



# Macondolypse and US Energy:

Policy by the Law of Unintended Consequences

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# A major tail risk event last April is changing the course of US and global energy

## Deepwater Horizon Explodes



Source: StatOil

## More than BP was at stake

- After health care, Obama turned to energy, with gesture to open deepwater
- Preparation for realistic policy of bridge to the future, based on more production, cleaner carbon
- Congressional carbon, 'new energy' compromises looked feasible
- But aftermath a major setback to US, global energy

## Two new foundations of US energy: inertia, regulation

- In our opinion what may be construed as the combination of administration criticism, increasingly acerbic, and divisive US politics point to few energy policy initiatives at home or abroad
- As Baker Institute study indicates, that's not necessarily bad: in many respects 'business as usual' provides a better basis for transition to a post-carbon-intensive world than many policy initiatives
- But reactions to Macondo blowout are setting back business as usual in one of the critical areas of both US and global production growth—the deepwater

## Inertia and business as usual: the shale revolution

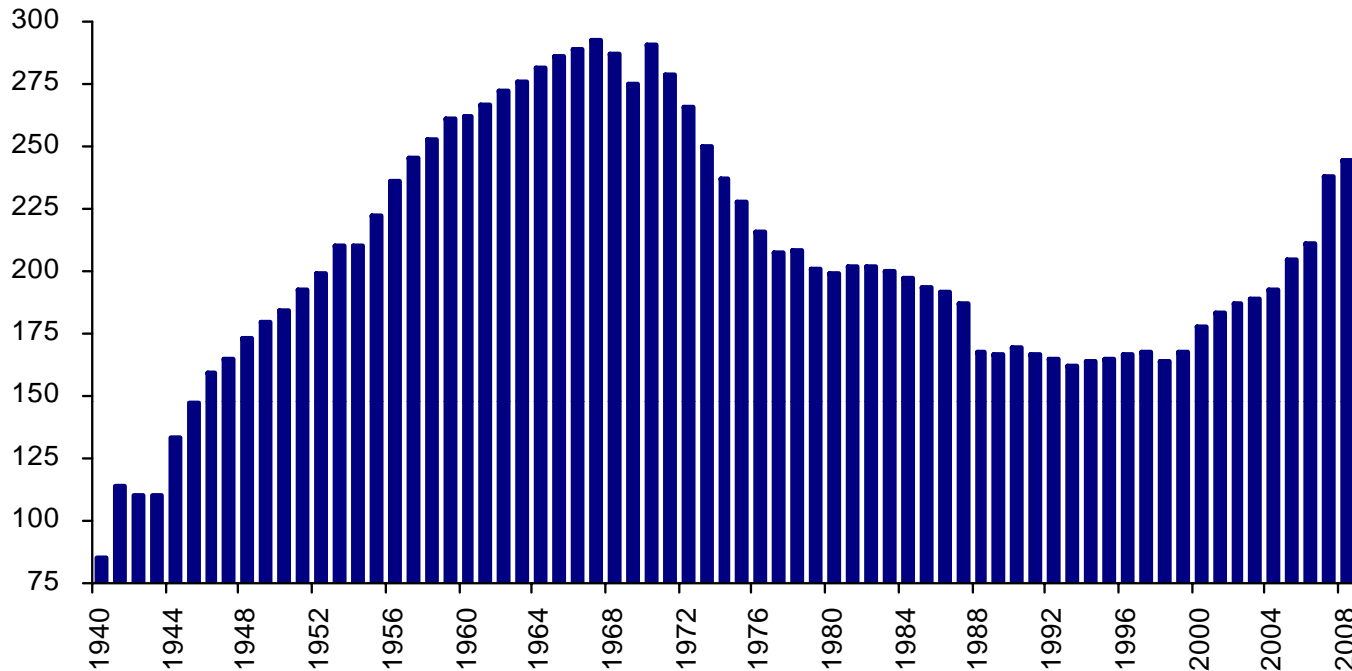


Source: [www.research.uky.edu](http://www.research.uky.edu)

- Sedimentary rock with traps of high concentrations of natural gas and oil
- US holds vast resources, not just of natural gas but also of oil
- High prices last decade started extraordinary new play
- Unconventional natural gas has been transformational, changing the US into a surplus natural gas producing country, essentially forever
- First projects for export of US LNG approved, in face of 50 bcm of US LNG re-gasification terminals
- The ripple effects at home and abroad are challenging basic assumptions about natural gas supply and pricing, impacting perceived political influence of Russia, Qatar, other gas producers

# Shale gas reversed decline treadmill for US gas supply

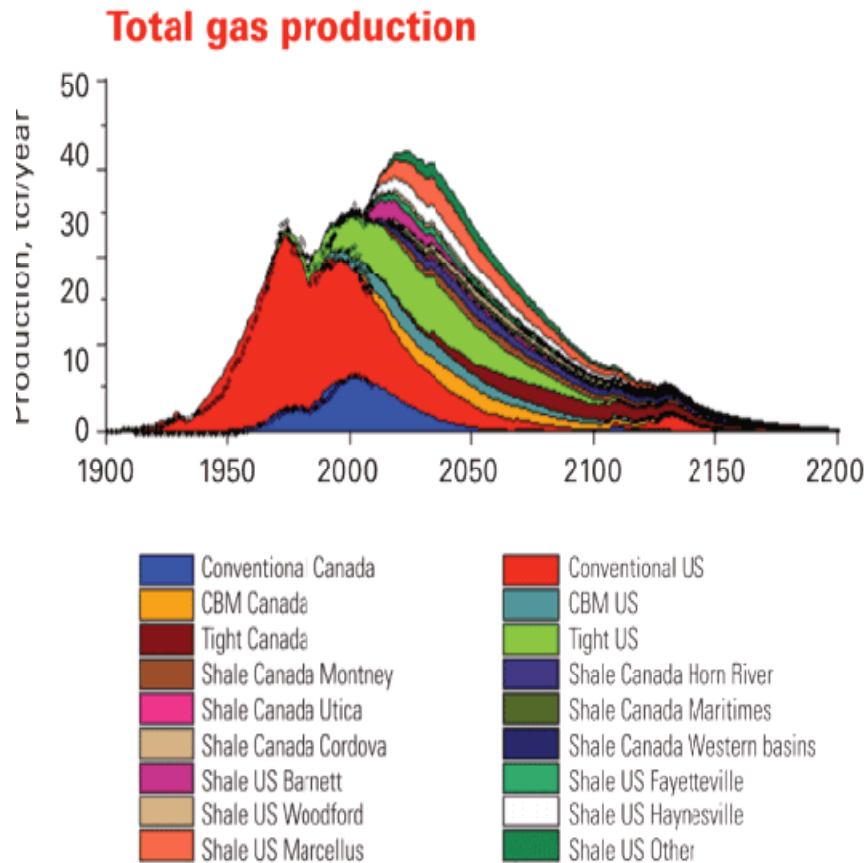
US Proved Reserves of Natural Gas (TCF)



Source: EIA, *U.S. Crude Oil, Natural Gas, and Natural Gas Liquids Proved Reserves, 2008*

- Over the last decade US proved reserves of natural gas have grown at the fastest clip in more than 50 years, reversing nearly a three-decade-long trend of declines.
- With nearly 245 Tcf of proved reserves and an additional 2,119 Tcf of unproved resources, the US may have nearly 100 years' worth of gas supply. A big challenge to Hubbert's Peak theorists.

# Medium-term gas production profile for US is stunning

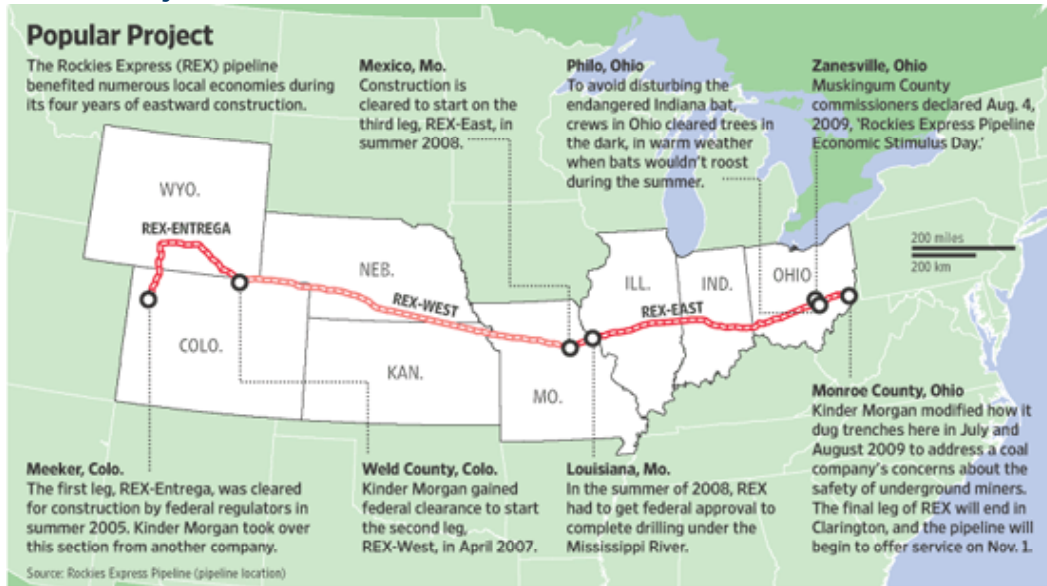


Source: Oil and Gas Journal,

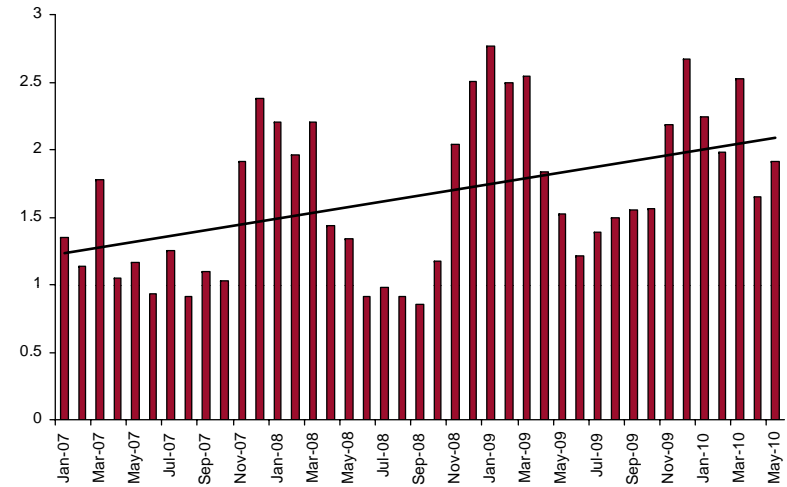
- Many analysts still think that the US shale play is a temporary phenomenon due to high cost, pending environmental uncertainties
- But median-case scenario sees US gas production rising an astonishing 50% by 2040
- If US adds more LNG export capacity, it will add all the more pressure
- With past LNG liquefaction growth aimed at US market, diversion elsewhere exacerbates global gas glut

# Gas ready to challenge coal: gas is losing its volatility as deliverability bottlenecks erode

## REX Project Timeline



## Rising Exports to Canada since REX (Bcf/d)



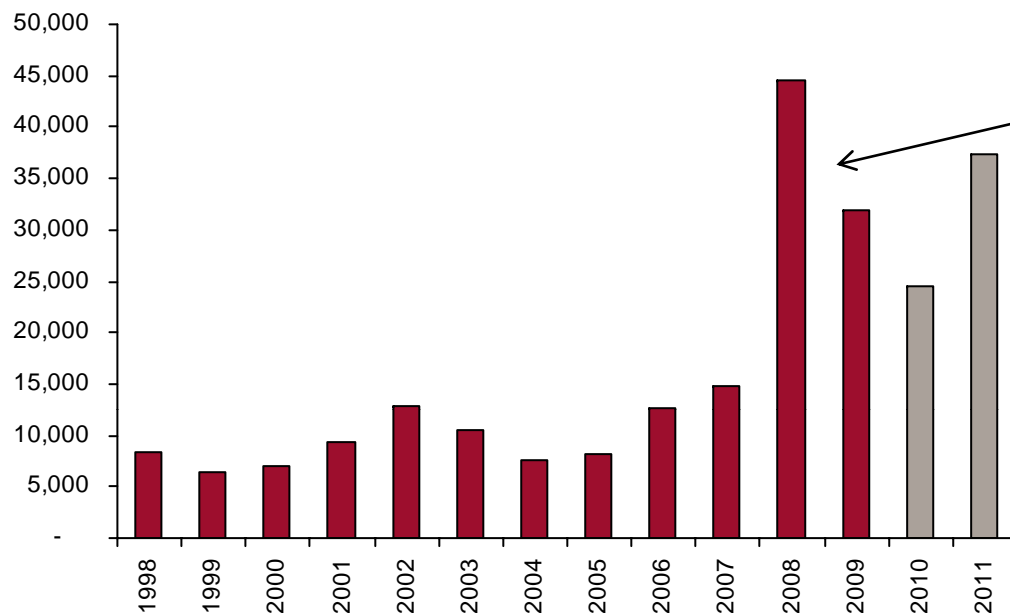
Source: Rockies Express Pipeline

Source: Credit Suisse estimates

- The Rockies Express Pipeline (REX) became fully operational in November 2009, stretching 1,679 miles, bringing once stranded gas from northwestern Colorado to eastern Ohio with 1.8 BCF/d of capacity.
- New pipeline infrastructure and the dispersion of production to consuming areas have transformed the N. American market, with Western Canada exporting to the US, and the US exporting to Eastern Canada.

# Surge in new pipelines adds flexibility in meeting demand

Natural Gas Pipeline Capacity Additions (MMCF/d)



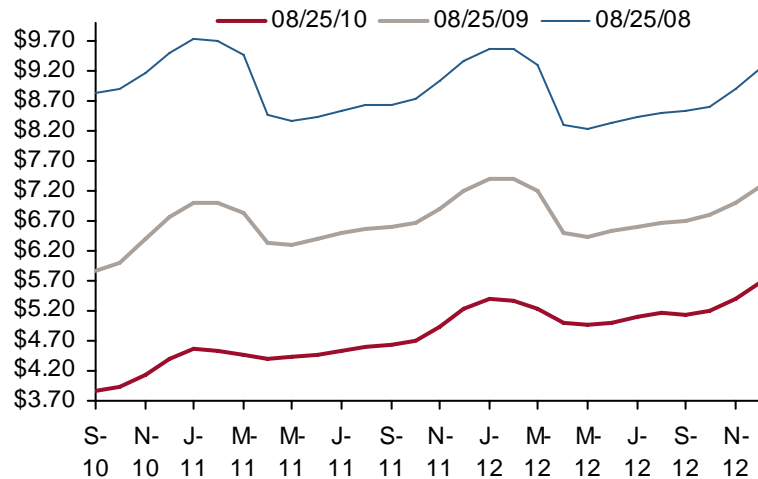
Who says take or pay contracts are needed to have new pipelines built?

Source: EIA

- The push for access to new supply sources has led to rapid infrastructure growth in relatively undeveloped production regions. This 'de-bottlenecking' of the pipeline grid will likely eliminate the chronic boom-to-bust cycles in the industry.
- With new pipeline flexibility, lower price volatility, constrained producer financing, utilities are poised to negotiate long-term supply contracts that could further smooth out price changes in their own and suppliers' long-term interests, removing putative market obstacles to eliminating coal.

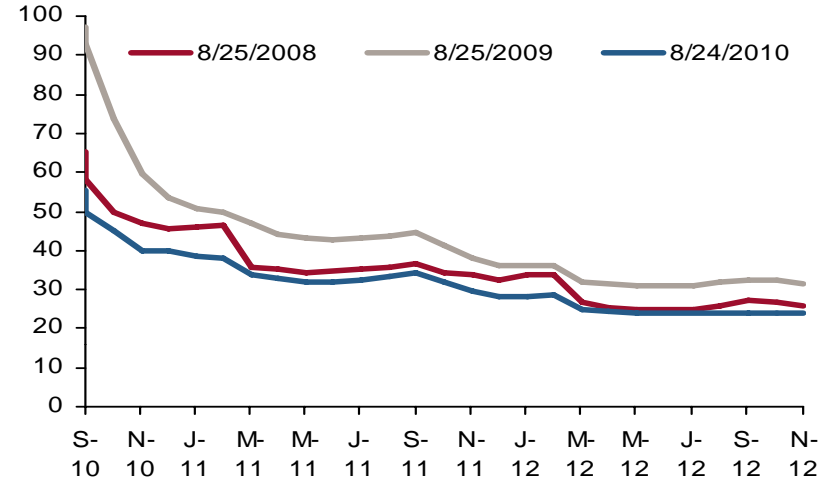
# With surplus supplies, reduced bottlenecks, main vulnerability of natural gas vs. coal no longer pertains

Henry Hub Forward Curves (\$/MMBTU)



Source: Credit Suisse

ATM Volatility- Falling through time

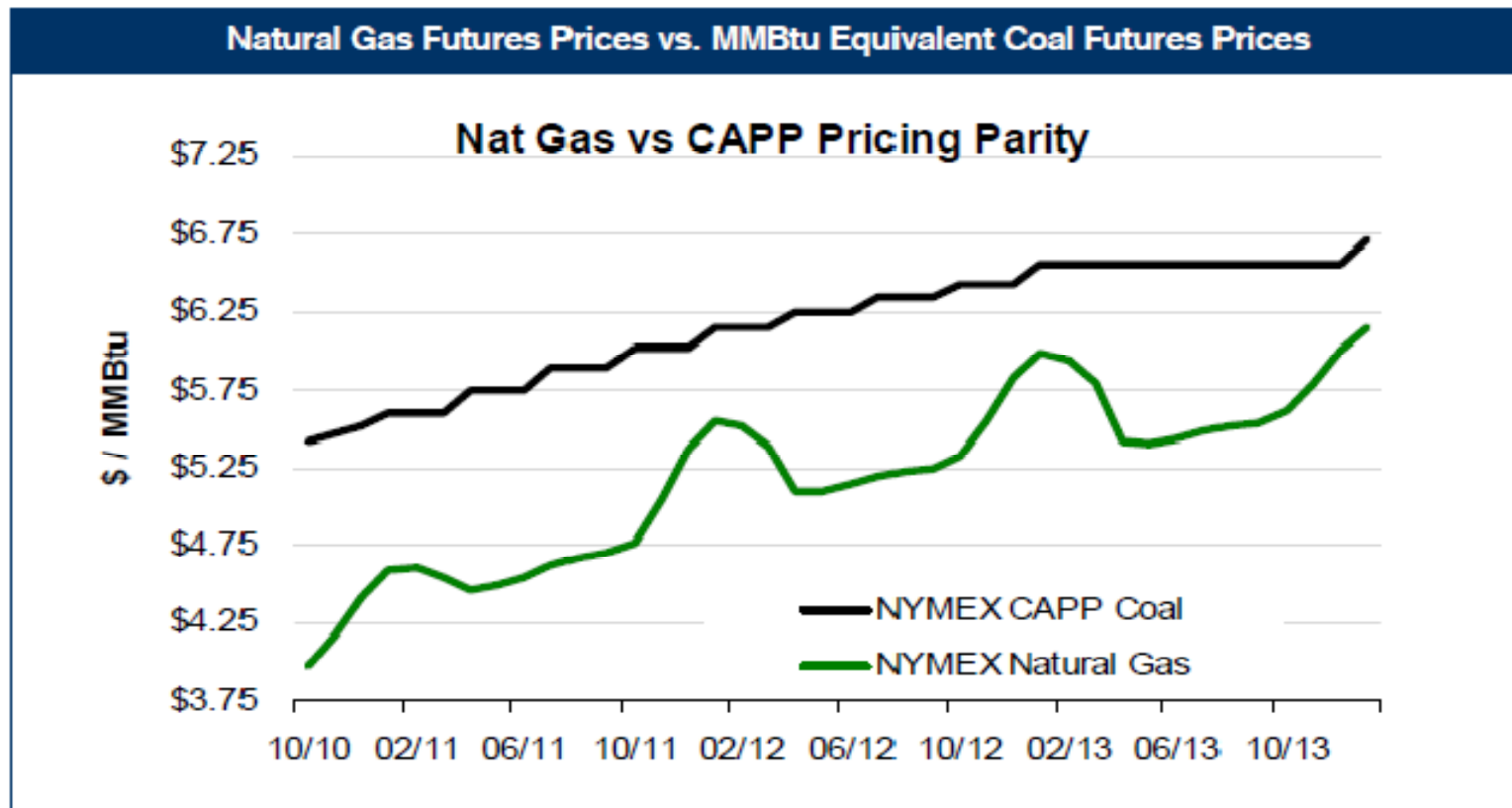


Source: Credit Suisse

- The forward curve for natural gas has shifted downward and become significantly flatter
- Of particular note is the reduction in seasonality – at present the summer to winter spread is trading at under \$0.60/mm BTU and next summer is trading flat to this coming winter.
- Volatility has been reduced by two-thirds over the past two years, providing another sign of forthcoming price stability.

And price is now making a difference:

Natural gas is priced competitively with coal out the curve; not encouraging for nuclear power either

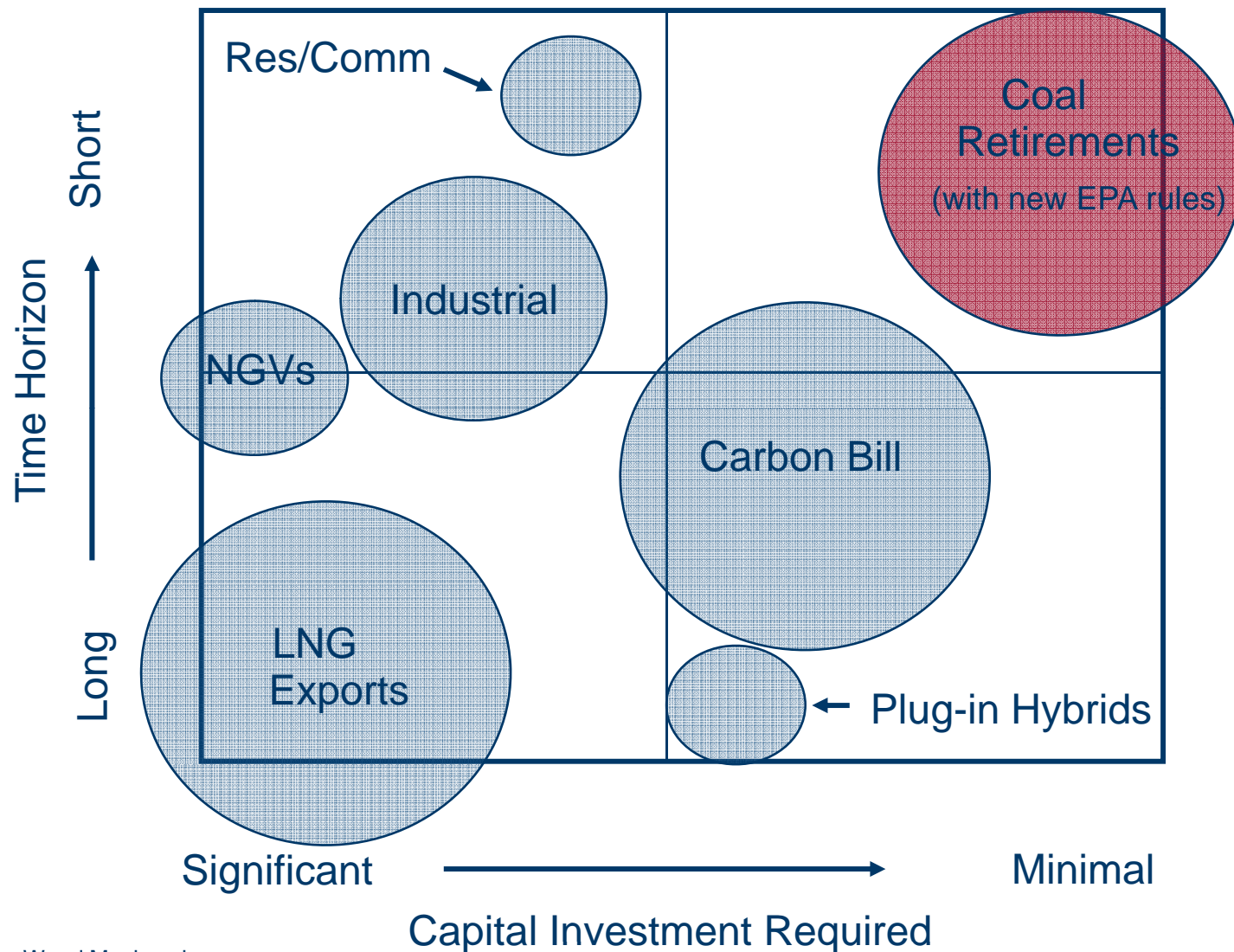


Source: Company data, Credit Suisse estimates

# Electric power demand key to medium-term outlook

- Why?
  - By and large industrial demand will likely be capped by industry's exodus abroad, whereas high industrial end users (e.g., Petchems) are already at high levels of capacity utilization
  - Residential and commercial users require additional recovery time
  - Environmental constraints will likely push utilities to natural gas as a bridge to the future
- How?
  - New market structures and conditions should reduce significantly the major obstacles to natural gas use by providing significantly reduced seasonality and short-term volatility

# Natural gas demand growth drivers, by opportunity



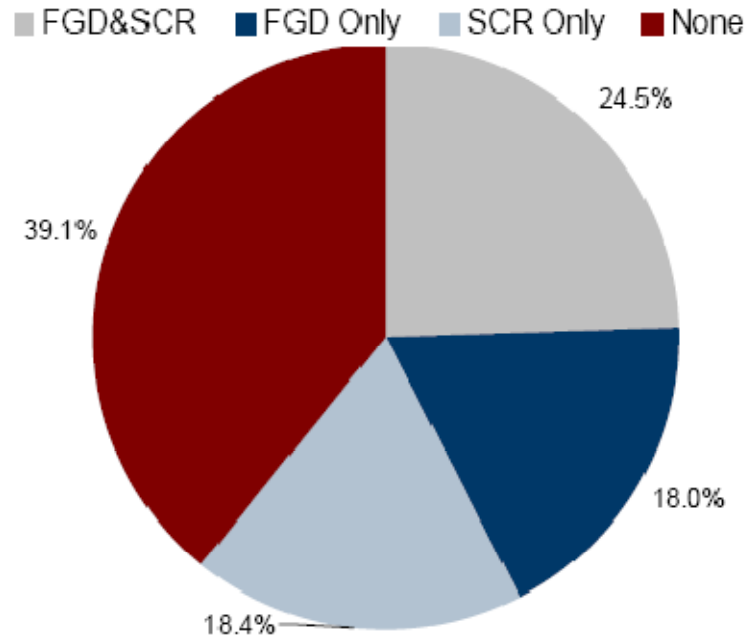
Source: Wood Mackenzie

# New EPA rules, not carbon legislation, should accelerate coal retirements

- In our opinion, the successful challenge to the EPA's Clean Air Interstate Rule ("CAIR") and the Clean Air Mercury Rule ("CAMR") will likely result in significantly more restrictive standards for the electric power industry, which in turn will have far-reaching implications for natural gas demand.
- The first of the new 're-tooled' rules, the Clear Air Transport Rule ("CATR"), was intended to replace CAIR and will require slightly more onerous emission limits.
- The other shoe to drop is the CAMR replacement. By court decree, the EPA has until March 2011 to draft a proposed maximum achievable control technology rule ("MACT"), which should be fast-tracked for finalization by November 2011.
- The MACT rule will set an outright floor on hazardous air pollutants ("HAPs") by limiting emissions to levels currently achieved by the best-performing 12% of operating units. This rule will not be met through the use of allowances.
- If SO<sub>2</sub> control equipment proves to be the best available control technology for HAPs, there is a slight problem... Roughly one-third of the 340 GW of installed US coal capacity not only lacks this equipment, but also has no plans for installing it.

# US coal plant capacity and cost to install scrubbers

## Current US Coal Plant Capacity



## Unscrubbed Coal Units (with no plans to retrofit)

### NERC Region

ERCOT  
FRCC  
MRO  
NPCC  
RFC  
SERC  
SPP  
WECC  
**Total**

### Net Capacity

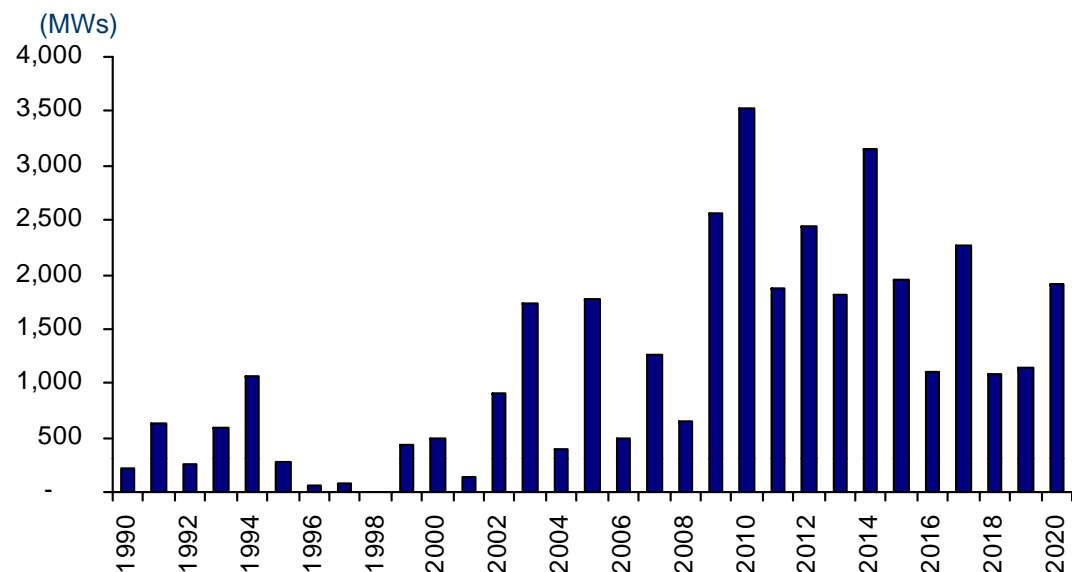
5,156  
50  
14,380  
2,096  
33,927  
37,592  
11,708  
3,210  
**108,118**

Source: EnergyVelocity and Credit Suisse Equity Research estimates

- Of the 340 GW Coal Plant Capacity in the US, only 83 GWs are fully scrubbed. If 50% of current unscrubbed plants are scrubbed, it will cost \$40bn (assuming \$600/KW cost); assuming partially controlled plants are also upgraded would mean costs would rise to \$120bn.

# Coal retirements might well double given EPA rules...

Announced US Coal Plant Retirements 1990-2020



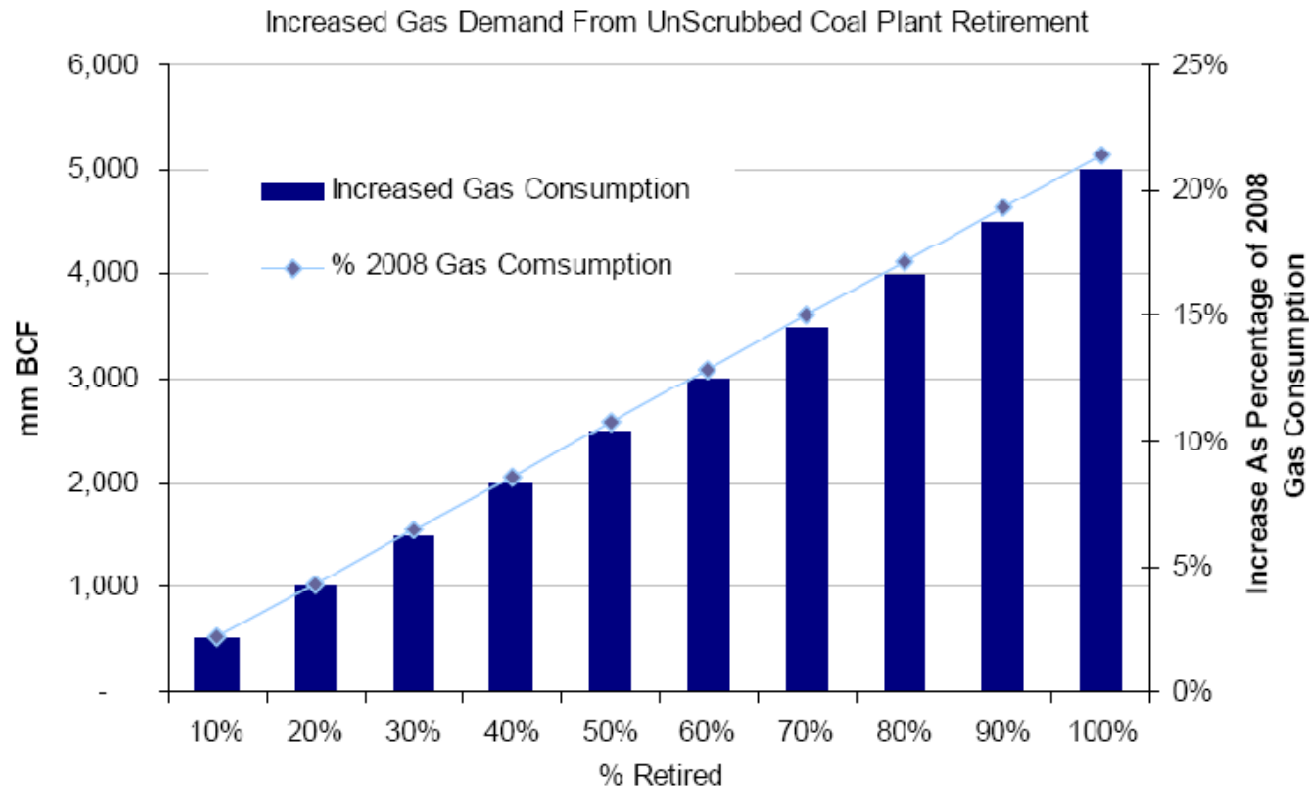
- Over 20 GW of coal generation will retire by 2020 or more than double the retirements of the last decade.
- After accounting for age and unit efficiency, the amount of retirements could actually climb to 40-50 GW during this period.

Potential US Coal Plant Retirements Based on Age and Efficiency (GWs)

	>12,000	11,000 - 12,000	10,000 - 11,000	<10,000	Subtotal
<b>Before 1960</b>	4.1	6.9	21.2	17.3	49.5
<b>1960-1970</b>	1.8	6.1	22.5	38.9	69.3
<b>1970-1980</b>	1	6.2	49.3	71.7	128.2
<b>1980-1990</b>	0.7	7.7	40	37.3	85.7
<b>1990-</b>	0.3	4.3	6.5	23.3	34.4
<b>Subtotal</b>	7.9	31.2	139.5	188.5	

Source: EnergyVelocity and Credit Suisse estimates

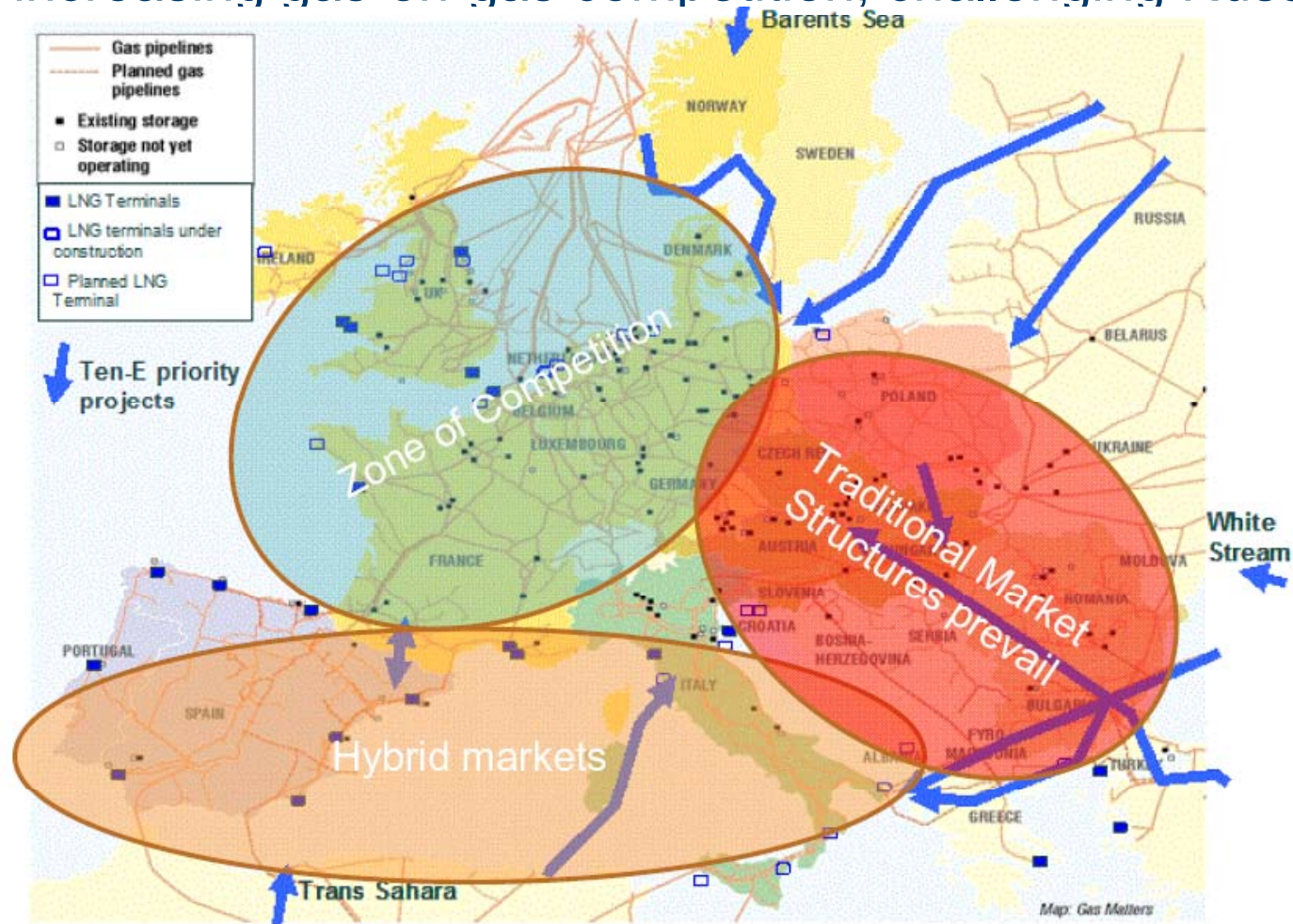
# Impact of coal retirements on natural gas demand?



Source: Credit Suisse estimates

- Replacing half of the US coal plants lacking controls with CCGTs would increase natural gas demand by 2.5 TCF / year or ~11% of 2009 US gas consumption.
- Renewables, nuclear might be the power fuel of the future, but natural gas is the critical bridge and government policy is slow to recognize this.

Meanwhile US gas surplus pushes LNG capacity aimed for US to Europe, increasing gas-on-gas competition, challenging Russia



Source: Global Gas Strategies

## But Big Question: Will German, EU Regulation push further? Or impede growth in market forces?

- The issue is natural gas vs. oil prices, with most int'l gas irrationally linked to oil, with which it doesn't compete.
- Victory of consumer challengers in Germany's Federal Court of Justice last spring, ruling that LDCs should not pass on oil-linked contracts to consumers provides precedent.
- Yet only 6% of German consumers have gas-competitive prices.
- Major obstacles in EU to third party sales, trans-border trades.



Source: Der Spiegel

# Asia growth markets also challenge oil-linked contracts



Sources: the BLOOMBERG PROFESSIONAL™ service, NASA

- India, China have indigenous oil/gas output, ending controlled prices.
- Both seek burn tip nat gas prices.
- China imports from FSU countries with effectively “stranded” gas, with floor price Russia’s domestic controlled/subsidized prices.
- Neither country is likely to tolerate full oil-linked contracts long term.
- This summer spot LNG has traded at 55% of European, Asian long-term contracts.
- Australia producers could challenge traditional Mid East contracts.

## Less dramatic but critically important has been the increasing move from shale gas to oil

### US drilling has moved to oil plays

- Lower 48 output has been growing robustly, up 250-k b/d in past quarter year.
- NGLs and crude rich sands in Bakken, Eagleford, Niobrara, Permian, California projects should add 1-mb/d by 2017.
- Bakken, Eagleford and California could each be 1-mb/d plays.

### US shale oil always been thought a game changer

- USGS has for long seen significant potential in US shale.
- In early 1980s, shale oil in place in state of Wyoming alone was estimated at 1.6-trillion barrels, with 600-bil recoverable – compares with 1-trillion bbls of proven commercial and 250-billion bbls in Saudi Arabia.
- Major environmental obstacles stand in way.

# There are lots of liquids in the Shale Plays

## Shale Gas Plays, Lower 48 States

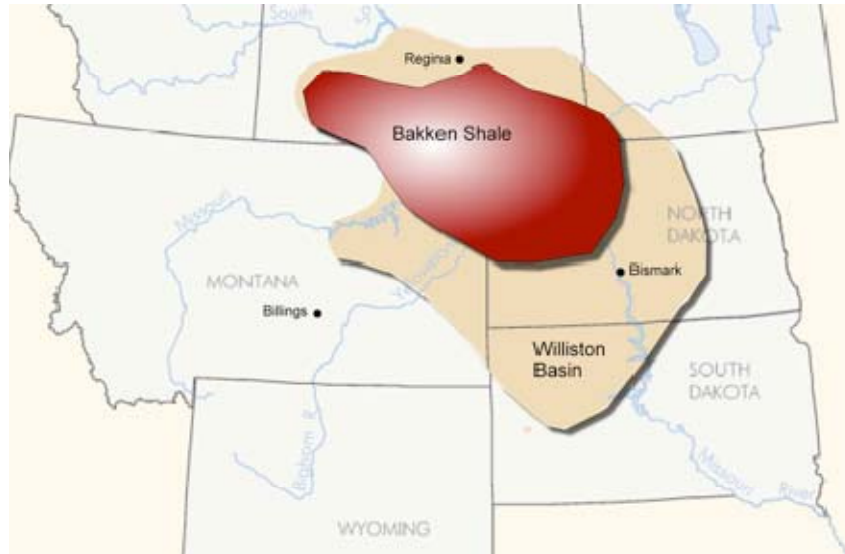


Source: Energy Information Administration based on data from various published studies  
Updated: May 28, 2009

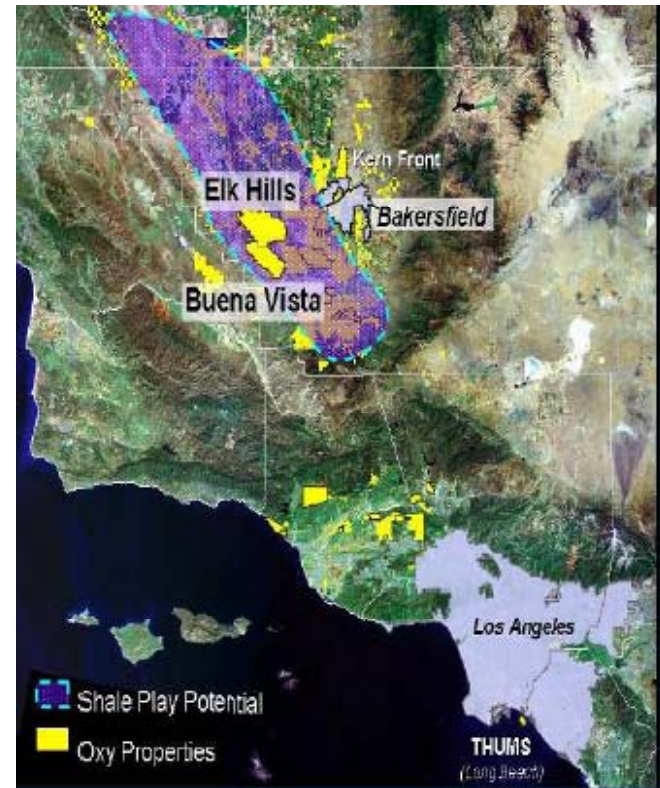
US shale oil should grow to over 1-m b/d within five years, mostly Bakken, excluding Eagle Ford

**Bakken looks likely to have 3.5-5 bil bbls recoverable**

**California shale play looks like a minimum 1-bil bbls**



Source: TheOilDrum



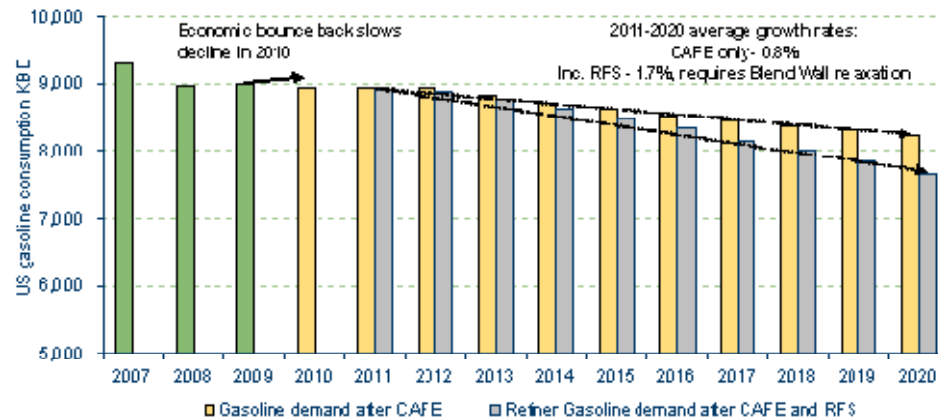
Source: TheOilDrum

And this just in.....

- Last week El Paso Corp. spent \$180 million for acreage in Permian Basin's Wolfcamp formation, getting nearly half of the 260-k acres leased.
- The University of Texas and Texas A&M received \$207 million in high bids – four times the previous record (\$52 million in 1980), five times the last sale (April 2010), more than annual royalty income.
- Latest reports indicate Eagleford could double Bakken volumes, which are on the rise to 800k b/d.
- In little bits and pieces onshore US production is increasing even more than Russian production, perhaps the same amount as total FSU.

# Regulations are also transforming US gasoline demand

## Impact on US Gasoline Demand of Tighter CAFÉ and RFS Requirements



Source: Credit Suisse Equity Research "US Refining Sector" April 14, 2010

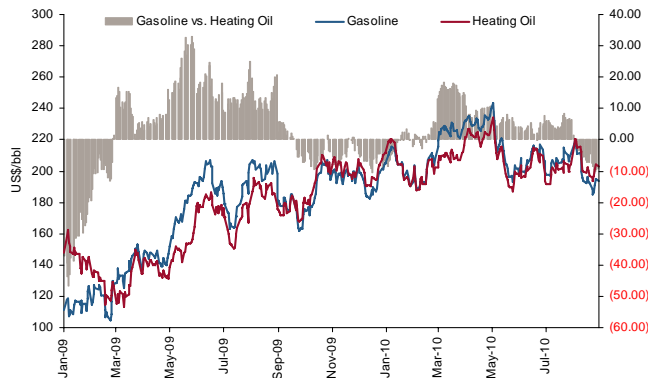
- US gasoline demand in structural decline, impact global gasoline fundamentals, as largest market goes from growth to contraction.
- New CAFÉ standards should drop US demand by 800-k b/d by 2020; add rising RFS ethanol mandate and ethanol requirements rise from 12 bil gallons in 2010 to 36 bil gallons by 2022 (from 770-k b/d to 2.3-m b/d).
- EPA review of petition for 15% ethanol waiver will impact current "ethanol wall"; combined ethanol, CAFÉ standards drop demand 1.4-mb/d by 2020.

# Gasoline is becoming a waste product in US, globally

**Seasonal impact of gasoline vs. heating oil:** Traditionally gasoline trades at a premium to heating oil leading through the driving season, when the price relationships between the two flips, as refiners maximize throughput of heating oil to meet winter demand. Given the large overhang of distillates stocks and prospects for a warmer winter, we remain more bearish on distillates than on gasoline after the winter season.

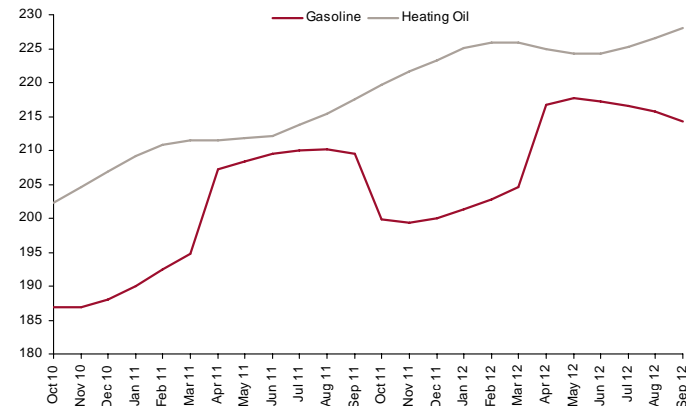
The forwards curves of gasoline and distillates show that the market no longer expects a seasonal gasoline premium

Gasoline vs. Heating Oil Prices, Jan.-09-present



Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse Global Commodities Research

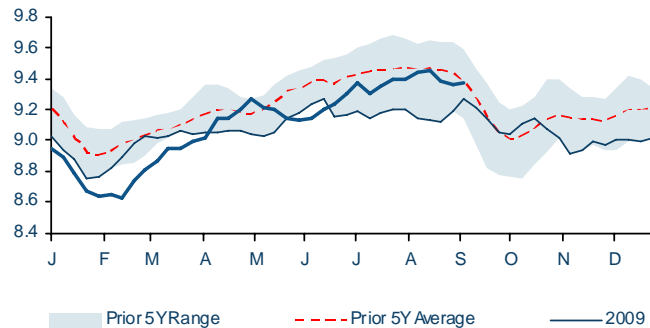
Gasoline and HO Forward Curves through September 12



Source: the BLOOMBERG PROFESSIONAL™ service, Credit Suisse Global Commodities Research

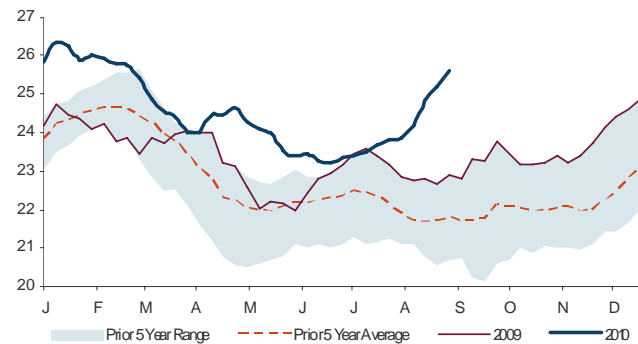
# Meanwhile gasoline is become a sort of waste byproduct

US gasoline demand, Jan. '05- present (m b/d)



Source: EIA, Credit Suisse Global Commodities Research

US gasoline stocks days of demand cover

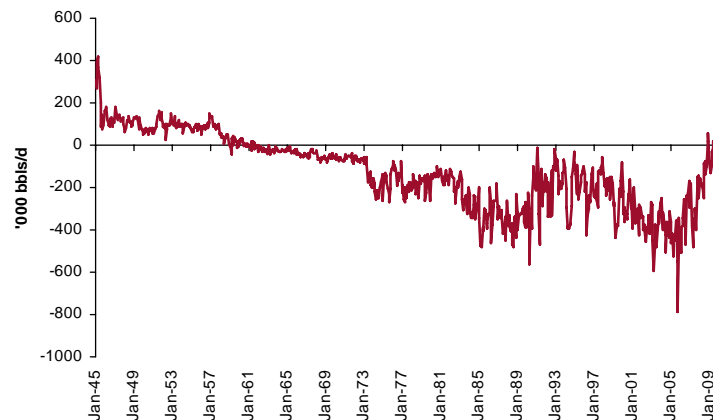


Source: EIA, Credit Suisse Global Commodities Research

- Despite low refining margins, US refiners are making too much gasoline, with inventories at record levels both in terms of absolute levels and in terms of days of forward demand cover.
- Lower imports and exports of finished mogas still prevent inventories from being drawn (see later slides).

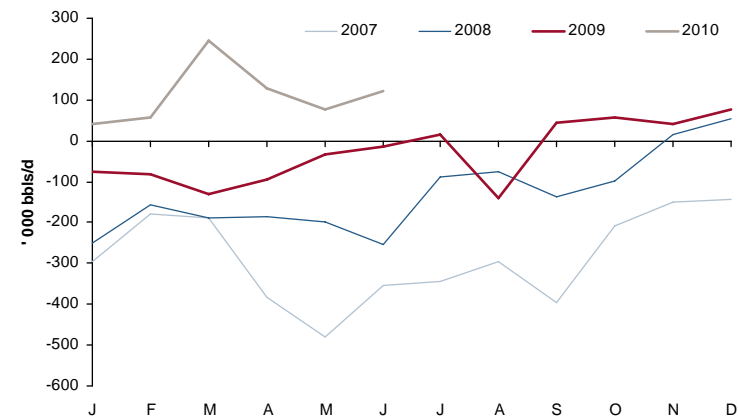
# And the US has become a net exporter of finished mogas

## US Net Exports of Finished Gasoline 1945-present



Source: EIA, Credit Suisse Global Commodities Research

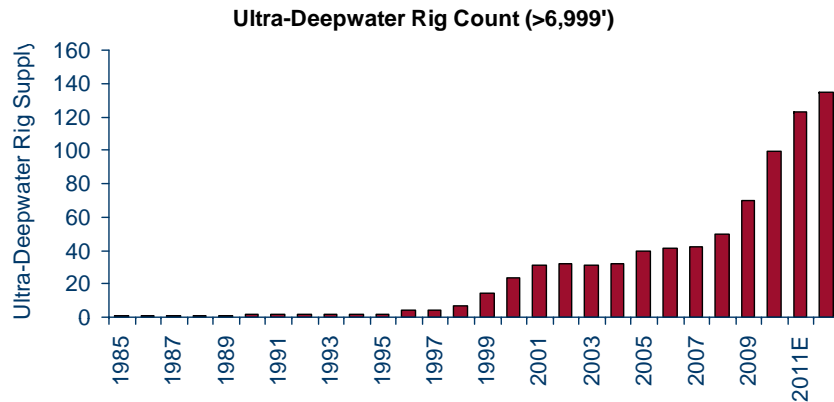
## US Net Exports of Finished Gasoline 2007- Present



Source: EIA, Credit Suisse Global Commodities Research

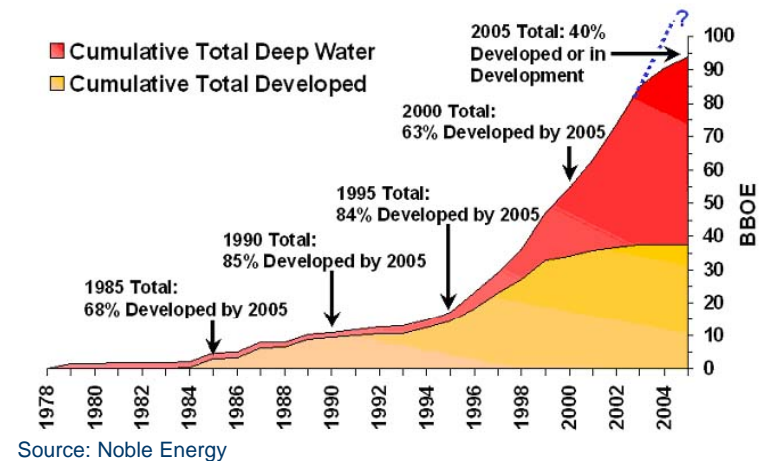
- PADD 3 refiners have also benefited breakdown of Venezuelan refining.
- But refiners in PADD 5 and PADD 1 are suffering, in part because subsidized refining in India and China are making them structurally long gasoline as well.
- Lack of oil industry influence in Washington means government unwilling to think through US national trade interests in refined products, in our opinion.

# But on the offshore, Macondo makes a big difference



Source: Credit Suisse

## Cumulative Deepwater Discoveries/Output



Source: Noble Energy

- US deepwater production had risen to 1.65-m b/d, 35% of global deepwater output, where US has been a leader.
- US deepwater poised to double later this decade, along with global deepwater, where constraint is not access to acreage but access to rigs.
- Like shale hydrocarbons, deepwater production a critical bridging fuel to a lower carbon future.

## MMS was a disaster in waiting

- In our view, US management of deepwater akin to a third world country – riddled by corruption scandals, conflicts of interest.
- US government income from oil and gas royalties is second largest source of US government revenue after taxes.
- Royalty-in-kind program led to establishment of an effective national oil company, collecting oil and selling it into the market.
- Reform of MMS should have been on the Obama agenda: September 2008, in the midst of election, the DOI inspector general report<sup>1</sup>: “*a culture of ethical failure,*” “*a culture of substance abuse and promiscuity,*” “*rigging contracts and accepting gifts,*” engaging in “*illicit sexual encounters*” with both subordinates and industry representatives.
- Good news about Macondo: new Bureau of Ocean Energy Management, Regulation and Enforcement.
- Bad news: delay in deepwater and impact on global supplies.

We have taken the following report from the DOI inspector general Earl E. Devaney report dated September 9<sup>th</sup>, 2008

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## So domestic energy is in the hands of the regulators

- New energy legislation in gridlock, will remain so after November
- EPA is critical to: gasoline demand, shale development, coal burn and future mix of power generation fuels
- Biggest impacts are probably going to be in power sector
  - Coal demand could fall 155-325 mt in a 1.1 billion ton/year market
  - Natural gas demand could grow 1.8-3.7 tcf/year in a 22 tcf market
- Whatever EPA does will likely be subject to lawsuits
  - In a society split by major energy issues, environmentalists and industry will likely turn to the courts to press their interests
  - Environmentalists have successfully sued the EPA on CAIR
- Some critical dates:
  - 2010 on ethanol wall waiver; ozone rules that can impact E&P
  - 2011 MACT proposal and final CATR rule
  - 2012 study completion on fracturing

## Meanwhile, USG has abandoned any international strategy

- The one clear policy stance has been sanctions on Iran
  - They have succeeded as punishment but not in changing Iranian nuclear policy
- China and Russia pose major challenges to the rules of the game
  - Both see energy as critical national interest issues, see use of energy as instruments of foreign policy
  - For Russia there is an increasingly successful policy of becoming a global player
  - For China the issues are more complexly neo-mercantilist
  - In both cases there are challenges to policy – what do we seek and how can we get it?
  - No one has rethought role of US in securing Middle East supplies and sea lanes
- Meanwhile, business as usual might well be a good way to protect US interests

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**Buy:** Indicates a recommended buy on our expectation that the issue will be a top performer in its sector.

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**Underperform:** Indicates a below-average total-return performer within its sector. Bonds in this category have weak or worsening credit trends, or they may be stable credits that, we believe, are overvalued or rich relative to the sector.

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# Disclosure Appendix cont'd

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