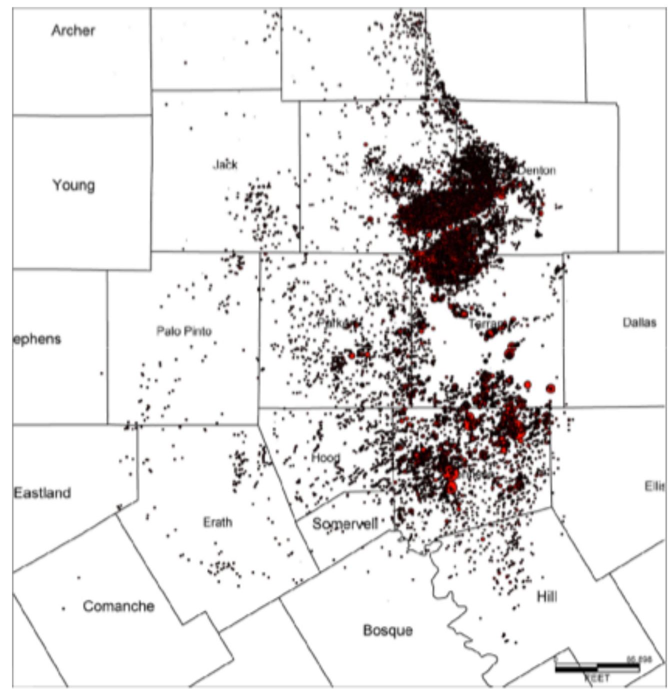
Doubts About Shale Plays

Implications of Exxon Mobil acquisition of XTO Energy



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February 2010

Acknowledgments

- IHS
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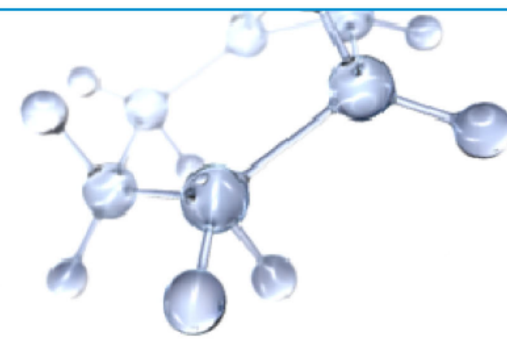
Exxon Mobil Acquisition of XTO Energy

- *Most analysts believe acquisition represents a dramatic shift by premier global E&P company*
- *Taken as a validation of shale plays*

ExxonMobil

Taking on the worlds' toughest energy challenges

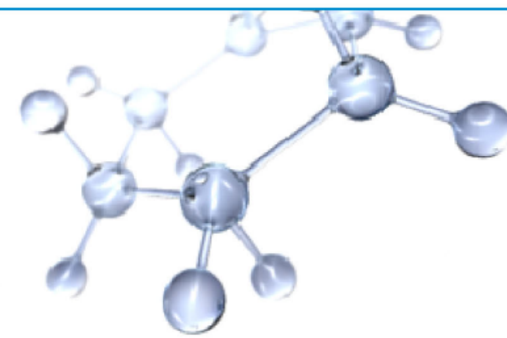


Exxon Mobil Acquisition of XTO Energy

- *The acquisition only seems dramatic to those who have not paid attention to XOM's strategy & portfolio mix over the past decade*
- *It is a validation that natural gas is the only short-term basis for North America's energy future: shale gas is an important component*
- *It is based on the assumption that much higher natural gas prices will be part of that energy future*
- *Rather than a validation of shale plays, it is a repudiation of the manufacturing approach to shale plays*

ExxonMobil

Taking on the worlds' toughest energy challenges



Background to the Shale Gas Problem

- *The mainstream belief is that shale plays have ensured North America an abundant supply of inexpensive natural gas that can be produced at a profit*
- *Little is known about most of the active shale plays upon which this belief is based—assumptions about decline rates are the sole support for large reserves*
- *There is considerable risk in shale plays because of their uncertain commercial outcome*

Premise of the Presentation: Why There is a Problem

- *Approach to shale plays destroys capital*
- *Reserves are overstated*
- *Costs are understated*

Why It is important

- *Policy and national security decisions are being based on the assumption of plentiful natural gas*
- *Massive capital investment in projects that have not yet demonstrated sustained value*
- *Risk has been misrepresented*

We are not alone!

SPE 119899

Economic Evaluation of Shale Gas Reservoirs
John D. Wright, SPE, Norwest Corporation

This paper was prepared for presentation at the 2008 SPE Shale Gas Production Conference held in Fort Worth, Texas, U.S.A., 16–18 November 2008.

Conclusions

1. There is wide range in EUR's and, according, a wide range in economic value for individual wells in the Barnett shale play.
2. At today's costs and prices it takes an ultimate recovery of about 550 to 900 MMCF to pay out a well.
3. Based on the economic assumptions used in this paper, 226 of the 389 wells studied (69%) had less than a 10% internal rate of return.
4. At today's costs and prices the 25th percentile areas based on EUR are not economically viable, the 50th percentile areas are almost economically viable, and the 75th percentile areas are reasonably economically viable.
5. Discounted profit to investment ratio is very sensitive to capital costs and gas prices and much less sensitive to operating costs.
6. In any given area, the top 5% of the wells based on ultimate recovery have a significant effect on the economic viability of the project.

"In our opinion, the potential impact of shale gas on total future North American production has been overstated. The entire gas resource needs to be examined with perspective."

--Richard Moorman,
Manager of Strategic Analysis,
Southwestern Energy Company

BernsteinResearch

The Degradation of Shale Wells and the Manufacturing Myth

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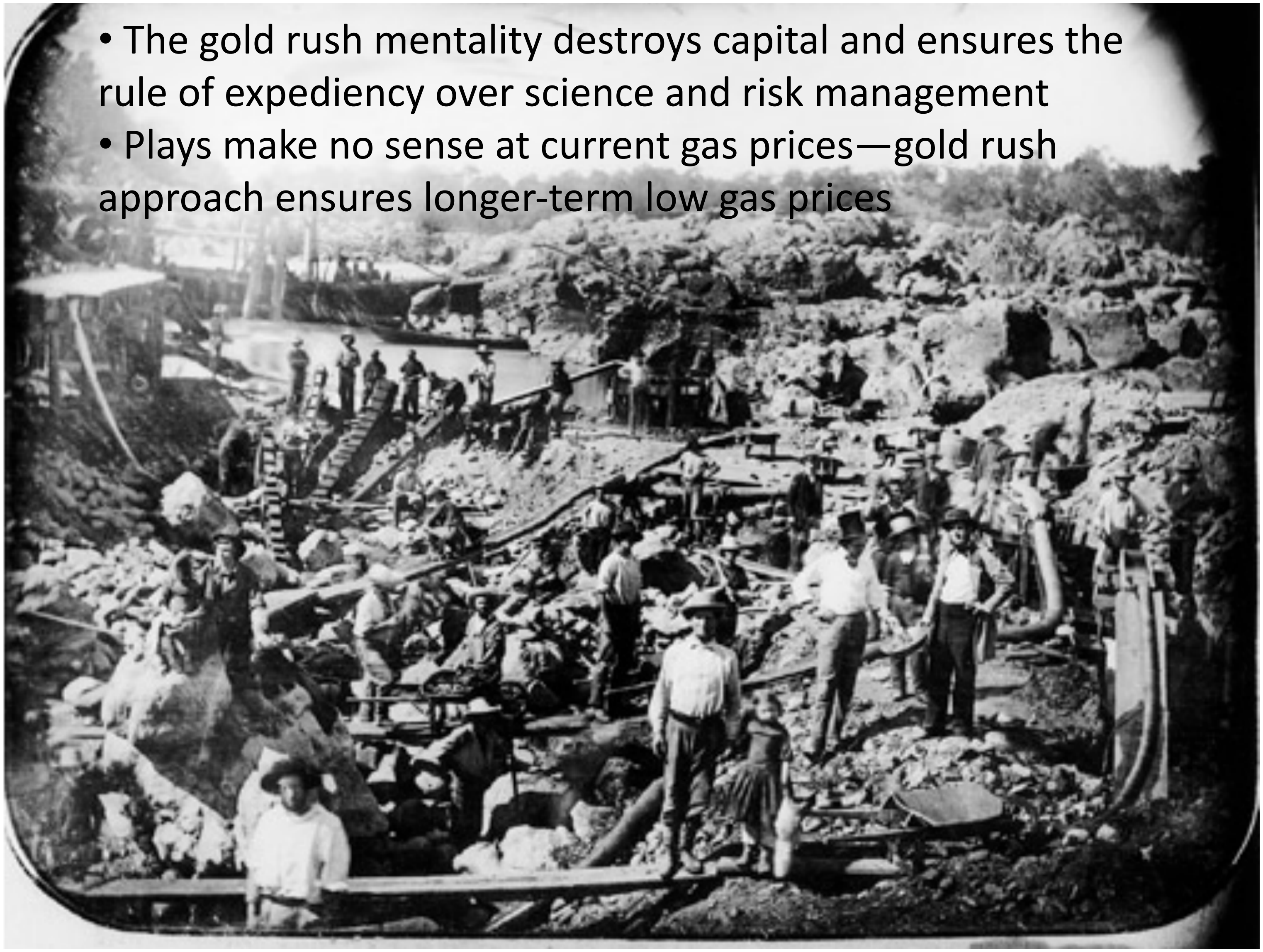
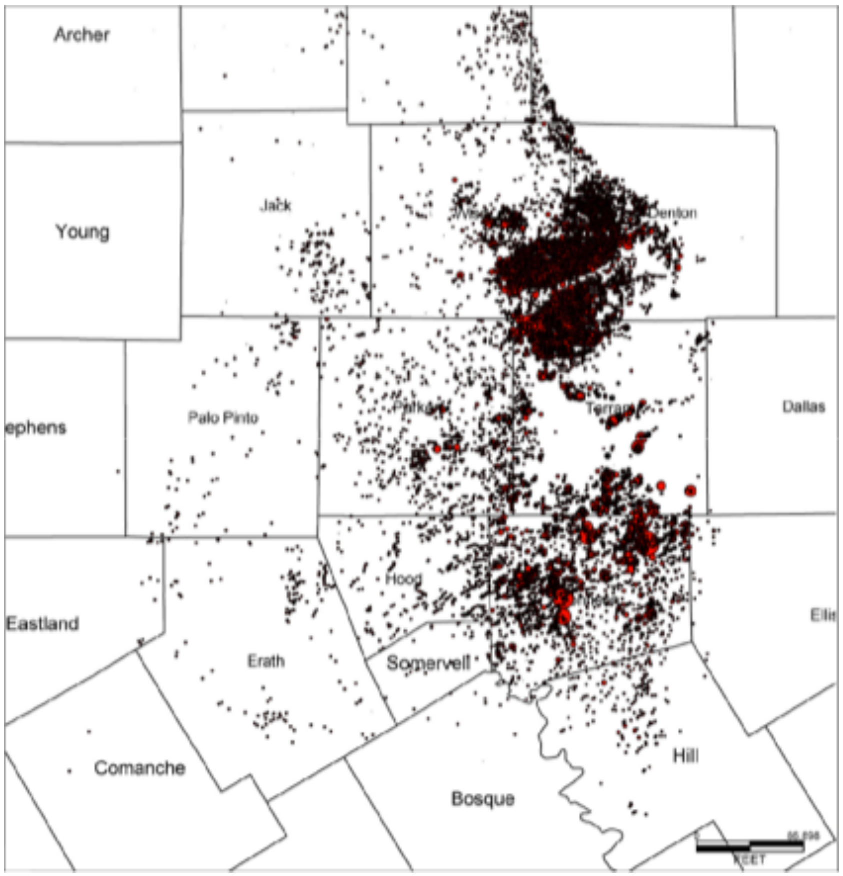
Approach to shale plays destroys capital

- The gold rush mentality destroys capital and ensures the rule of expediency over science and risk management
- Plays make no sense at current gas prices—gold rush approach ensures longer-term low gas prices



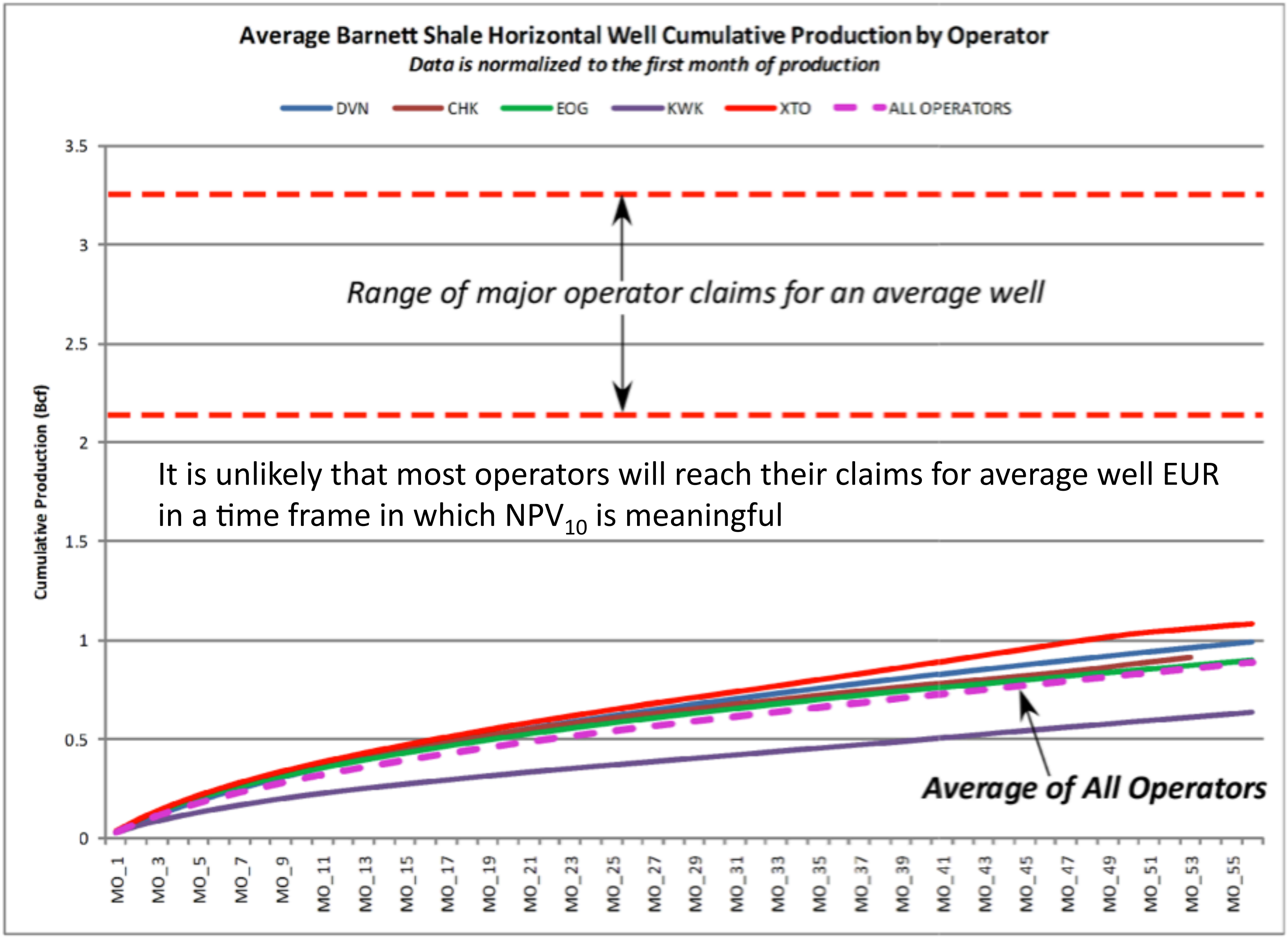
Manufacturing Paradigm born in the Barnett Shale Play:
<u>Shoot, ready, aim!</u>



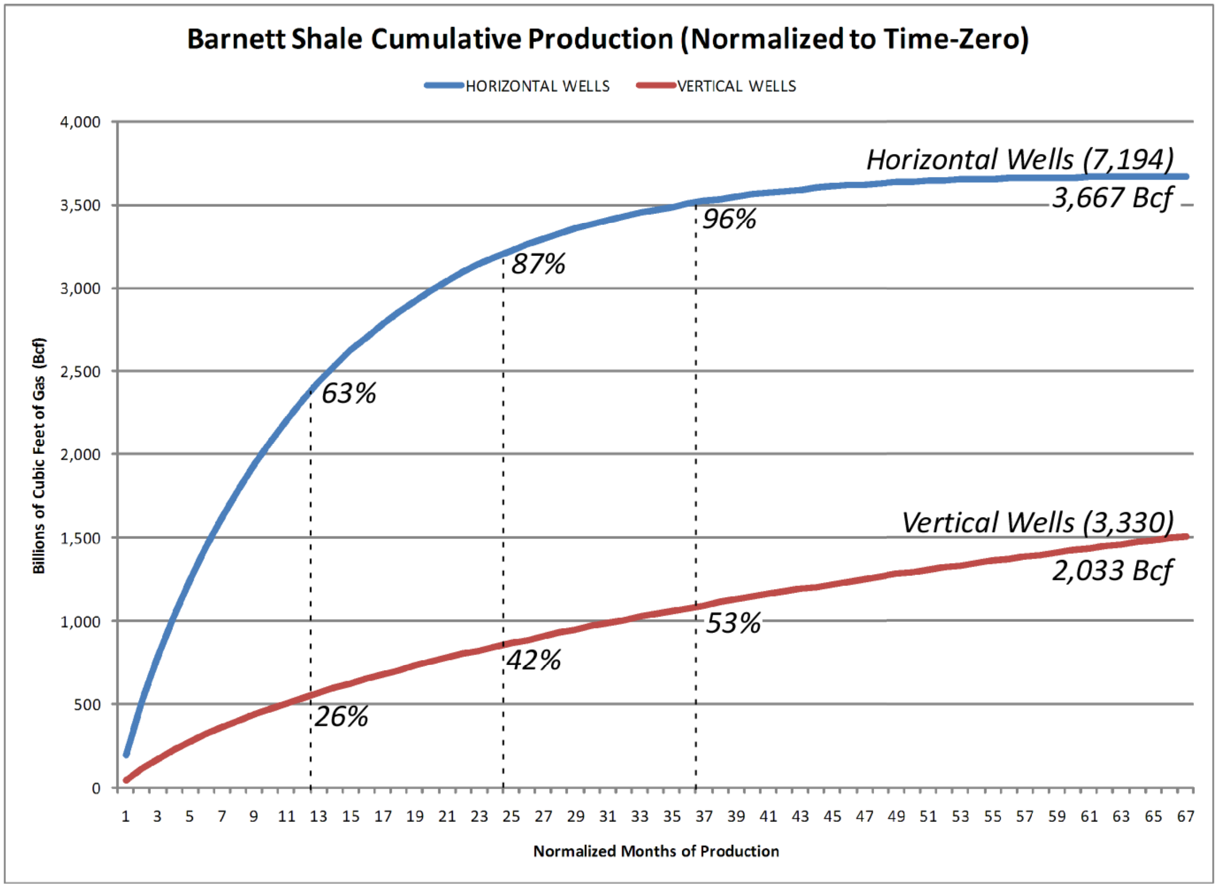
- Indiscriminate leasing in an acreage rush
- Announce success & resource size
- Lease-driven drilling campaign
- Find the sweet spot by the Braille Method after 12,000 wells drilled
- Do the hard science
- CHK has spent $1.2 MM/well on acreage for shale plays (Bernstein Research, January 2010)

"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

Reserves are overstated

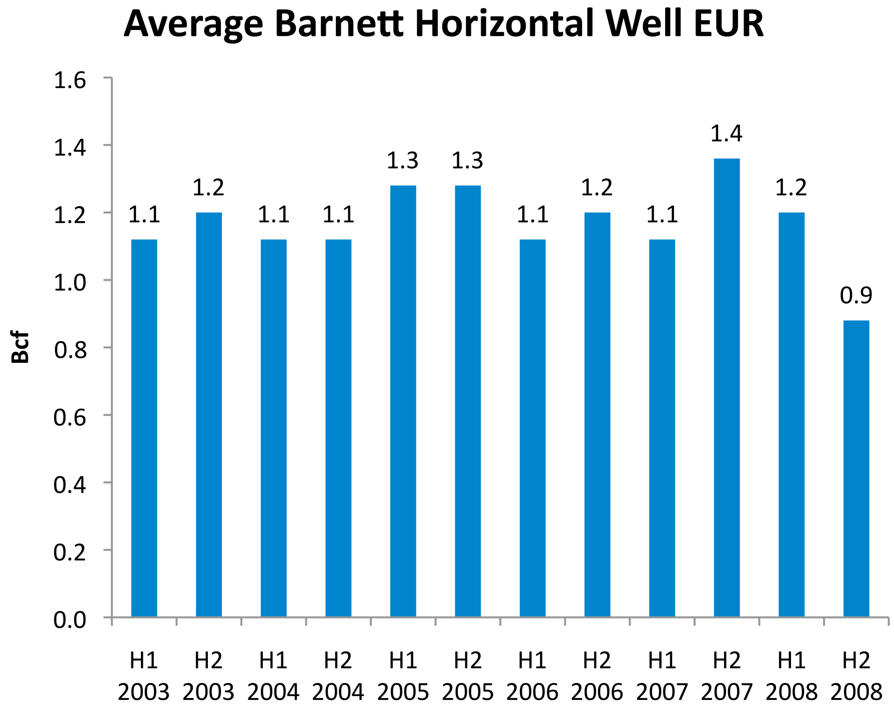


Rapid decline rate for horizontal wells



- **63% of cumulative was produced in the first year, 87% in the first two years, and 96% in the first three years—little long-term value despite claims of 40-65 year well life**
- **The Drilling Treadmill: high decline rates mean that wells must be continually drilled to prevent production from falling**

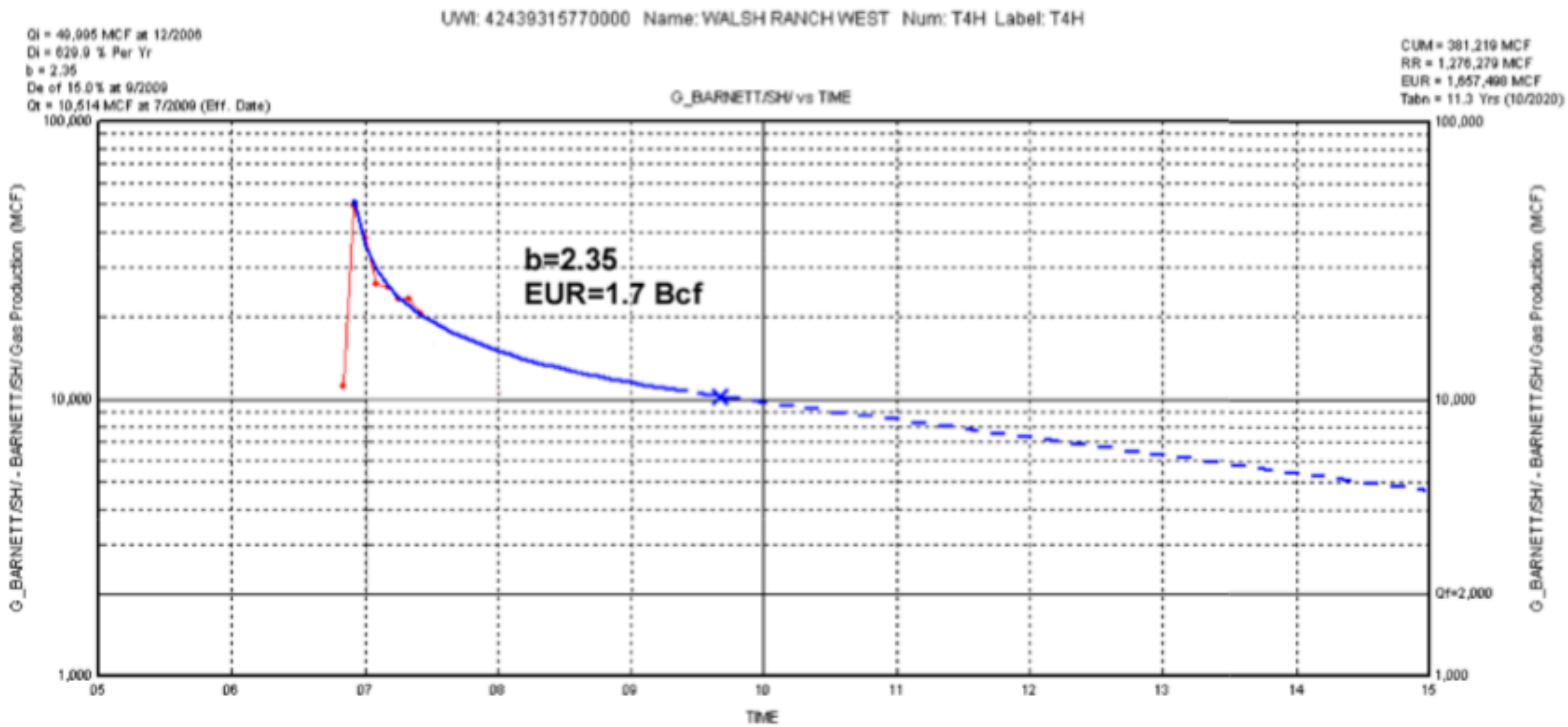
Average (most-likely P_{50} case) Barnett horizontal well EUR is not commercial



Avg EUR Bcf	Number Wells	Weighting Factor
0.9	1417	1,247
1.0	0	0
1.1	2037	2,281
1.2	2299	2,759
1.3	762	975
1.4	1291	1,756
	7806	9,018
Avg EUR Bcf	1.16	

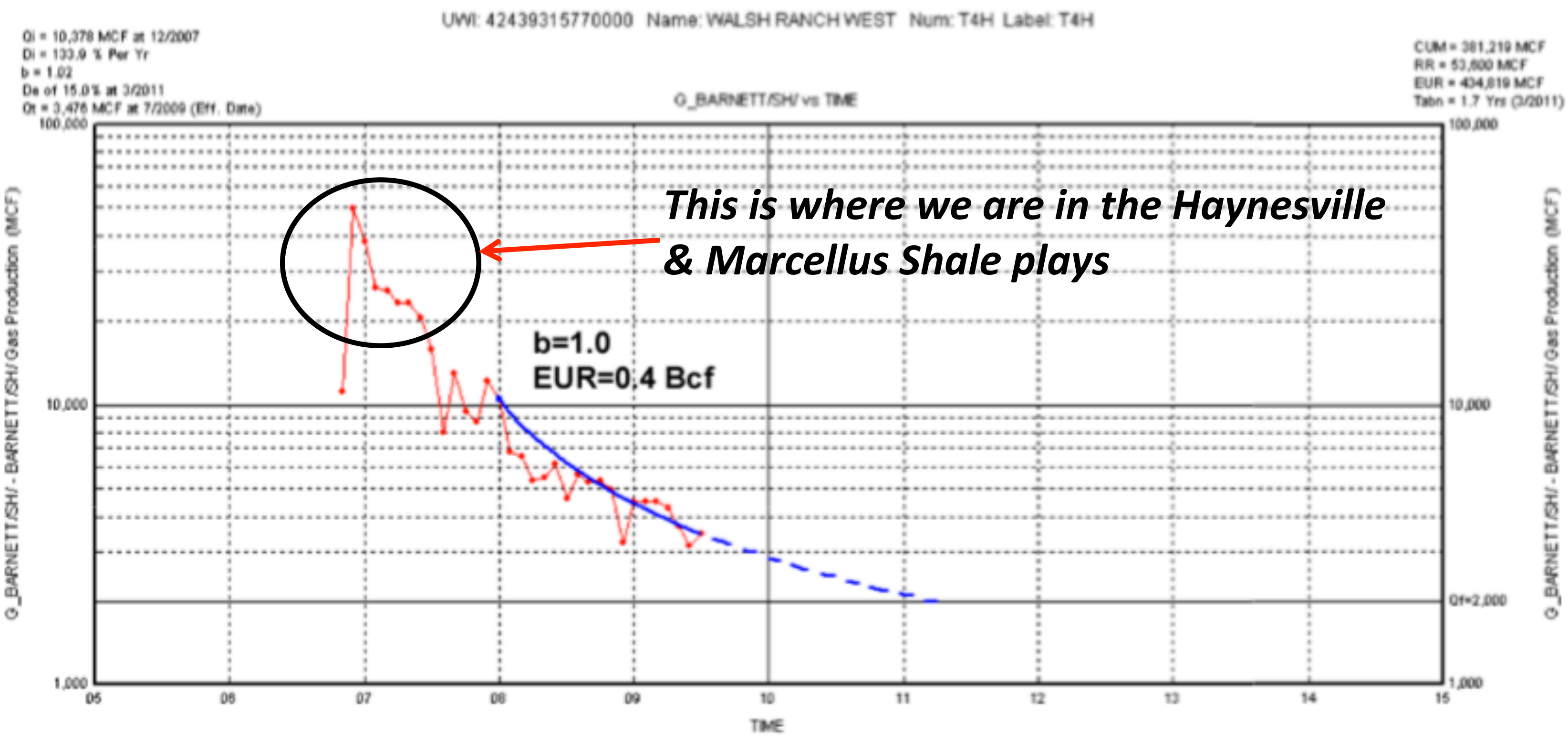
- *Average EUR is 1.2 Bcf/well using optimistic assumptions (probabilistic Bcf range of 1.0 P_{75}—1.2 P_{50}—1.4 P_{25}): break-even threshold is 1.5 Bcf @ $7/Mcf Henry Hub gas price*
- *Maximum average EUR reached in wells with first production in H2 2007*
- *Most recently completed wells (H2 2008) have lower EUR than any previous period*

Why EUR projections are too optimistic : 2007 projection



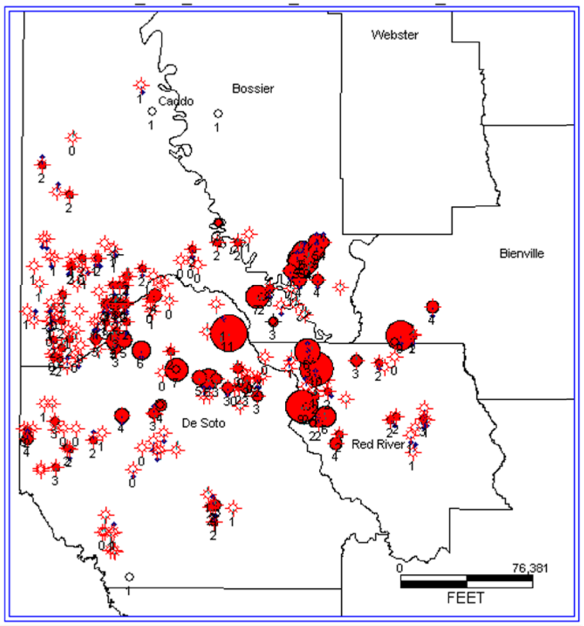
Departure from hyperbolic decline trajectory in many of wells

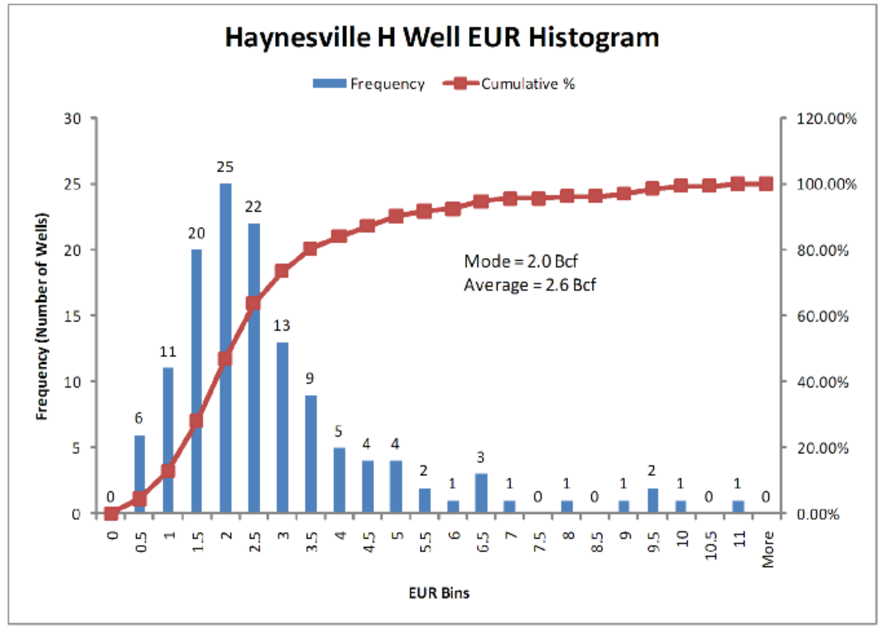
Why EUR projections are too optimistic: 2009 projection



- Liquid loading determines production limit is most probable cause
- Induced fractures close at pressure drawdown threshold?
- What is drainage area of the well?
- What is the cost benefit of a re-frac?

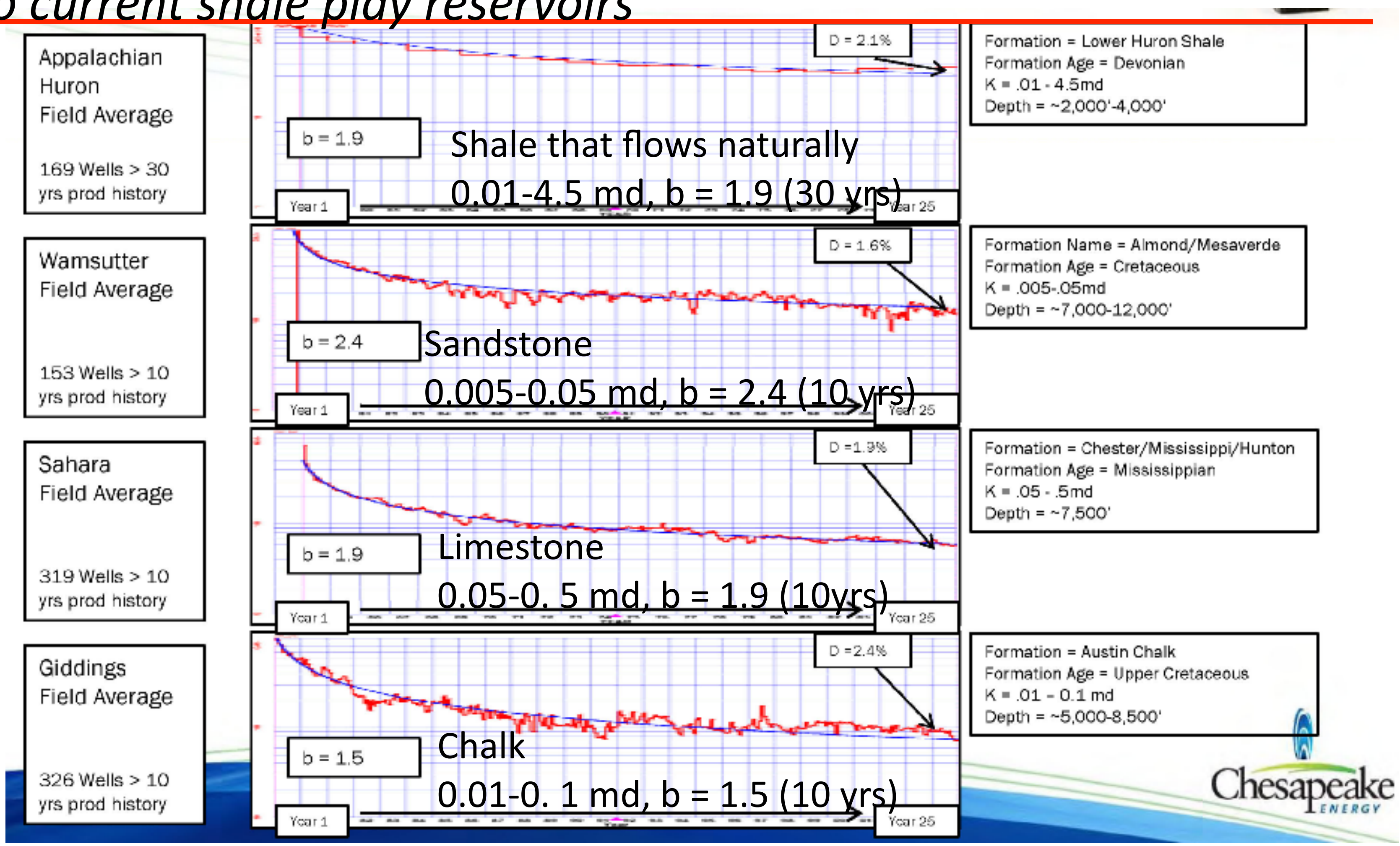
How are we doing in the Haynesville Shale?





- *Map shows wells with EUR > 1.5 Bcf (132 wells used in this study)*
- *Best wells are 8-11 Bcf EUR*
- *Only 25% of wells > 3 Bcf EUR (no terminal decline, 1 MMcf/mo production limit, very optimistic hyperbolic decline model)*
- *Only 10% of wells projected to reach commercial threshold of 5-6 Bcf EUR*
- *Areas not equal: Petrohawk's wells much better than other operators (4-4.5 Bcf EUR)*
- *Not a manufacturing play*

Operator optimism based on analogues that are not comparable to current shale play reservoirs



•And all have orders of magnitude better reservoir quality than current shale-play reservoirs: range of permeability for shale plays is 0.00005-0.0003 md!

- Few wells with > 10 years of production, none with 40-65 years, & few total wells
- Water-free production characterizes these examples but is a rare phenomenon

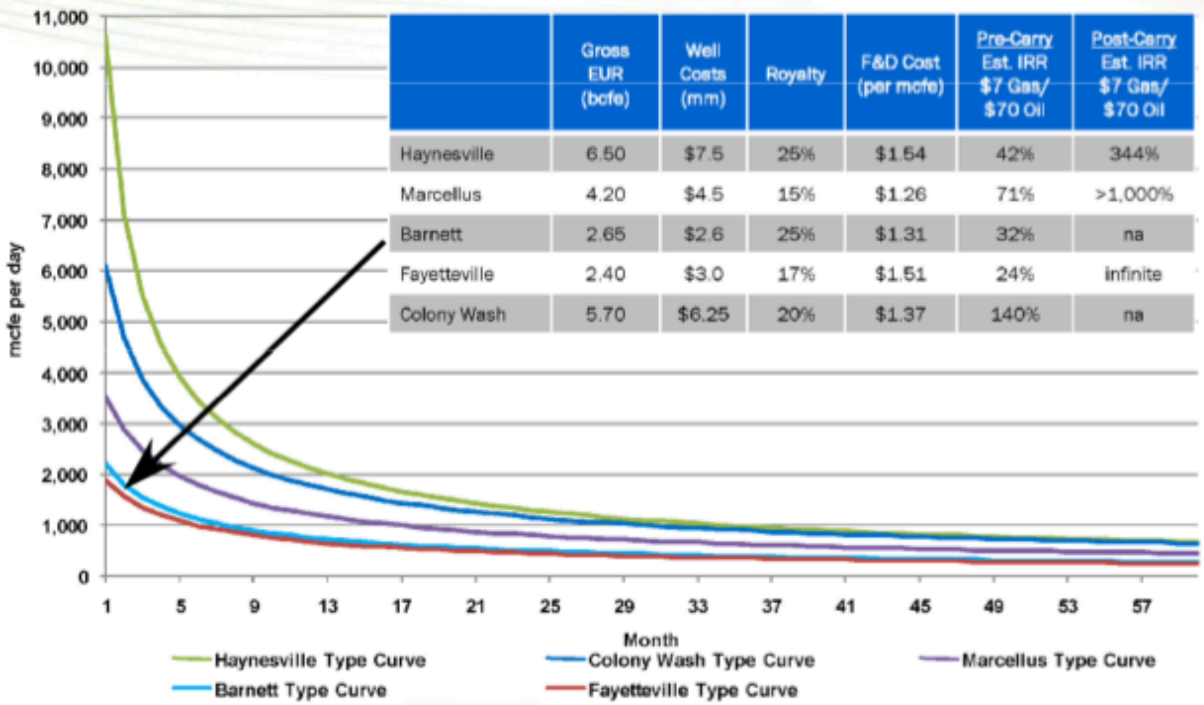
How do they arrive at such optimistic forecasts?

August 2009 Investor Presentation

CHK Play Comparison

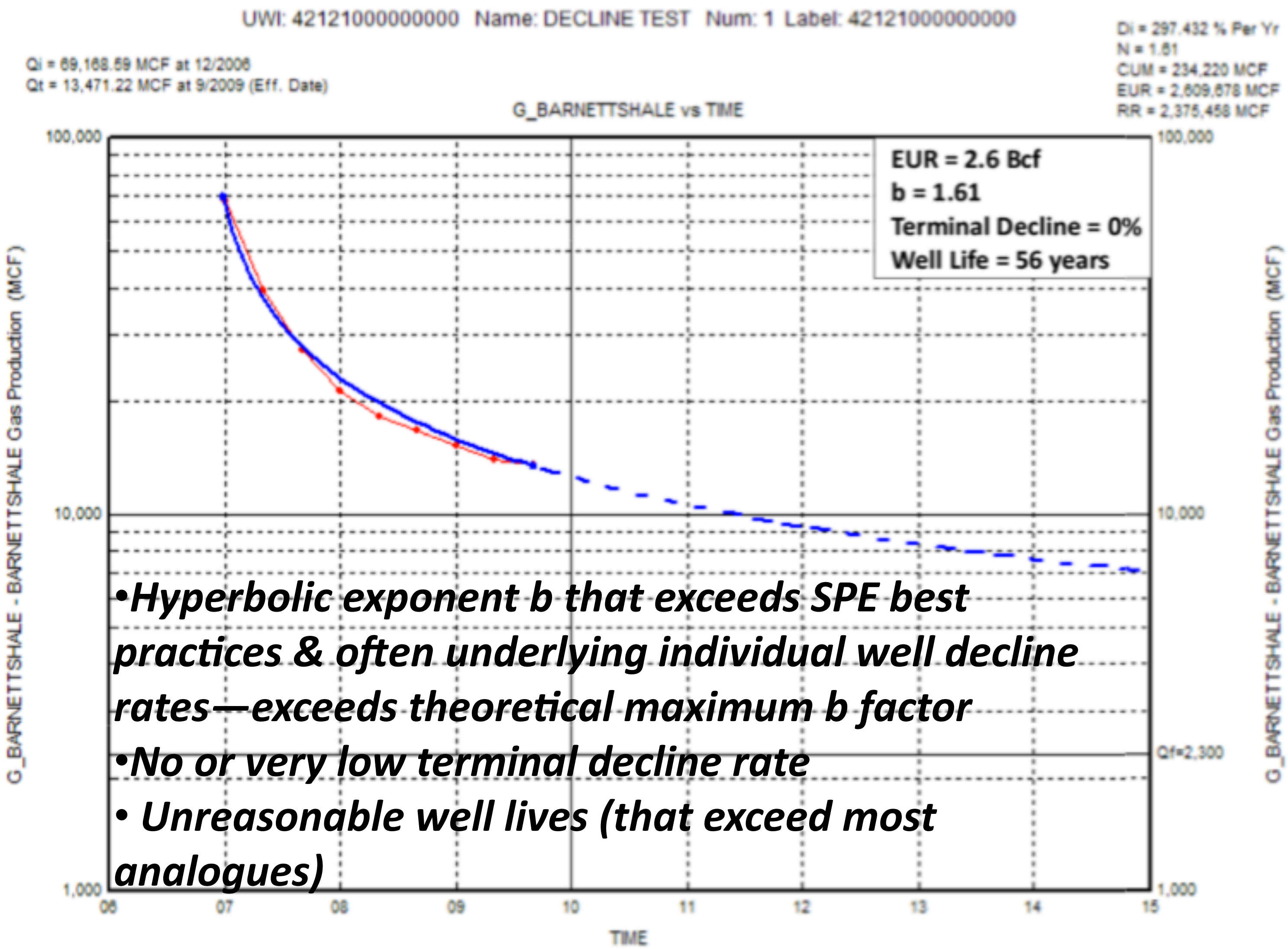
POWERFUL ASSETS

	Gross EUR (bcfe)	Well Costs (mm)	Royalty	F&D Cost (per mcfe)	Pre-Carry Est. IRR $7 Gas/ $70 Oil	Post-Carry Est. IRR $7 Gas/ $70 Oil
Haynesville	6.50	$7.5	25%	$1.54	42%	344%
Marcellus	4.20	$4.5	15%	$1.26	71%	>1,000%
Barnett	2.65	$2.6	25%	$1.31	32%	na
Fayetteville	2.40	$3.0	17%	$1.51	24%	infinite
Colony Wash	5.70	$6.25	20%	$1.37	140%	na



Chesapeake ENERGY

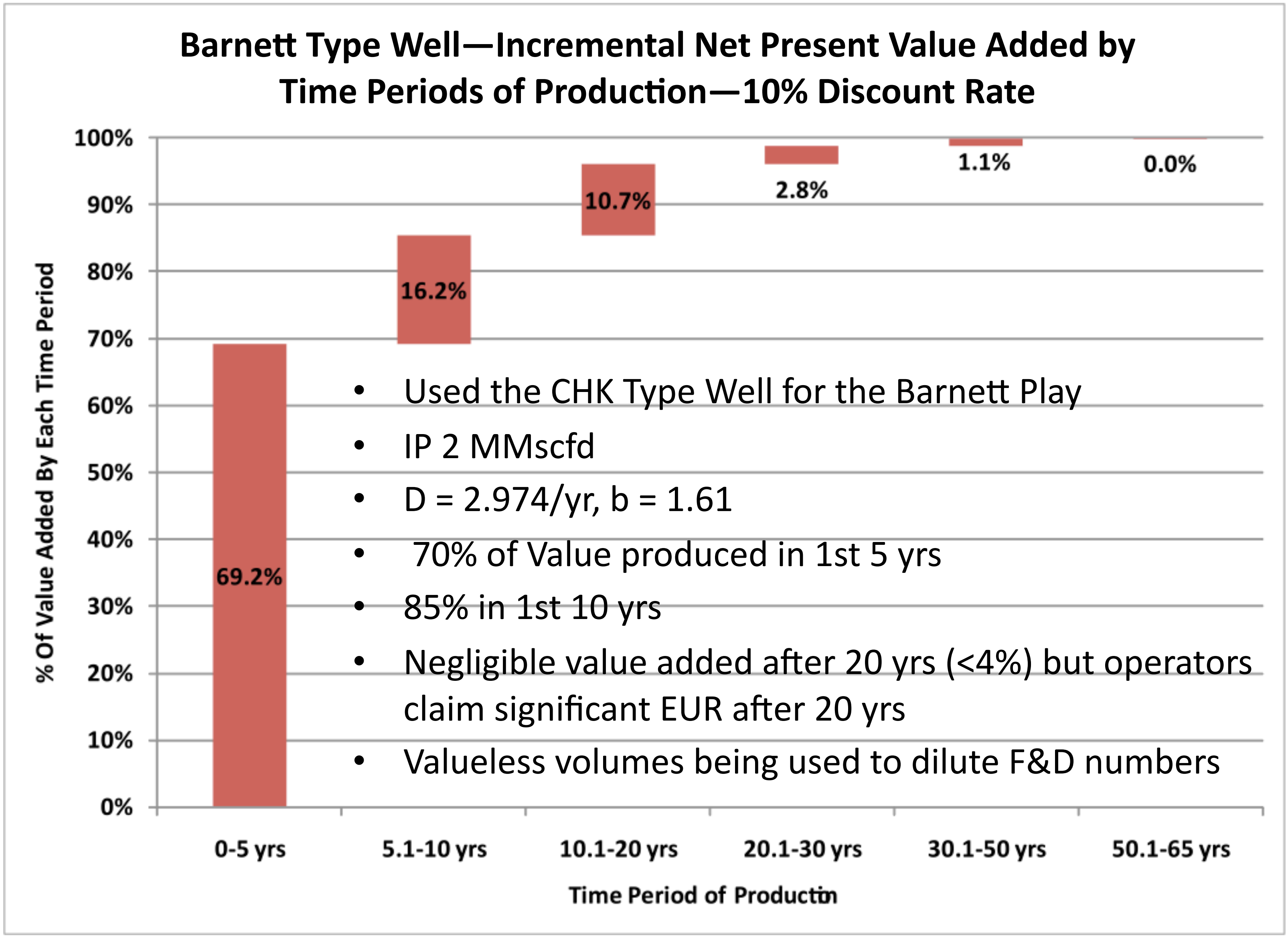
How do they arrive at such optimistic forecasts?



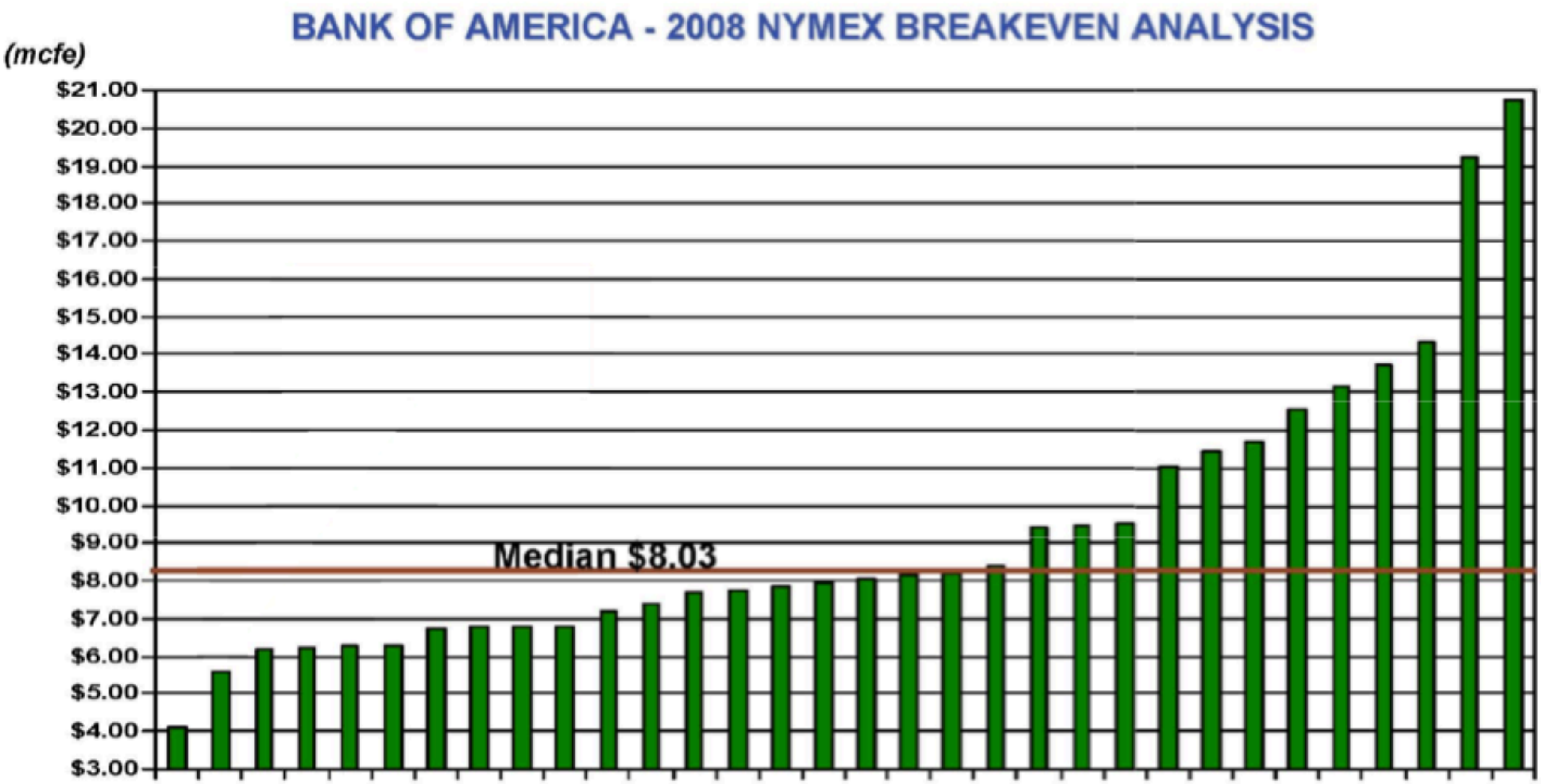
- ***Hyperbolic exponent b that exceeds SPE best practices & often underlying individual well decline rates—exceeds theoretical maximum b factor***
- ***No or very low terminal decline rate***
- ***Unreasonable well lives (that exceed most analogues)***

Data provided courtesy of IHS Inc. However, the analysis and opinions expressed here are solely those of the author and do not represent those of IHS or any other organization.

How Important Is Assumed Well Life?



Costs are understated



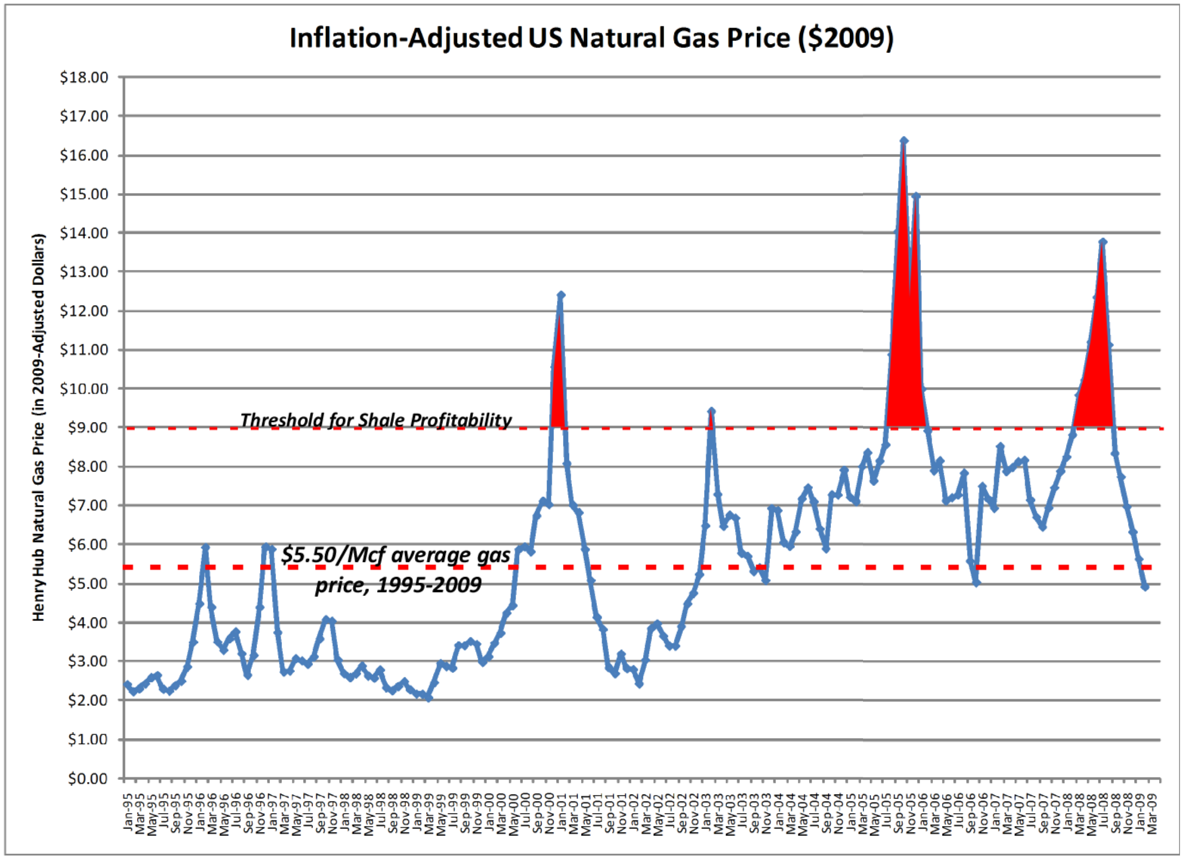
- Operators claim that shale plays are "low cost" compared to conventional plays
- Costs stated in investor presentations are less than those in public filings
- Typically exclude "sunk costs" like lease expense & geophysics

Unit costs are understated

TYPICAL SHALE COMPANY COSTS	
	$/Mcfe
Lease operating expenses	$1.00
Gathering & Transportation	$0.50
Production taxes	$0.50
Total Lease Operating Expense	$2.00
General and Administrative Costs	$1.00
Interest expense	$1.50
TOTAL OPERATING EXPENSE	$4.50
Drilling Cost	$2.00
Acreage Acquisition Cost	$1.50
TOTAL UNIT COST	$8.00

- *Companies state shale profitability at less than $5/Mcf gas price, but their average unit cost is more than that*
- *If reserves are overstated, unit costs will be higher*
- *Costs do not include re-fracs and workovers—no record of these operations or costs*
- *Some companies capitalize interest expense*
- *Plugging liability never considered*
- *Debt repayment not considered*
- *Hedging has helped minimize losses since price collapse, but difficult to find attractive hedge prices for significant volumes in low-cost environment*
- *Many operators are losing money on each unit of gas after hedges*
- *We're losing money but making it up on volume!*

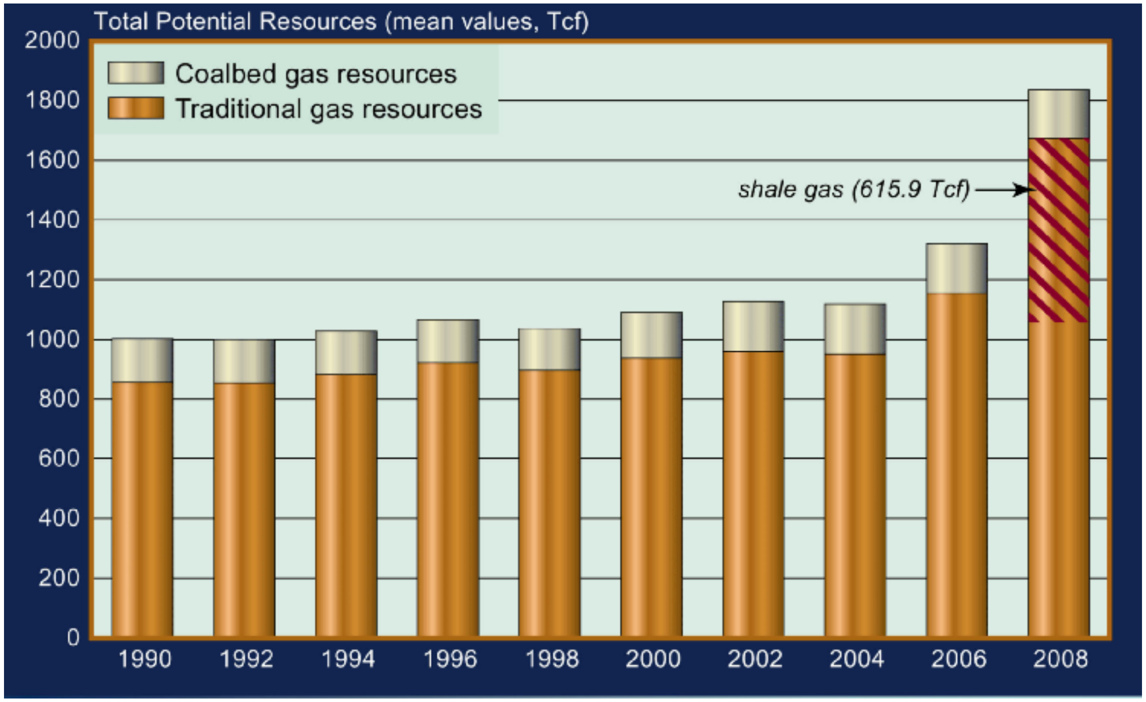
Higher gas prices will save the day



- *Average inflation-adjusted gas price since 1995 is $5.50/Mcf*
- *Gas prices necessary to make shale plays profitable have only existed for brief periods since deregulation*
- *All previous gas price spikes because of storage shortfalls/decreased gas-directed drilling*
- *Opposite is occurring now: storage surplus*
- *If shale gas development continues at current pace, unlikely to get a new spike to save the day*
- *Why should the market reward the lack of drilling discipline by the shale operators?*

What is the premise of 100 years of natural gas supply?

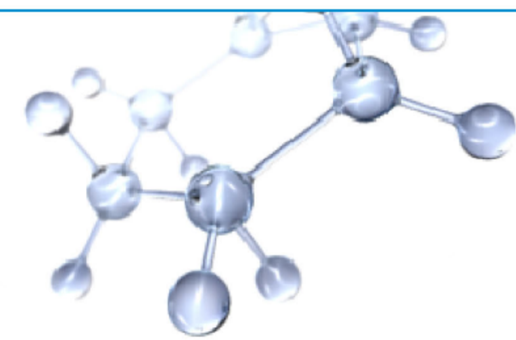
- *Potential gas committee report: 1,836 Tcf technically recoverable resources + 238 Tcf proved (~90 years supply @ current demand)*
- *616 Tcf (about 1/3) is shale gas*
- *The probable component of total resource is 441 Tcf (~ 20 years supply)*
- *About 150 Tcf (1/3) of that is shale gas*
- *Approximately 6 years of shale gas supply at current consumption rates*
- *That's a lot of gas from shale, but not what is generally perceived*
- *Operators claim more than that in both the Haynesville and Marcellus plays*



ExxonMobil Acquisition of XTO Energy

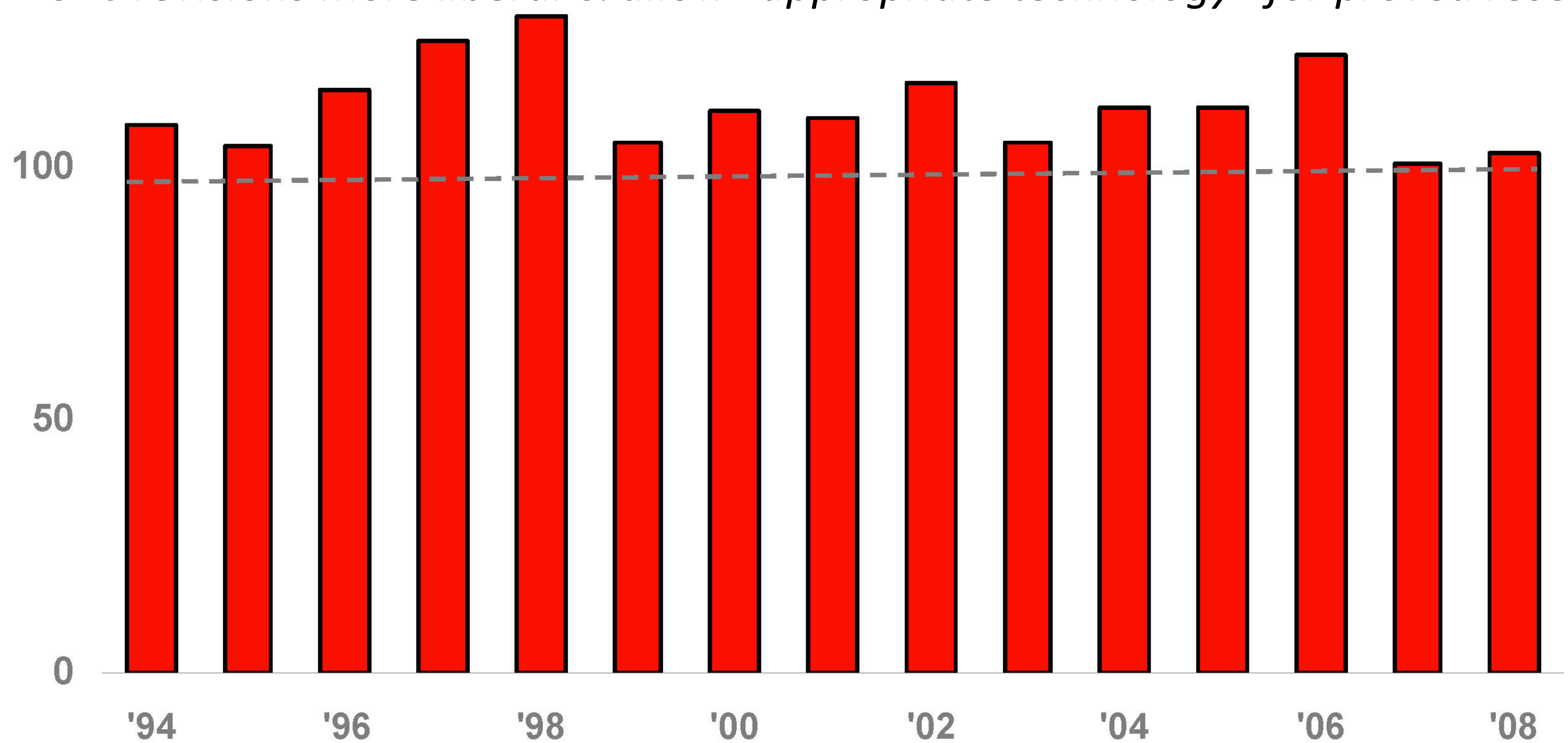
- *$31 billion in stock & assumption of $10 billion of debt--25% premium above XTO stock price (XTO P/E ratio =12.8)*
- *Condition that Congress does not restrict hydraulic fracturing*
- *Viewed as a dramatic shift by premier IOC to bet on U.S. unconventional gas*
- *Taken as a validation of shale gas plays*

Taking on the worlds' toughest energy challenges

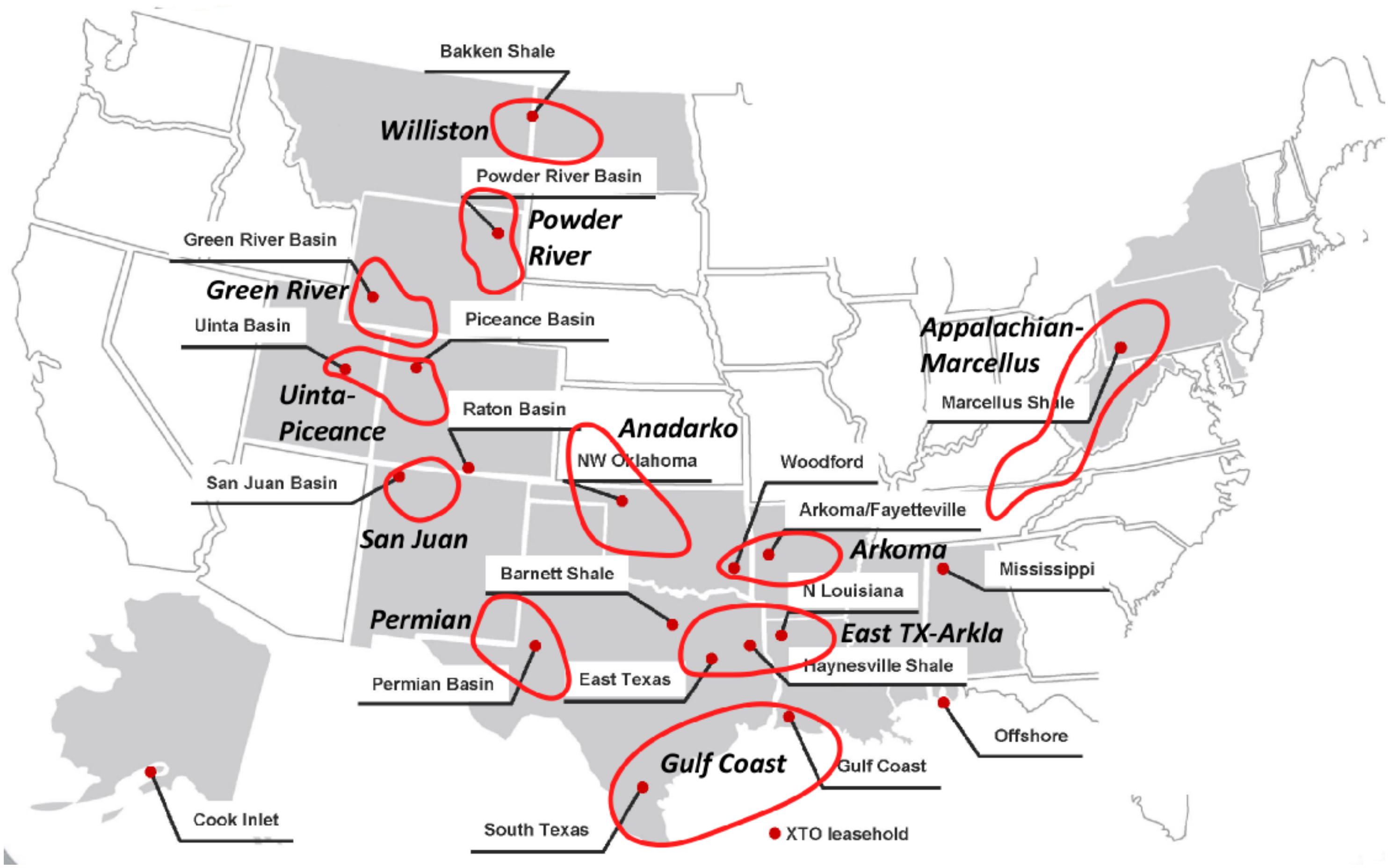


Acquisition driven by XOM's need to add reserves

- *2007 & 2008 were the company's worst years ever for reserve additions*
- *2008 additions reported as 103%*
- *Without Canadian oil sands, replacement would have been 27% (LaVine, 2009)*
- *Loss of Venezuela oil sands another blow*
- *Other accounting maneuvers with Qatar LNG*
- *Unconventional gas represents the only remaining scalable resource*
- *SEC revisions more liberal & allow "appropriate technology" for proved reserves*



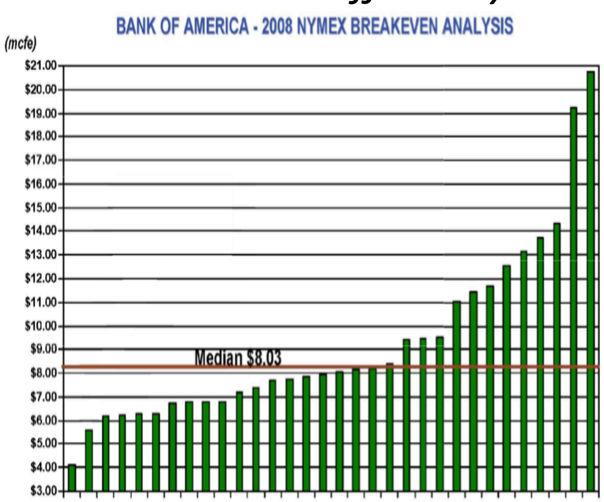
XTO has gas production and positions in many plays

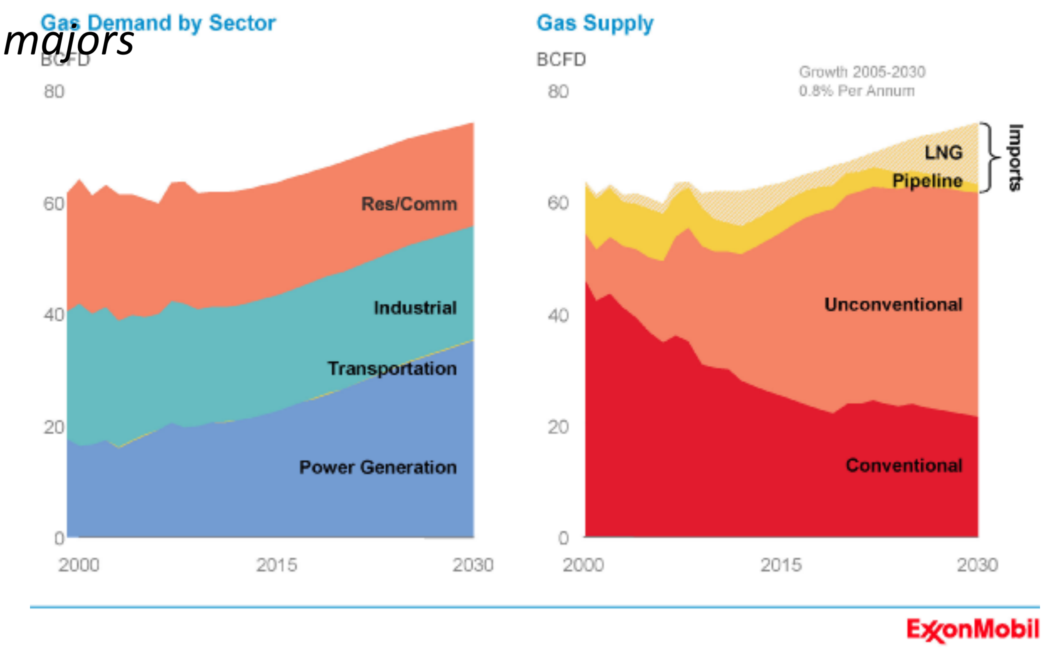


XTO has great representation in the shale plays, but 83% of production is from tight gas, conventional gas, and coal-bed methane

Long-term natural gas prices will increase

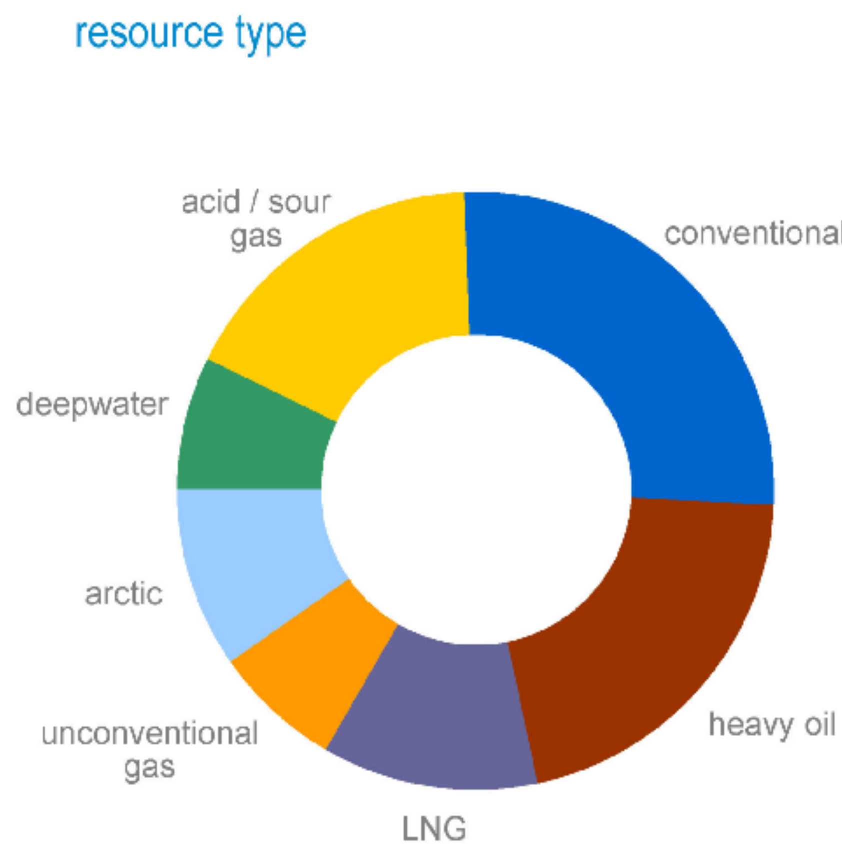
- *Energy demand will grow, gas is the answer*
- *Coal, nuclear will take 10-15 years start-up, other alternatives farther in future, LNG?*
- *Oil is controlled by NOCs: consuming more, less to export*
- *Gas is abundant in the U.S. and Europe—at some cost, there is plenty of gas*
- *XOM knows the truth about shale play reserves & costs*
- *Some companies in shale plays are surviving on borrowed money and hedges: not sustainable*
- *Price must accommodate marginal cost of production*
- *Some companies will fail or be acquired*
- *XOM will be there to harvest the better assets*
- *Shale gas the best of a bad lot for majors*
- *XOM hallmark is efficiency*





XTO acquisition only a dramatic shift to those not paying attention

- *ExxonMobil's portfolio has reflected growing importance of unconventional oil and gas for at least a decade*
- *Company has been "bullish" on shale plays since 2003 (Tim Cejka, President Exxon Mobil Exploration Company)*

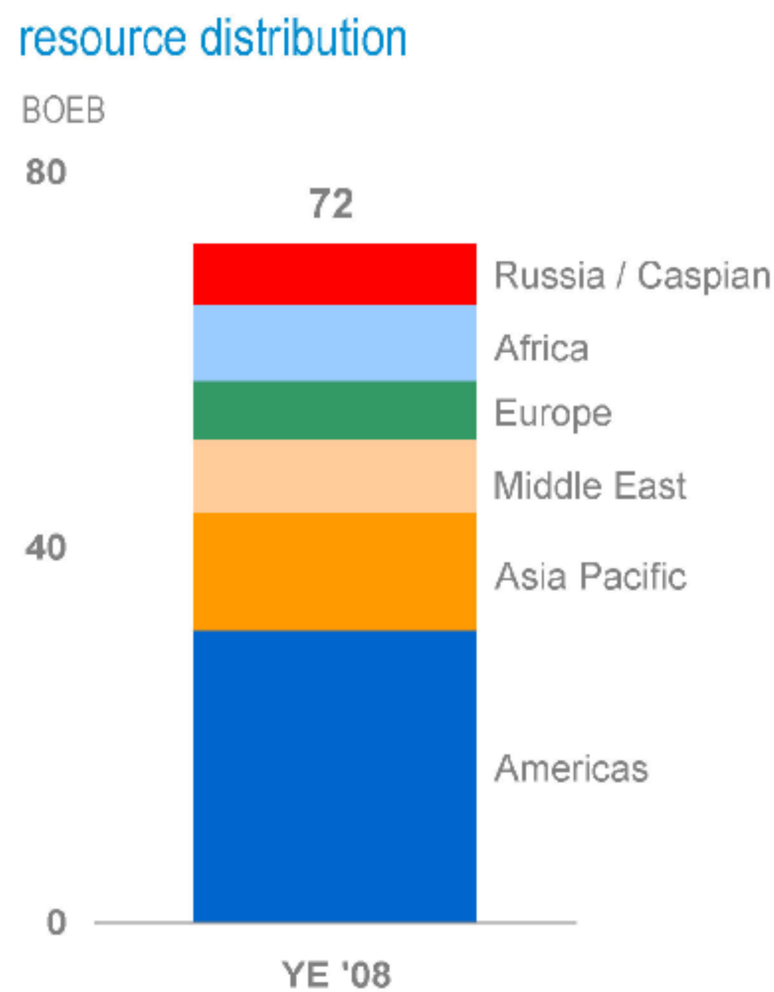


"It's not a strategic shift."

David Rosenthal, Exxon Mobil VP Investor Relations

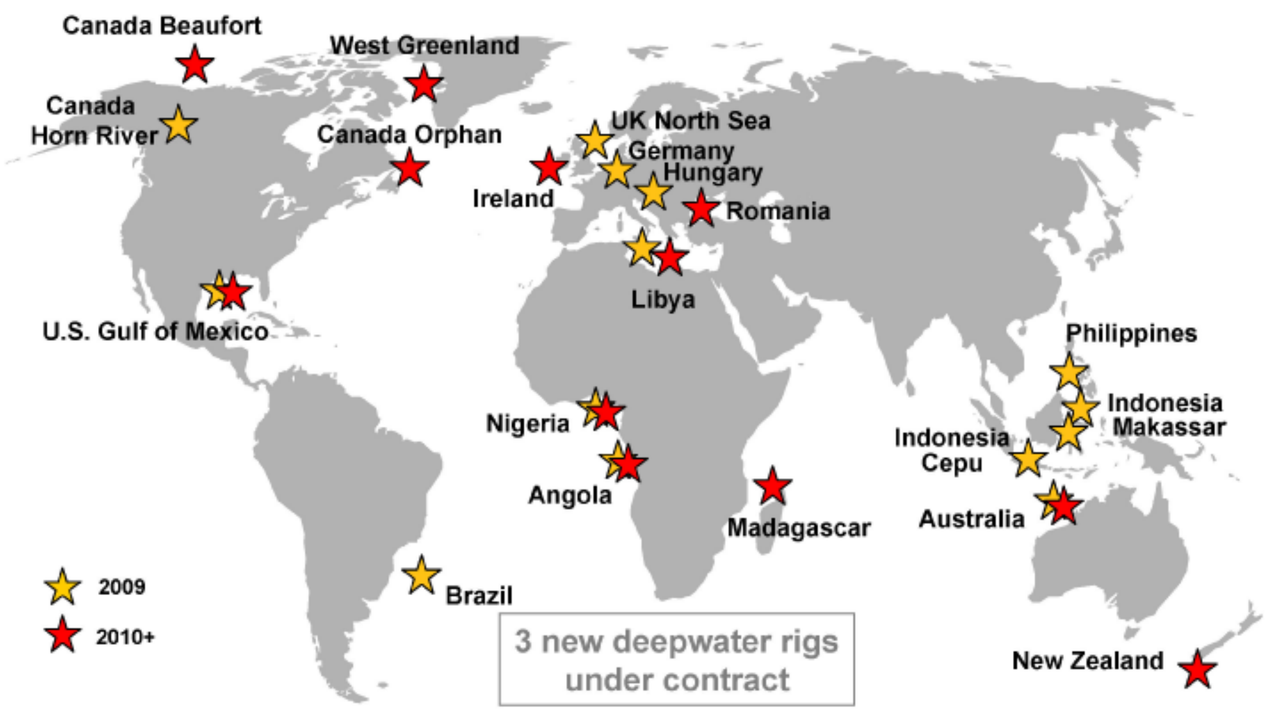
Only a dramatic shift to those not paying attention

- *Winner's Curse speech by Kurt Rudolf at AAPG Annual Meeting in Long Beach, 2007-- few new opportunities not already captured in international arena*
- *XOM applied petroleum system/ basin analysis methods to North American basins*
- *XTO was determined to be best fit after deliberate & comprehensive evaluation & ranking*
- *Opposite approach to Gold Rush*
- *Showcased Piceance Basin tight gas sand play: Multi-zone stimulation technology*
- *Most resources currently in Americas*

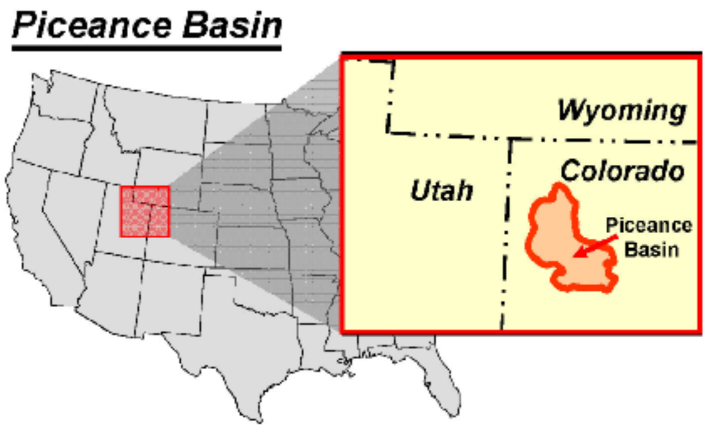


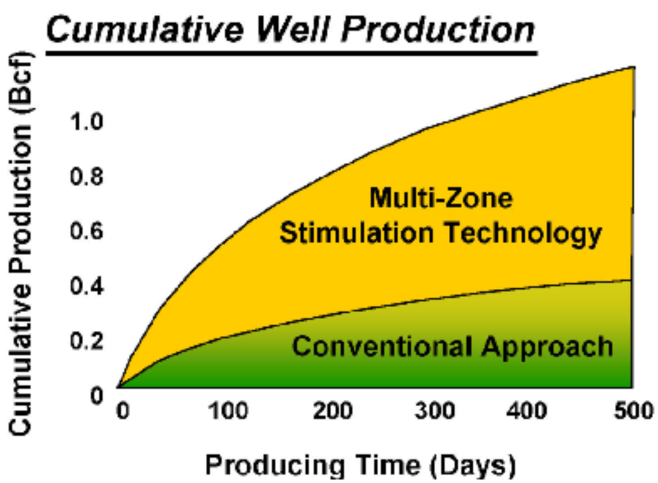
Only a dramatic shift to those not paying attention

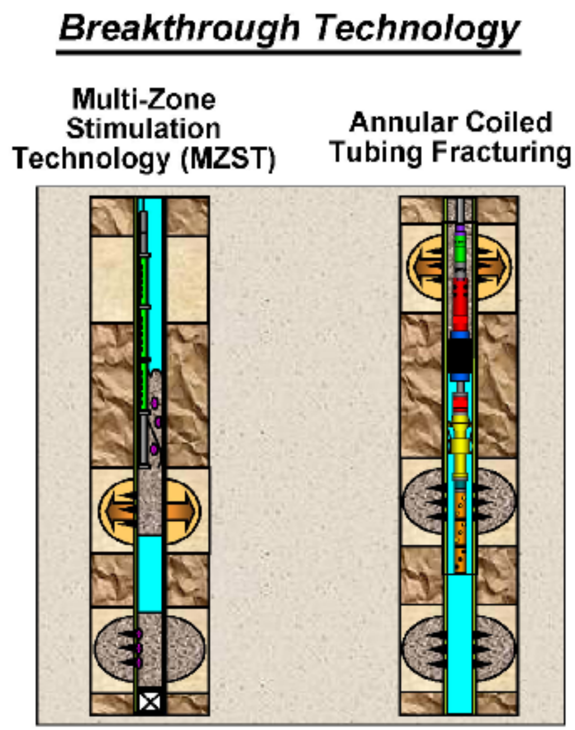
- *Tight gas play in Hungary (Pannonian Basin Mako Trough)*
- *Shale play in Horn River Basin (Canada)*
- *290,000 acres in Marcellus with Pennsylvania General Energy*
- *Ongoing commitment to Canada oil sands*



Unlocking Tight Gas







- *Use technology to "crack the code" first with tight sandstone reservoirs, then with shale*
- *Use the Multi-zone stimulation technology to produce shale in vertical wells that cost less*

Conclusions

- *Approach to shale plays destroys capital*
- *Reserves are overstated*
- *Costs are understated*
- *Why it is important*

THE WALL STREET JOURNAL.
WSJ.com

JANUARY 30, 2010

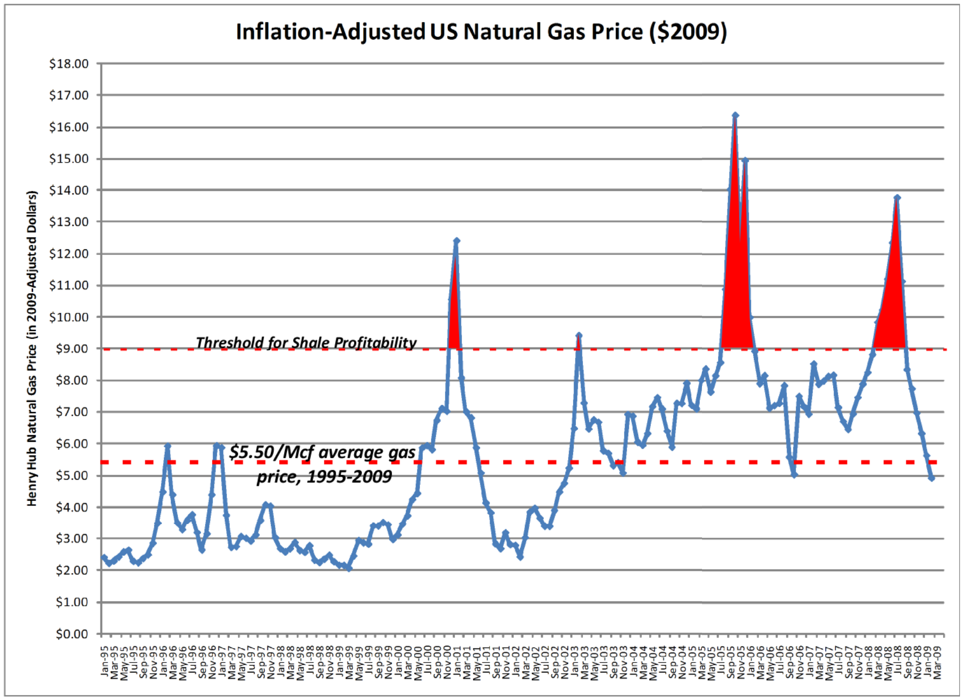
Latest Risk to Alaska Gas Pipeline: More Gas

As the Long-Discussed Energy Project Finally Advances, Discoveries of Fields Outside the State Threaten Chances

By BEN CASSELMAN

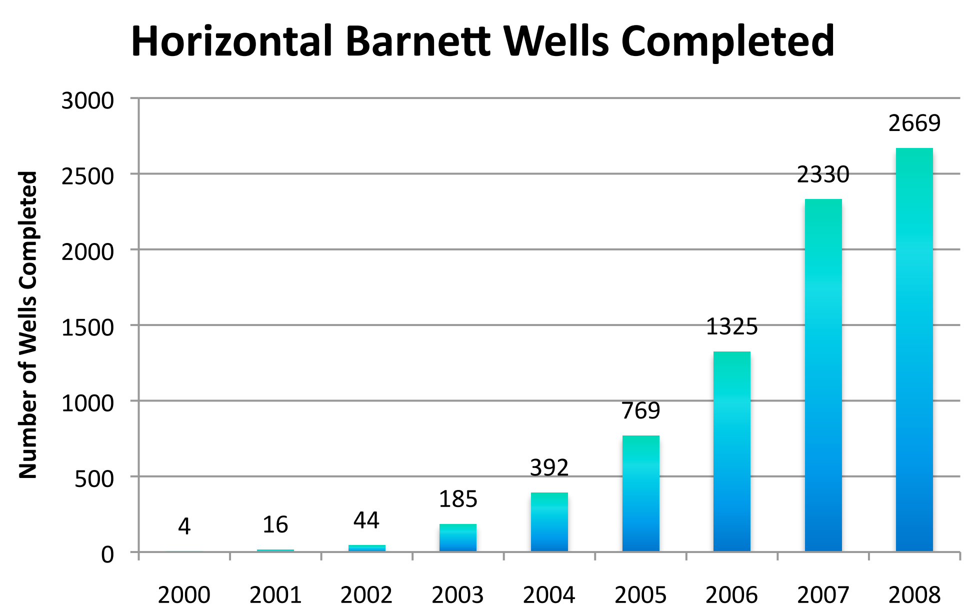
Implications

- *Shale gas plays will be a permanent & important part of the E&P landscape*
- *They require "peak" market conditions to be commercial based on historical gas prices*
- *Companies that bet everything on shale plays (or any single play-type) will have a competitive disadvantage through 80% of the price cycle*



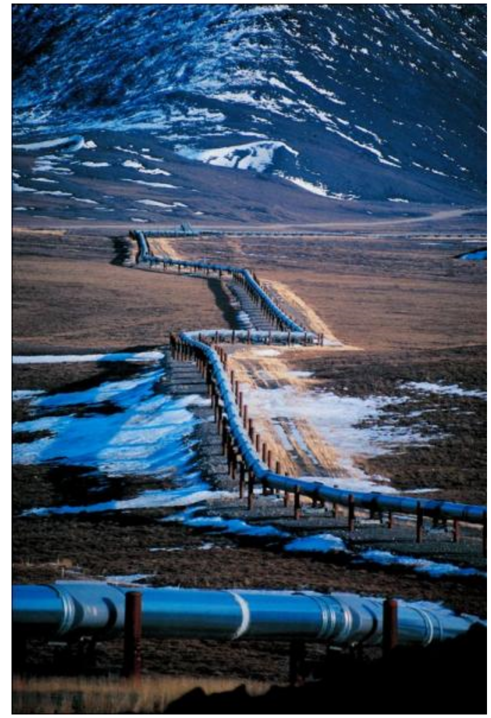
Troubling implications

- Massive capital investment & debt load in projects that have not yet demonstrated sustainable value
- Undisciplined drilling & resulting over-supply keeps prices low
- Ongoing asset sales, share offerings & new debt: present level of drilling & leasing cannot be paid from cash flow
- High decline rates mean the drilling treadmill must continue
- A potential bubble when the music stops: tighter credit, higher interest rates



Closing thoughts

•Exxon Mobil (and other majors) will be there to clean up the mess and, hopefully, do it right!
• Gas will cost a lot more in the future
• Instead of viewing the Exxon Mobil acquisition of XTO Energy as validation of shale plays, operators that engage in the gold rush approach to these plays should view it as a repudiation

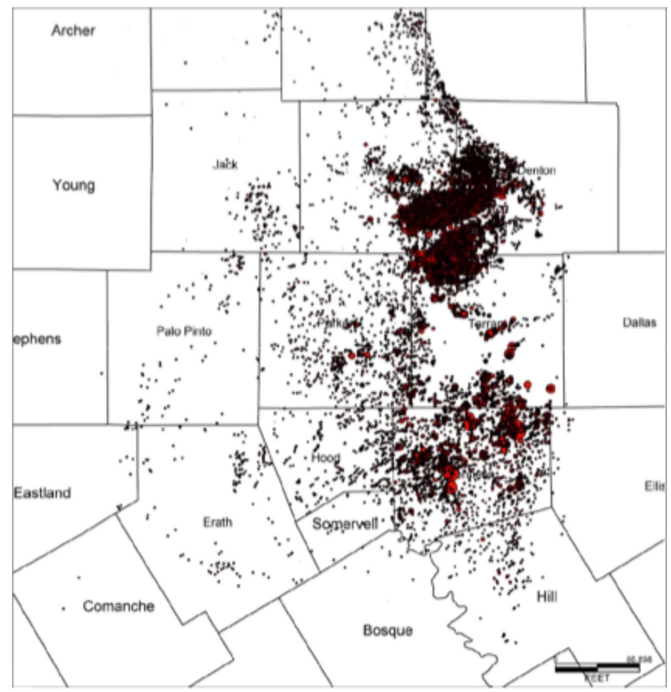


"We are awash in gas today because the market continues to distribute funds to companies that destroy the capital they are given. There is no type of skillful way to differentiate a positive shale well from a negative one. I believe this is the dilemma you should focus on."

CEO of a public gas E&P company, personal communication (January 2010)

Doubts About Shale Plays

Implications of Exxon Mobil acquisition of XTO Energy



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