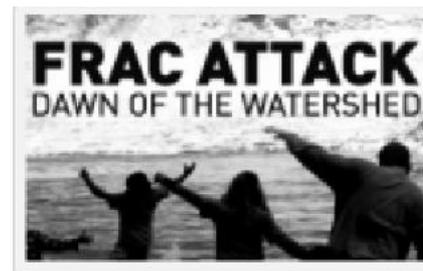
## Why the Marcellus Shale will disappoint expectations



- Infrastructure limitations will slow development:
  - Limited pipeline capacity,
  - Insufficient plants to strip NGLs,
  - Pipeline expansion from Rocky Mountains has minimized gas price differentials that existed a few years ago & made Marcellus attractive.
- The same financial fundamentals that have hurt other shale plays apply to the Marcellus:
  - difficulty identifying core areas,
  - high marginal costs to produce shale gas,
  - poor economics,
  - the play area is so large that a lot more capital will be destroyed than in other shale plays.

## Why the Marcellus Shale will disappoint expectations

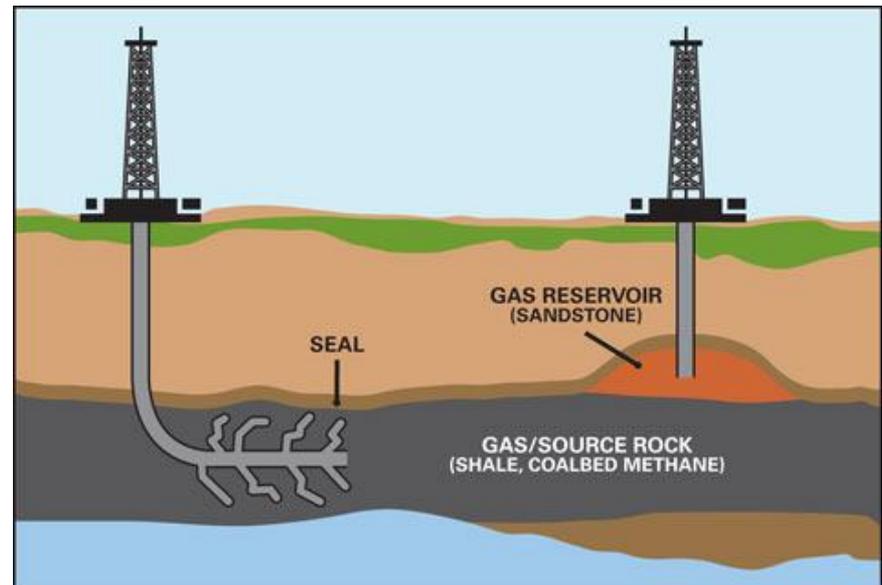
- Environmental issues will not go away:
  - hydraulic fracturing has contaminated aquifers in some areas,
  - proximity to urban areas & high population density mean heightened sensitivity,
  - also more difficult to put land deals together & get permits to drill,
  - think Santa Barbara or Florida.



*"When the town of Ithaca, New York gets fracked by natural gas drilling, the water goes sour and the citizens start craving human flesh. Anna and other survivors band together to save their community."*

## Natural gas abundance or mirage?

- The bubble is the land—gas is a by-product.
- Drilling adds value to the land by proving reserves.
- Drilling will continue as long as there is a market for tradable land & capital is available.
- The shareholder is the loser & is subsidizing cheap gas.
- The shift to liquid-rich shale plays is a distraction from the reality of poor underlying performance.
- For many companies, there is no turning back.
- Selling the company is not an option if there is little underlying value.
- Higher gas prices to the rescue?
- A day of reckoning will come.



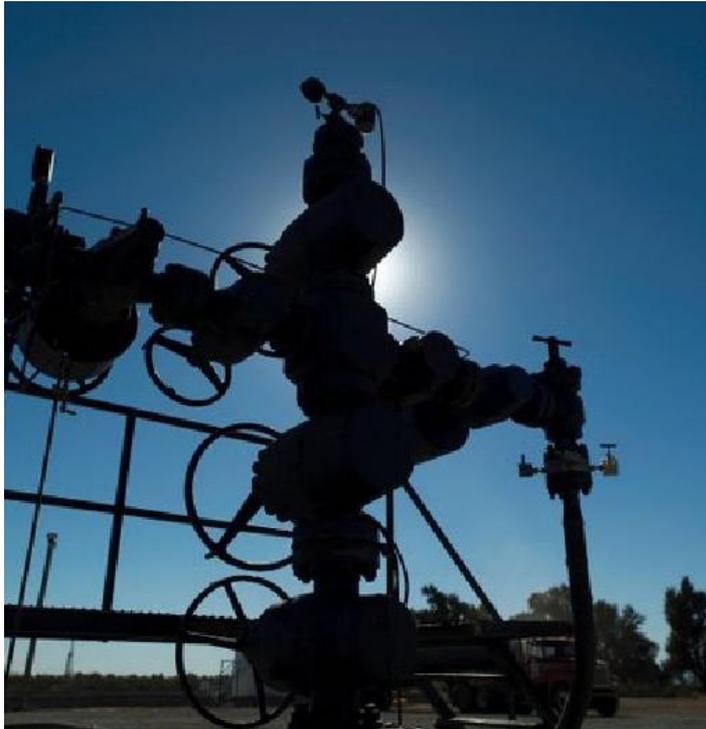
# Acknowledgments

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- Mike Bodell
- Allen Brooks
- Perry Fischer
- Robert Gray
- Jim Halloran
- IHS
- Lynn Pittinger
- Keith Shanley

# **North American Shale Gas**

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