Council of Industrial Boiler Operators

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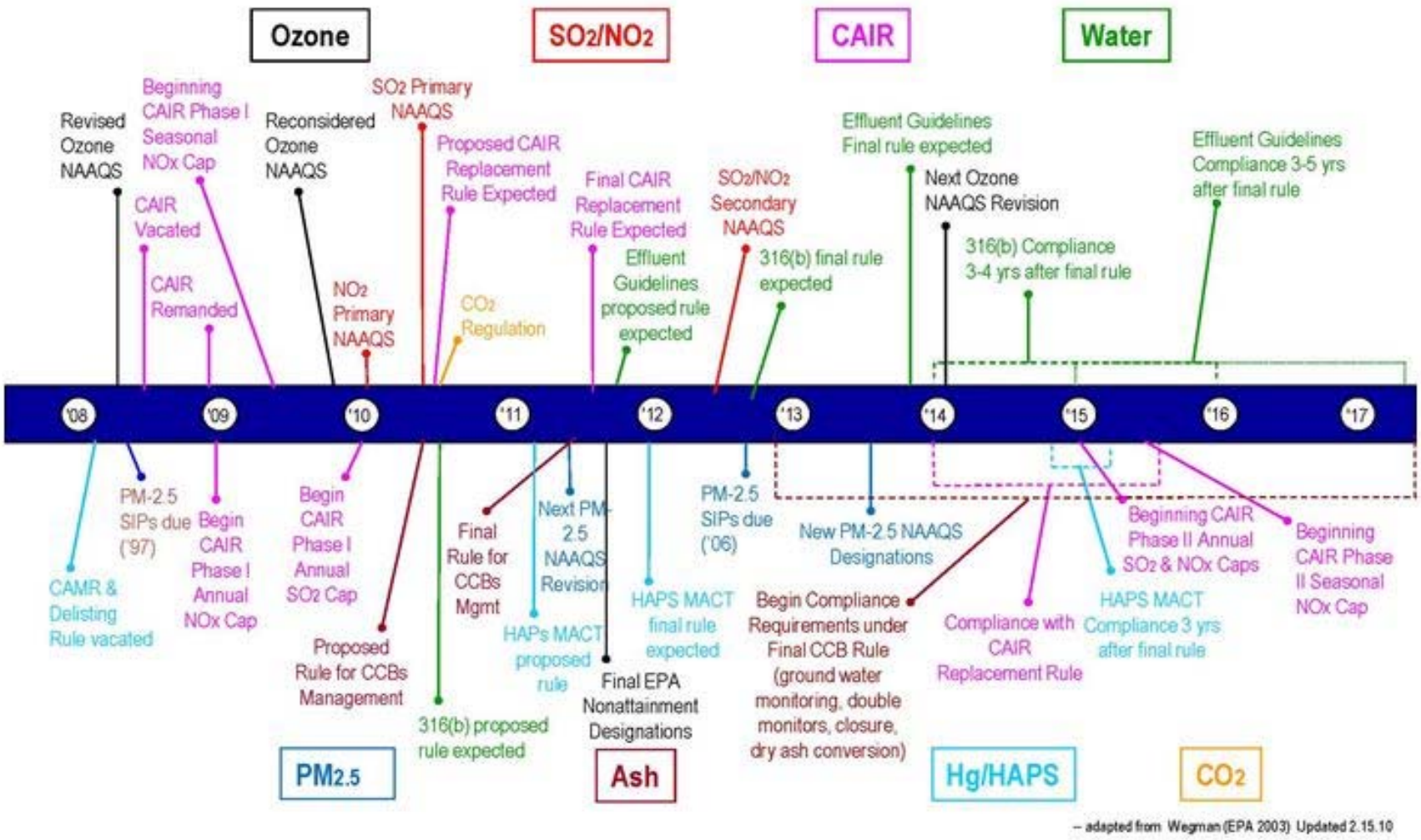
Arlington, VA| December 2012

The President's "All of the Above" Energy Policy Does Not Envision Coal



– adapted from Wegman (EPA 2003) Updated 2.15.10

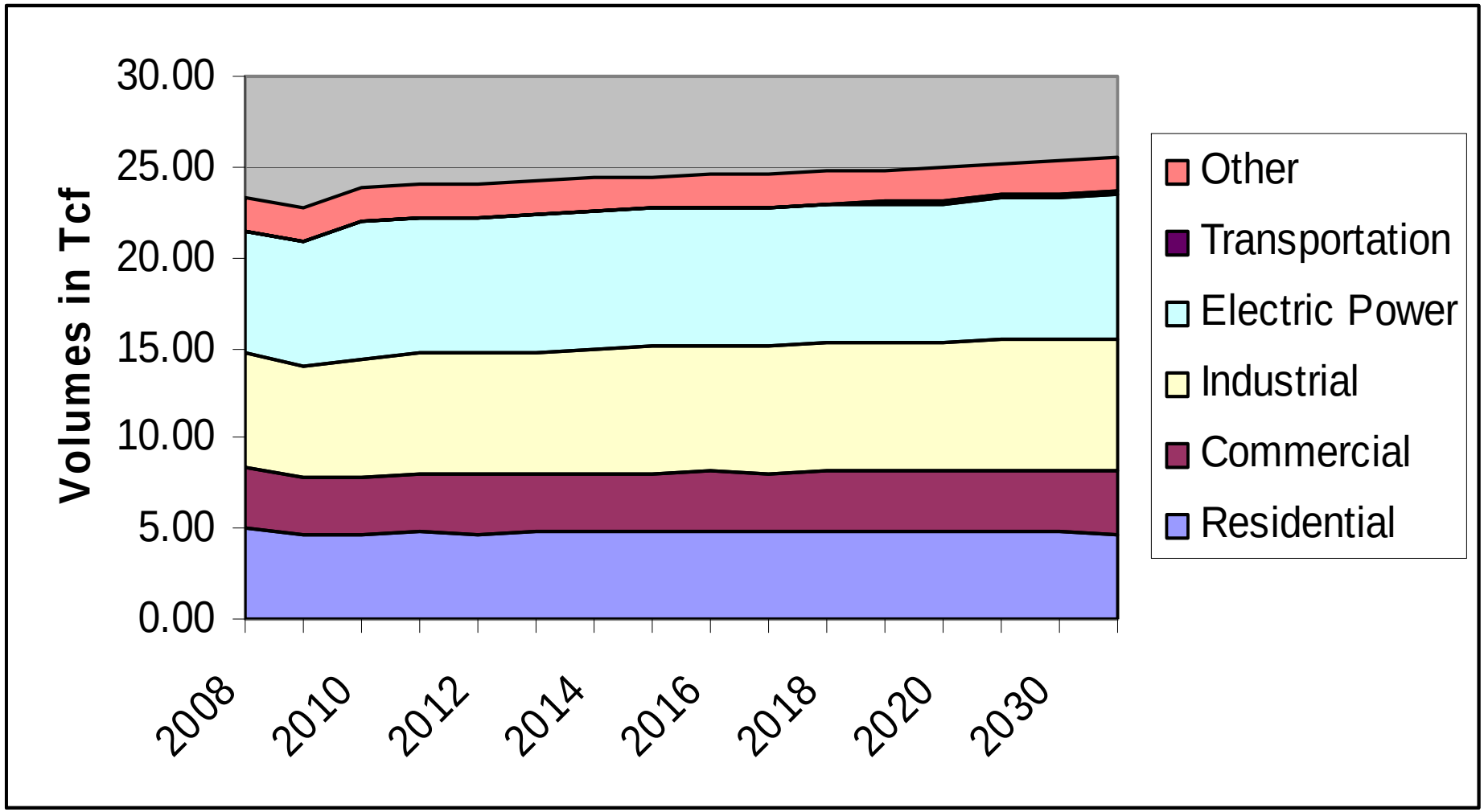
“The electric power industry has referred to natural gas as the “Crack Cocaine” of the power industry… They get you hooked and then raise the price.”

-Steve Drake, Marsh Operating Company

Switch to Gas?

- Uncertainties – Demand Drivers
  - Industrial Consumption – 3 TCF/yr.
  - Residential Consumption
  - Power Generation Consumption
  - Export Consumption – up to 10 TCF/yr. based on Export Applications
- Uncertainties – Supply Concerns
  - Conventional decline
  - Canadian decline
  - Frac well depletion rates
  - Gas Supply Contracts (duration; price)
  - Pipeline Capacity (National & Regional)
- Uncertainties – Policy
  - Fracing Regulation – federal/state
  - GHG Regulation

Demand Expected To Have Slow Long-term Growth



Natural Gas Export Applications

(updated Nov. 2012)

	Name	Export Destination	Location	Size of Exports	Date Filed	Date Approved
1	Sabine Pass LNG Terminal	FTA	Sabine, LA	803 bcf/year, 20 years	8/11/2010	9/7/2010
	Sabine Pass LNG Terminal	NFTA	Sabine, LA	803 bcf/year, 20 years	10/12/2010	5/20/2011
2	Lake Charles Exports, LLC	FTA	Lake Charles, LA	730 bcf/year, 25 years	5/6/2011	7/22/2011
	Lake Charles Exports, LLC	NFTA	Lake Charles, LA	730 bcf/year, 25 years	5/6/2011	Pending
3	Carib Energy LLC	FTA	Southeast Atlantic, FL, Gulf Coast	10.95 bcf/year, 25 years	6/6/2011	7/27/2011
	Carib Energy LLC	NFTA	Southeastern U.S., Gulf Coast	3.65 bcf/year, 25 years	10/20/2011	Pending
4	Jordan Cove Energy Project	FTA	Coos Bay, OR	438 bcf/year, 30 years	9/22/2011	12/7/2011
	Jordan Cove Energy Project	NFTA	Coos Bay, OR	292 bcf/year, 25 years	3/23/2012	Pending
5	Cameron LNG LLC (Sempra)	FTA	Cameron, LA	620.5 bcf/year, 20 years	11/10/2011	1/17/2012
	Cameron LNG LLC (Sempra)	NFTA	Cameron, LA	620.5 bcf/year, 20 years	12/21/2011	Pending
6	Dominion Cove Point, LP	FTA	Calvert County, MD	365 bcf/year, 25 years	9/1/2011	10/7/2011
	Dominion Cove Point, LP	NFTA	Calvert County, MD	365 bcf/year, 25 years	10/3/2011	Pending
7	Freeport LNG, LLC	FTA	Freeport, TX	511 bcf/year, 25 years	12/17/2010	2/10/2011
	Freeport LNG, LLC	NFTA	Freeport, TX	511 bcf/year, 25 years	12/17/2010	Pending
8	Freeport LNG, LLC	FTA	Freeport, TX	511 bcf/year, 25 years	1/12/2012	2/10/2012
	Freeport LNG, LLC	NFTA	Freeport, TX	511 bcf/year, 25 years	12/19/2011	Pending
9	Gulf Coast LNG Export, LLC	FTA	Brownsville, TX	1022 bcf/year, 25 years	1/10/2012	10/16/2012
	Gulf Coast LNG Export, LLC	NFTA	Brownsville, TX	1022 bcf/year, 25 years	1/10/2012	Pending
10	Gulf LNG Liquefaction Co.	FTA	Pascagoula, MS	547.50 bcf/year, 25 years	No.	6/15/2012
	Gulf LNG Liquefaction Co.	NFTA	Pascagoula, MS	547.50 bcf/year, 25 years	8/31/2012	Pending
11	LNG Development Co.	FTA	Warrenton, OR	456.25 bcf/year, 30 years	5/3/2012	5/31/2012
	LNG Development Co.	NFTA	Warrenton, OR	456.25 bcf/year, 25 years	7/16/2012	Pending

Natural Gas Export Applications (cont.)

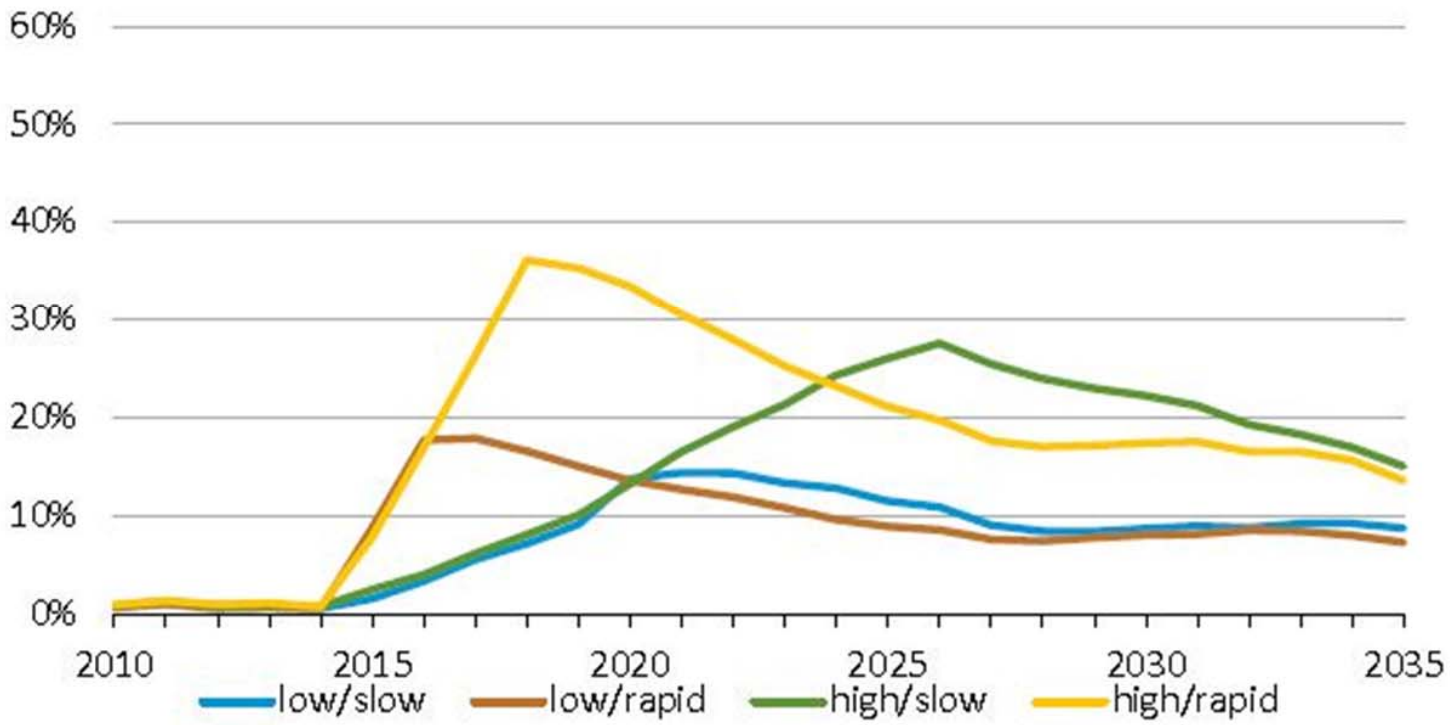
No.	Name	Export Destination	Location	Size of Exports	Date Filed	Date Approved
12	SB Power Solution	FTA	Atlantic Coast	26.8 bcf/year, 25 years	5/7/2012	6/15/2012
13	Southern LNG Company	FTA	Savannah, GA	182.5 bcf/year, 25 years	5/15/2012	6/15/2012
	Southern LNG Company	NFTA	Savannah, GA	182.5 bcf/year, 20 years	8/31/2012	Pending
14	Excelerate Liquefaction	FTA	Calhoun County, TX	503.7 bcf/year, 20 years	5/25/2012	8/9/2012
	Excelerate Liquefaction	NFTA	Calhoun County, TX	485.45 bcf/year, 20 years	10/5/2012	Pending
15	Alaska Gas Port Authority	FTA	Valdez, AK	912.5 bcf/year, 25 years	7/12/2012	DOE needs info
16	Golden Pass Products, LLC	FTA	Sabine Pass, TX	740 bcf/year, 25 years	8/17/2012	9/27/2012
	Golden Pass Products, LLC	NFTA	Sabine Pass, TX	740 bcf/year, 25 years	10/25/2012	Pending
17	Cheniere Marketing, LLC	FTA	Corpus Christi, TX	767 bcf/year, 25 years	8/31/2012	10/16/2012
	Cheniere Marketing, LLC	NFTA	Corpus Christi, TX	767 bcf/year, 25 years	8/31/2012	Pending
18	Main Pass Energy Hub, LLC	NFTA	16 miles offshore of LA	1,175 bcf/year, 30 years	9/11/2012	Pending
19	CE FLNG, LLC	FTA	Plaquemines Parish, LA	389.6 bcf/year, 30 years	9/12/2012	Pending
	CE FLNG, LLC	NFTA	Plaquemines Parish, LA	389.6 bcf/year, 30 years	9/12/2012	Pending
20	Waller LNG Services, LLC	FTA	Cameron, LA	58.4 bcf/year, 25 years	10/12/2012	Pending

TOTAL = 10,770 Bcf/year (10.770 Tcf/year)

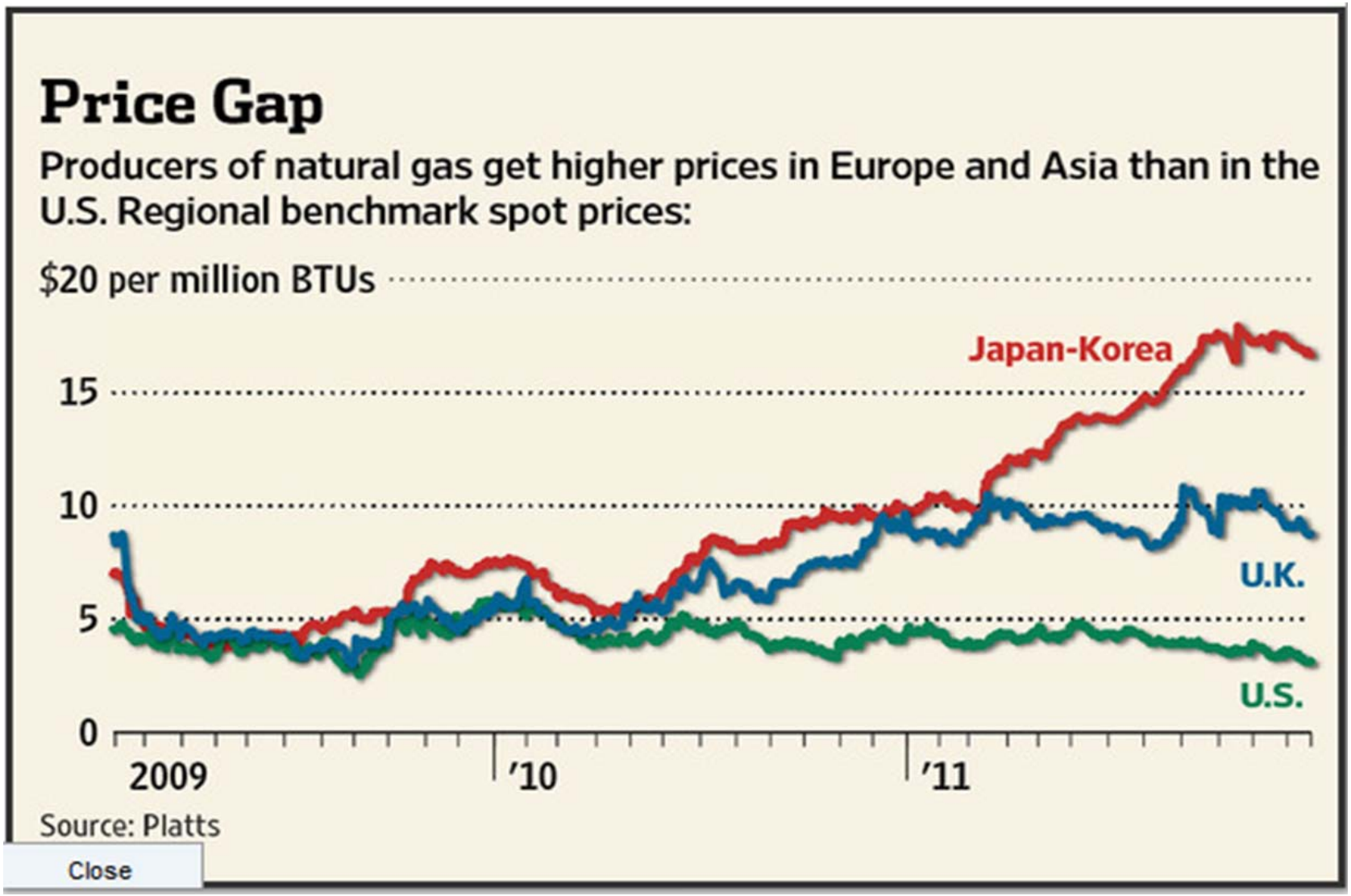
- **Total U.S. consumption in 2011 was 24.3 Tcf**
- **10.770 Tcf is 44.3% of 2011 demand**

Natural Gas Prices Increase Under the AEO2011 Reference Case Under All Export Scenarios

Figure 3. Natural gas wellhead price difference from *AEO2011* Reference case with different additional export levels imposed

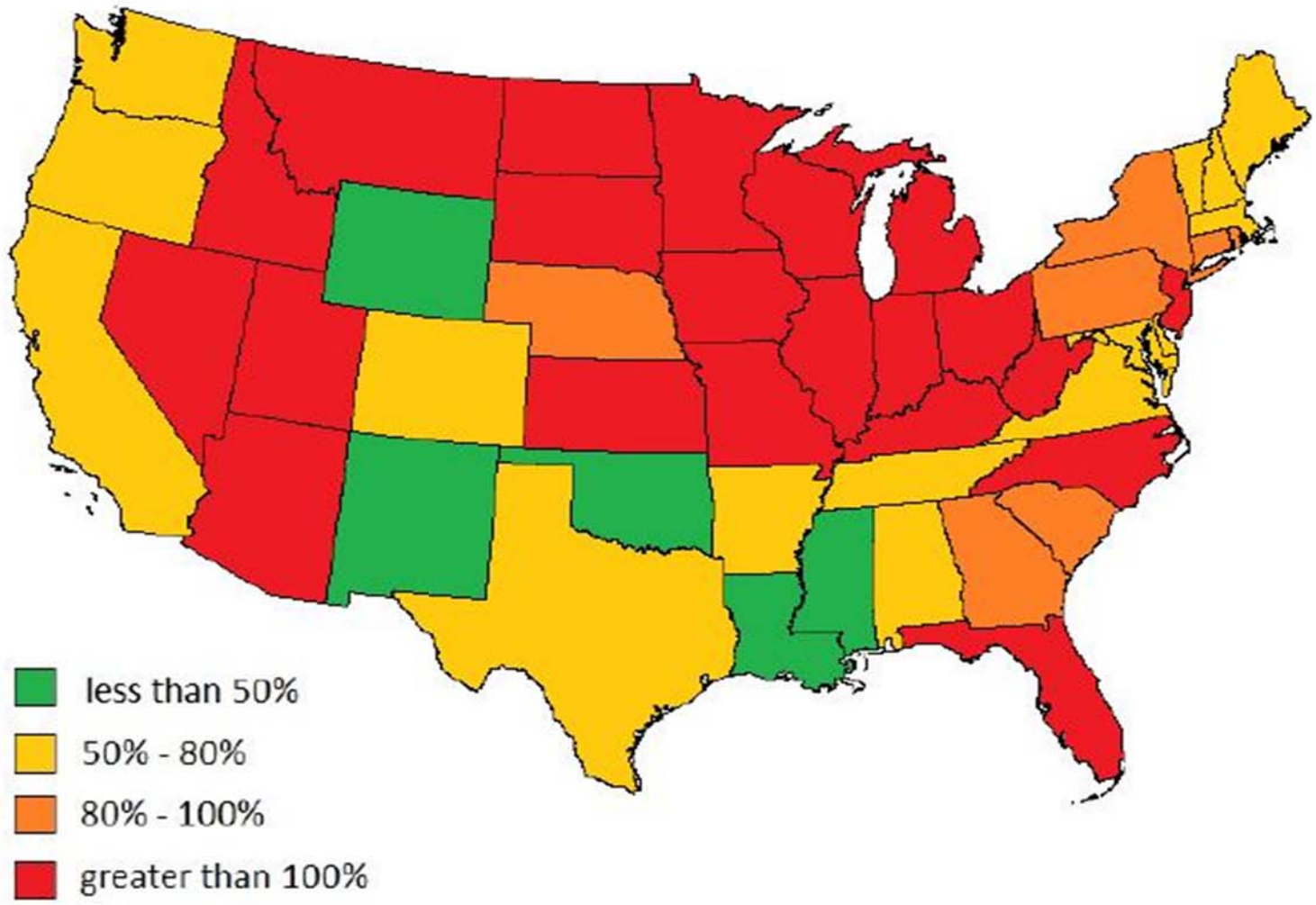


The Price of Natural Gas in a Peak Oil World

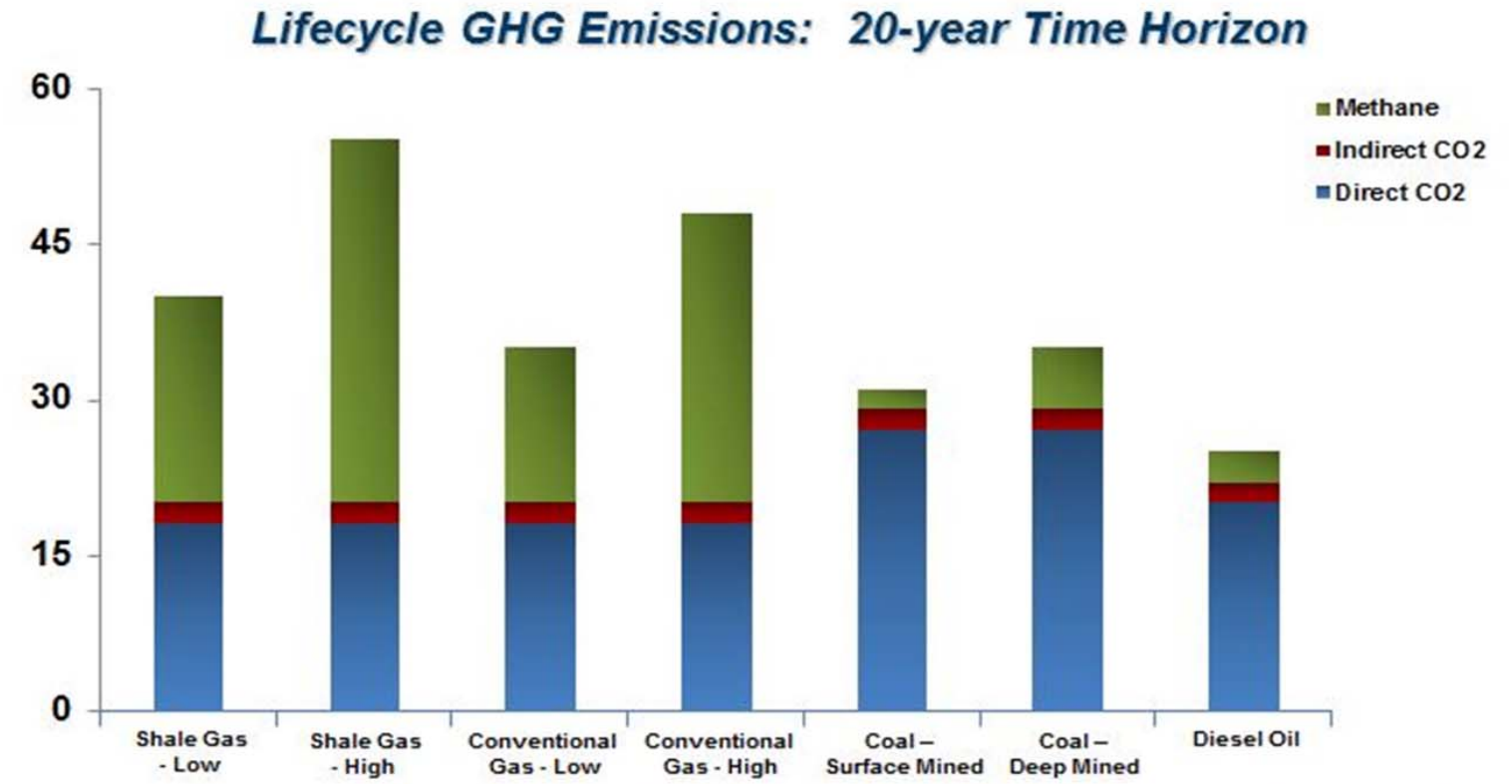


An Example: Pipeline Capacity to Support Fuel Switching

Figure 14: Interstate Pipeline Capacity Utilization if An Individual State Switched its Coal-Fired Generation to Natural Gas



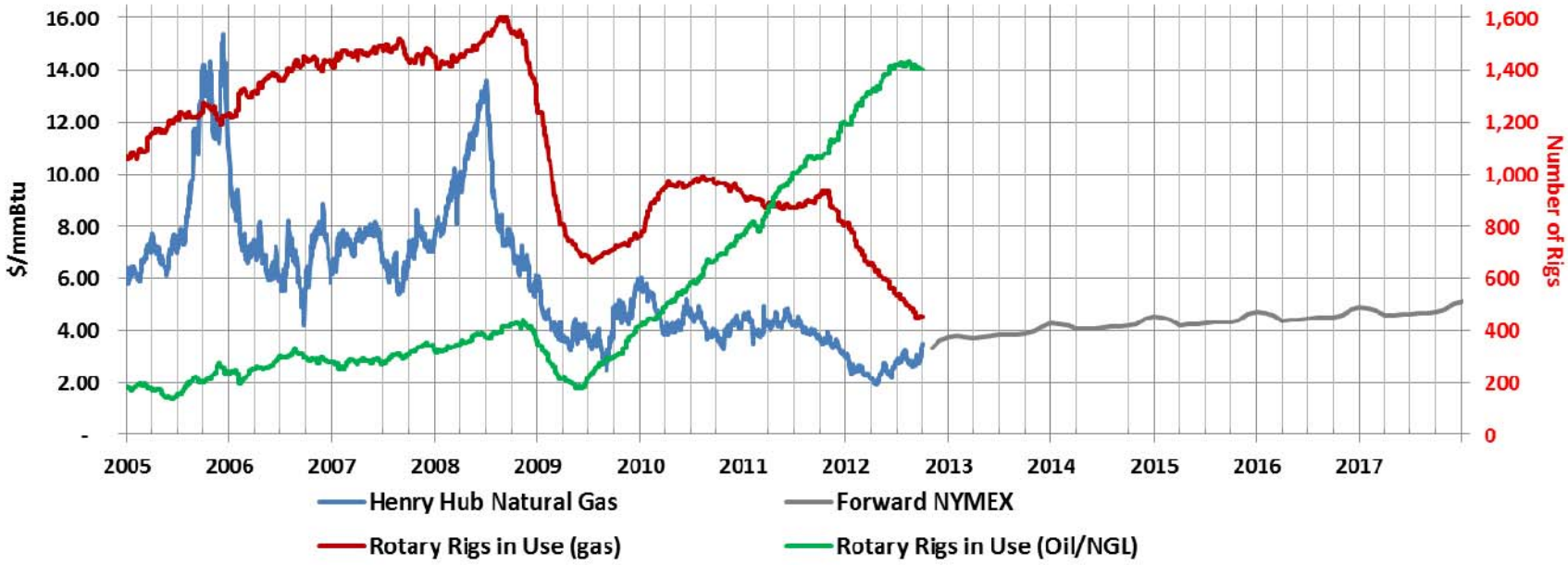
But Shale Gas Is Not a Climate Solution



"Compared to coal, the footprint of shale gas is at least 20% greater and perhaps more than twice as great on the 20-year horizon and is comparable when compared over 100 years."

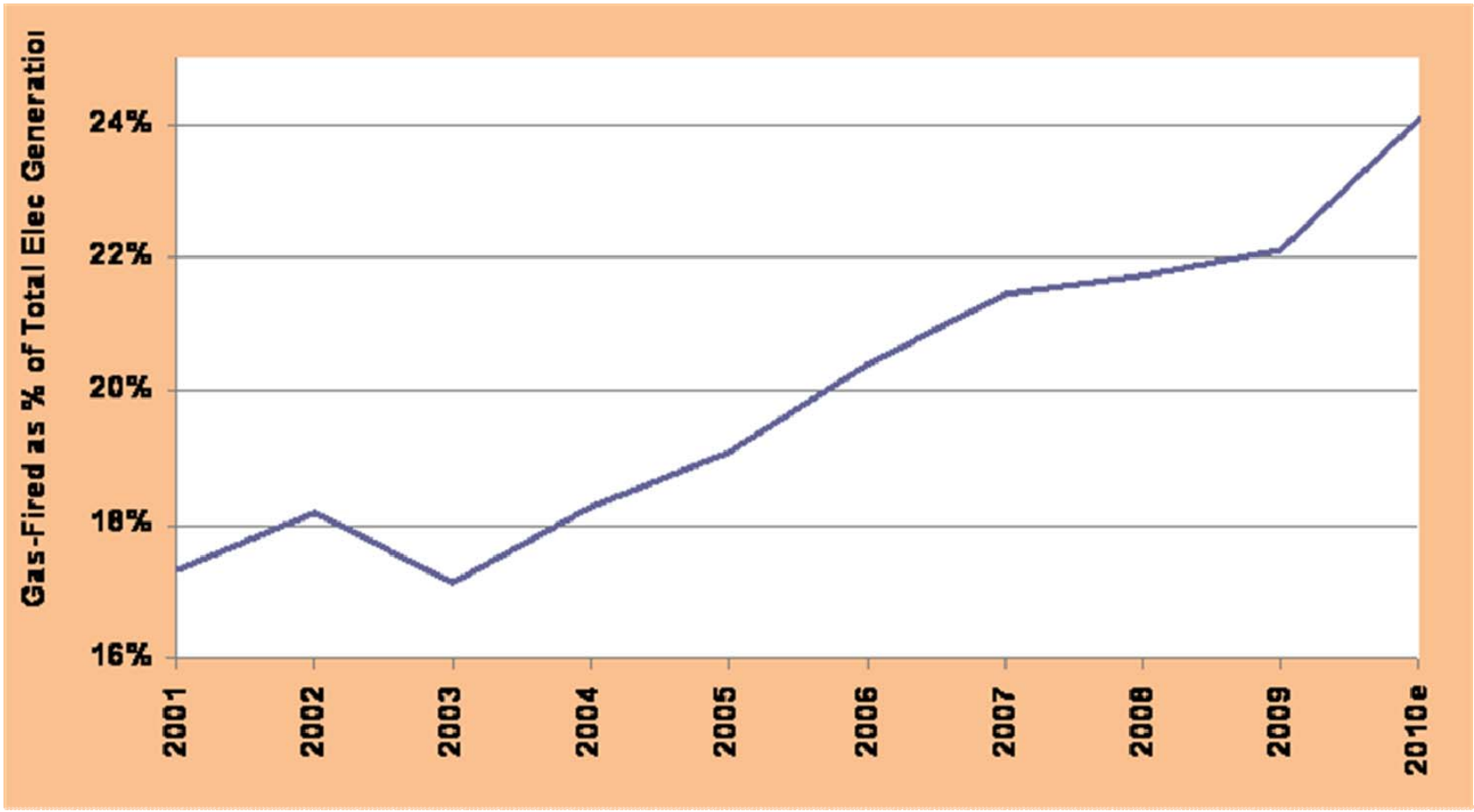
Sources: (1) R. Howarth, R. Santoro, A. Ingraffea, "Methane and the Greenhouse-Gas Footprint of Natural Gas from Shale Formations," Climatic Change Letters (March 2011); and (2) R. Howarth, "Global Warming Impacts of Natural Gas Fracking", Webinar (January 17, 2012).

Natural Gas Price & Rig Count



- Natural gas prices have increased to ~$3.60/MM for this winter
  - Closing in on year-ago prices
- Rig count suggesting that forward production of natural gas will decline
  - Sub $3.50 prices apparently do not provide adequate return for dry natural gas development

Gas Fired Generation Demand Continues to Climb



The Hypothesis

- Drillers are greatly underreporting their true costs in their income statements due to accounting rules
- Real breakeven natural gas price, while it clearly varies from shale gas play to play and even well to well, is still significantly higher than gas prices we have seen since the shale gas boom

The Accounting Problem

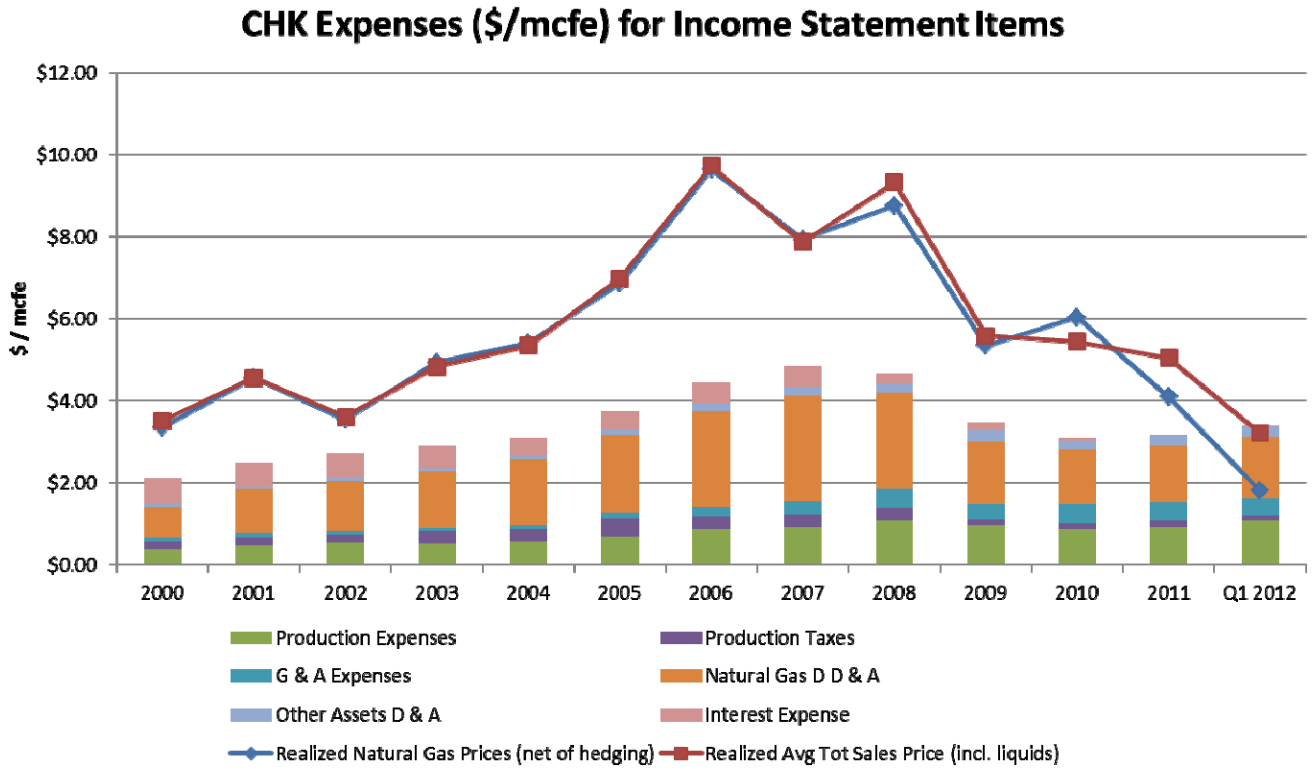
- But these rosy profits are not echoed by CEOs and those within these companies:
  - "In the US, as a result of a lower long-term Henry Hub price premise, BG Group recorded a $1.3 billion non-cash post-tax impairment charge against our shale gas business. In keeping with our new US gas price premise, we have further reduced our rig count to six."
    BG Group Q2 2012 Earnings Release
  - "The word I hear from every company that is not in the Haynesville and Marcellus is that they are not economic… The word In the world of independents is that the shale plays are just giant Ponzi schemes and the economics just do not work."
    Unnamed IHS Global Analyst
  - "We are all losing our shirts."
    Rex Tillerson, CEO of ExxonMobil, largest natural gas producer in the United States, in response to a question about the US Gas Industry – Natural gas was at $2.78/mmBtu
  - "In the US, as a result of a lower long-term Henry Hub price premise, BG Group recorded a $1.3 billion non-cash post-tax impairment charge against our shale gas business. In keeping with our new US gas price premise, we have further reduced our rig count to six."
    BG Group Q2 2012 Earnings Release

The Explanation

- We have done the most work here with Chesapeake (CHK) so we will pick on them
- From Accounting 101, an investment (buying a factory or a mine for example) is not an upfront cost but is capitalized over the useful life of the investment
  - In the case of shale gas drilling, drilling and exploration costs are treated as investments for accounting purposes
  - Wells are assumed a life of 50 years and the investment is capitalized over 50 year life of the well and depreciated
  - Essentially allows a company to defer true, full cycle costs over a long period of time

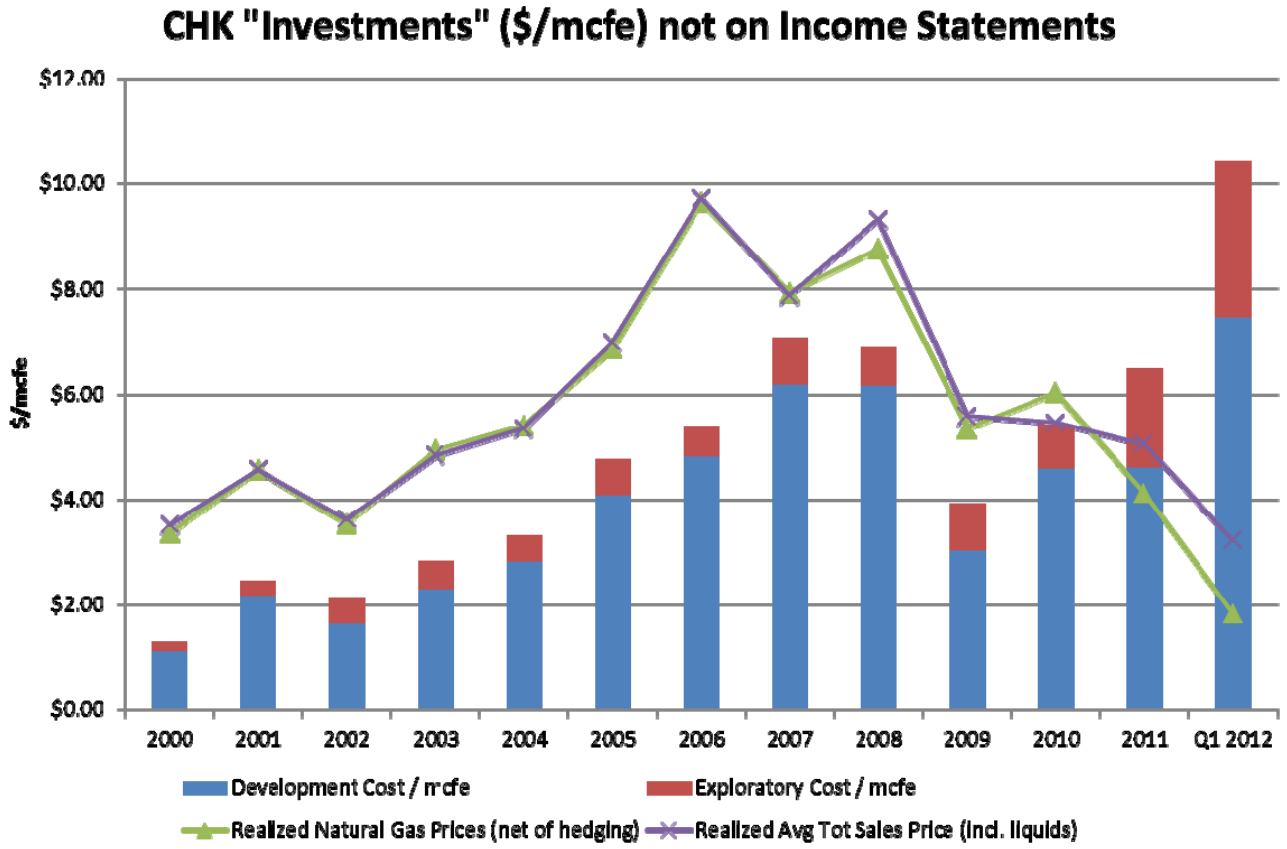
The Evidence

Just looking at the income statement, we are led to believe that, until recently, things have been looking just fine for shale gas drillers and they are very profitable. Something like the below would be what is reported in an earnings call



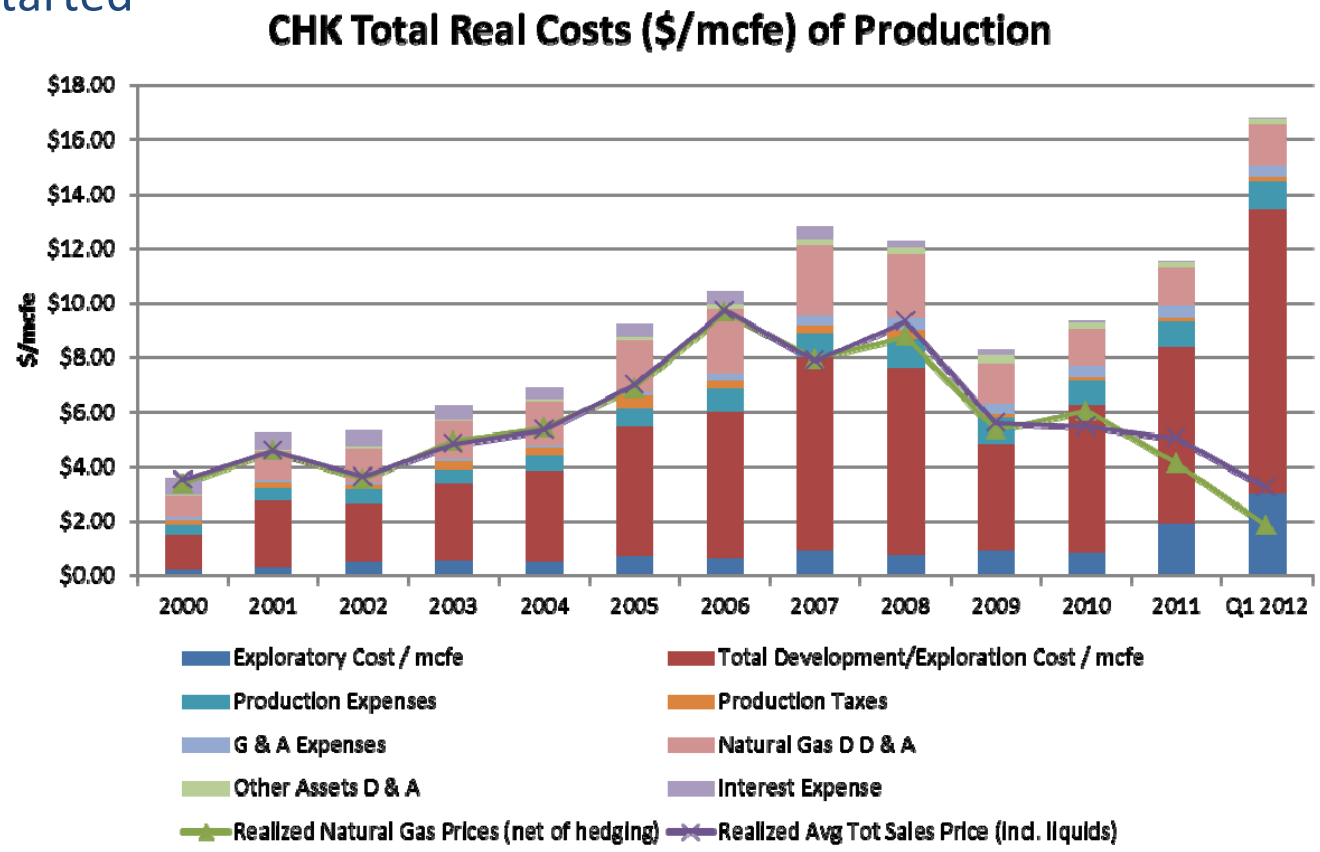
But the Real Story…

But the real story is in drilling and exploration costs, or “investments”. They are high and in some quarters/years higher than all *revenues* at CHK:



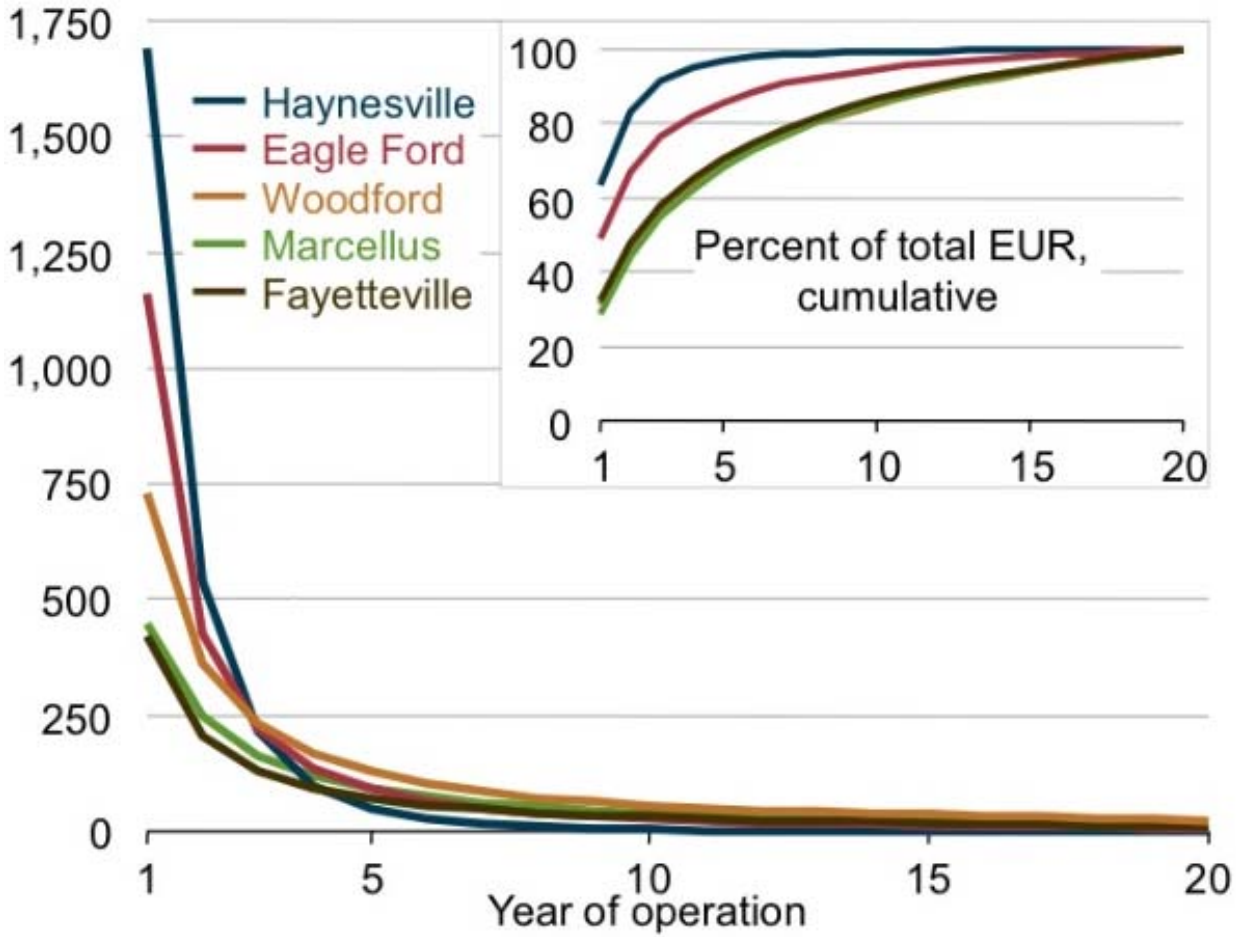
Putting it all together

Looking at total cash costs, we can see that CHK reports a nice healthy profit but has not been cash flow positive since several years before the shale gas boom started



Production Decline Curves

Source: EIA

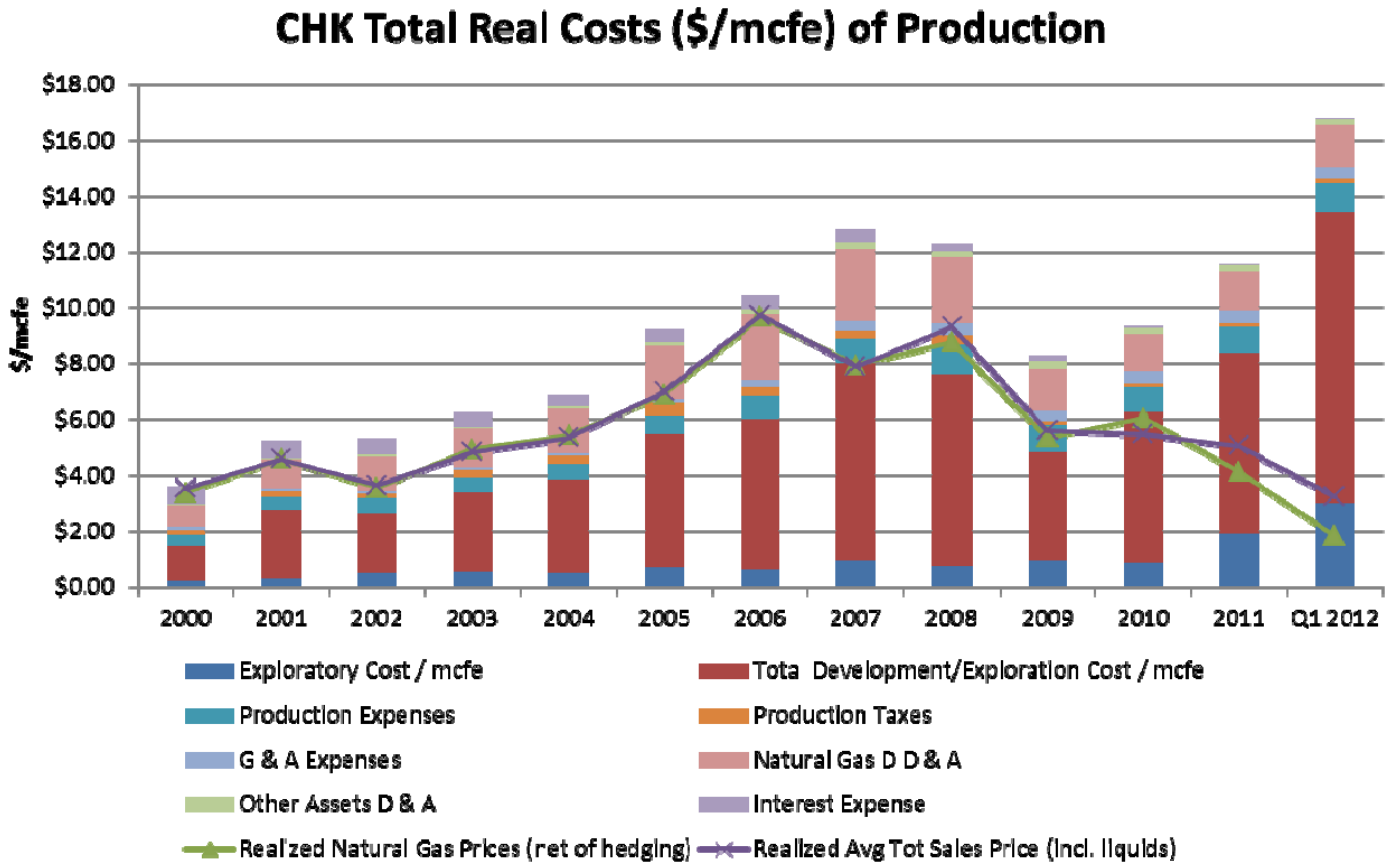


How did we get here?

- In the mid 2000s the gas industry in the U.S. was on the decline and we thought we would be importing a substantial portion of our natural gas as fields played out
- Shale gas seemed to be the answer – enough gas for hundreds of years
- A land rush ensued. Chesapeake Energy led the charge and locked up billions of dollars in prime shale gas land
- Others followed and bid up prices to astronomical highs
- Bernanke & Co. pushed interest rates down to near zero – cash flowed in seeking higher returns
- Investors wanted eye-popping production numbers and drillers obliged, driving gas prices down to historic lows
- Only, shale gas production is too expensive – CHK has never been cash flow positive and several other companies have similar problems
- Remember the country has over a hundred years of coal reserves too – it is just a question of price/cost

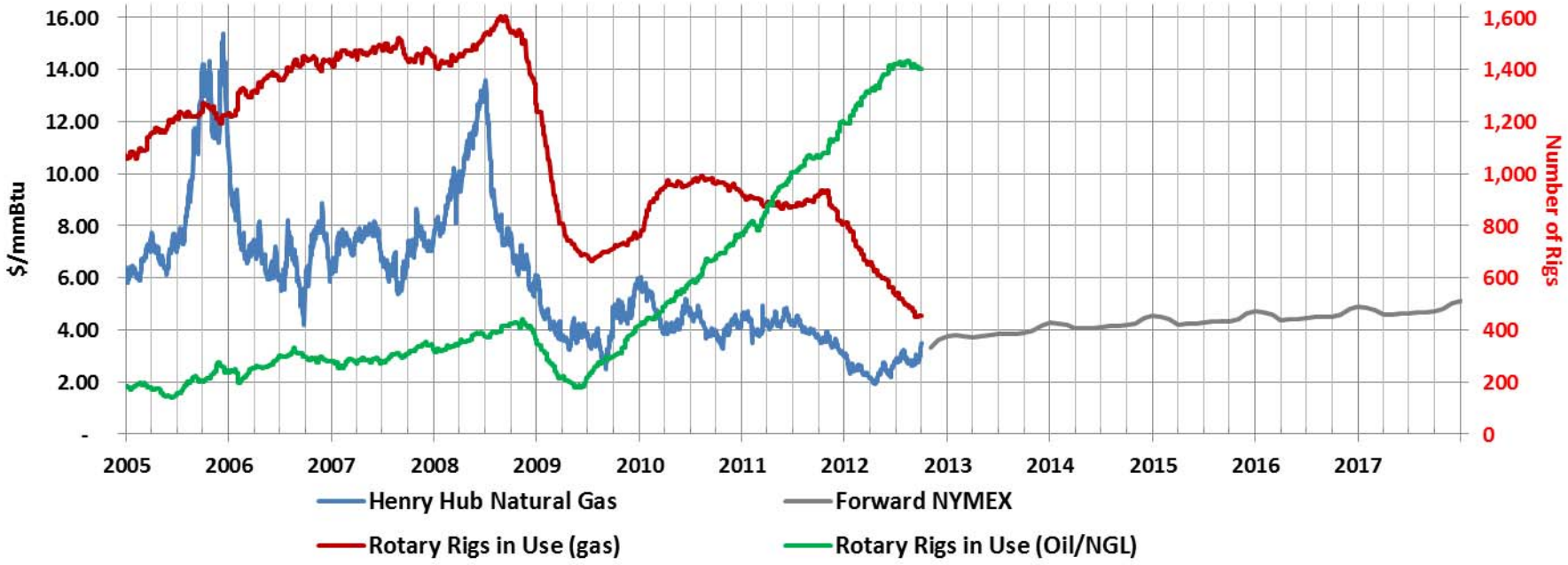
But they have a ways to go

- These are historic free cash flow break even prices needed to account for total costs at CHK (note: things like taxes are not included here and would make this breakeven point actually higher)



And Drilling Is Down to Unsustainable Levels

- An estimated inventory of up to a few thousand wells that have been drilled but not tapped yet is keeping production up even as rig counts drop to record lows
- We feel that once this inventory works itself through, sustaining production at these current drilling rates is not feasible



Conclusion

- Drilling and Exploration costs needed to offset natural production declines are not included in a company's income statement
- These costs are massive (estimated at $22 billion a quarter for the 34 largest shale production companies)
- Eventually these will show back up as depreciation costs but these wells are assumed to have very long lives (50+ years)
- Decline curves are steeper in shale gas than traditional drilling so this need to replace production is more pronounced
- We don't want to give what we think is a breakeven price because of the complexity of the geology of these shale plays but illustrate that CHK expects cash flow under the rosiest of circumstances in 2013 ($5/mmbtu gas, sharply reduced drilling (and therefore drilling costs) and WTI Oil at $90/bbl) will still be several hundred to well over a billion dollars negative

Conclusion (cont.)

- At the end of the day, for simplicity's sake, ignoring valid points on both sides companies are not profitable at these prices.
  - An inventory of wells drilled but not yet tapped acts as shadow inventory and keeps production up even as drilling falls below replacement levels
    - We do not know the total number of these wells but the backlog appears to be going away quite quickly
  - Once this backlog is gone production will have to decline or drilling increase again. With it will come increased natural gas prices.