

## Industry on the Move - What's Next?

What will the changes in energy prices mean to industry in South Louisiana?

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## Industry Changes

- Unconventional development continues to dramatically change the U.S. economic landscape.
- U.S. has already moved from being an anticipated importer to major exporter of natural gas.
- U.S. has moved being the largest crude oil producer and will likely become an active and considerable world trading participant (on the supply side).
- Impacts go far beyond domestic energy resource independence and has large manufacturing implications.
- U.S. has the ability (potential) to enter into a new era of economic prosperity.

Understanding Recent Changes

- Recent fall in crude oil prices should not come as a “big” surprise. However, speed and magnitude of the decrease is stunning.
- Factors destined to shift the market:
  - (1) End of easy monetary policy (quantitative easing).
  - (2) Markets are re-assessing crude oil demand outlook
    - Continued U.S. structural change (increased efficiency/transportation fuel switching).
    - Japanese/European economic contraction.
    - “BRIC” (Brazil, Russia, India, China) slow-down/contraction.
  - (3) Trader realization/rationalization of stability and continuity of U.S. unconventional supplies.
  - (4) Saudi unwillingness to “catch the falling knife.”

## Take Aways

- Likely to continue to see near-term pricing volatility. Market having a tough time processing information.
- Lower prices will reduce upstream activity, but a slow recovery is very likely.
- The “genie is out of the bottle,” U.S. shale production is a relatively known and secure resource opportunity, if anything, low prices are the market’s best support for that belief.
- U.S. producers in survival mode: reduce costs; increase capital & operating efficiencies; and increase well productivity. (“the best solution for low prices is low prices”)
- Ultimately will see a turn around, and likely one that sees greater supply diversity and less OPEC supply dominance.

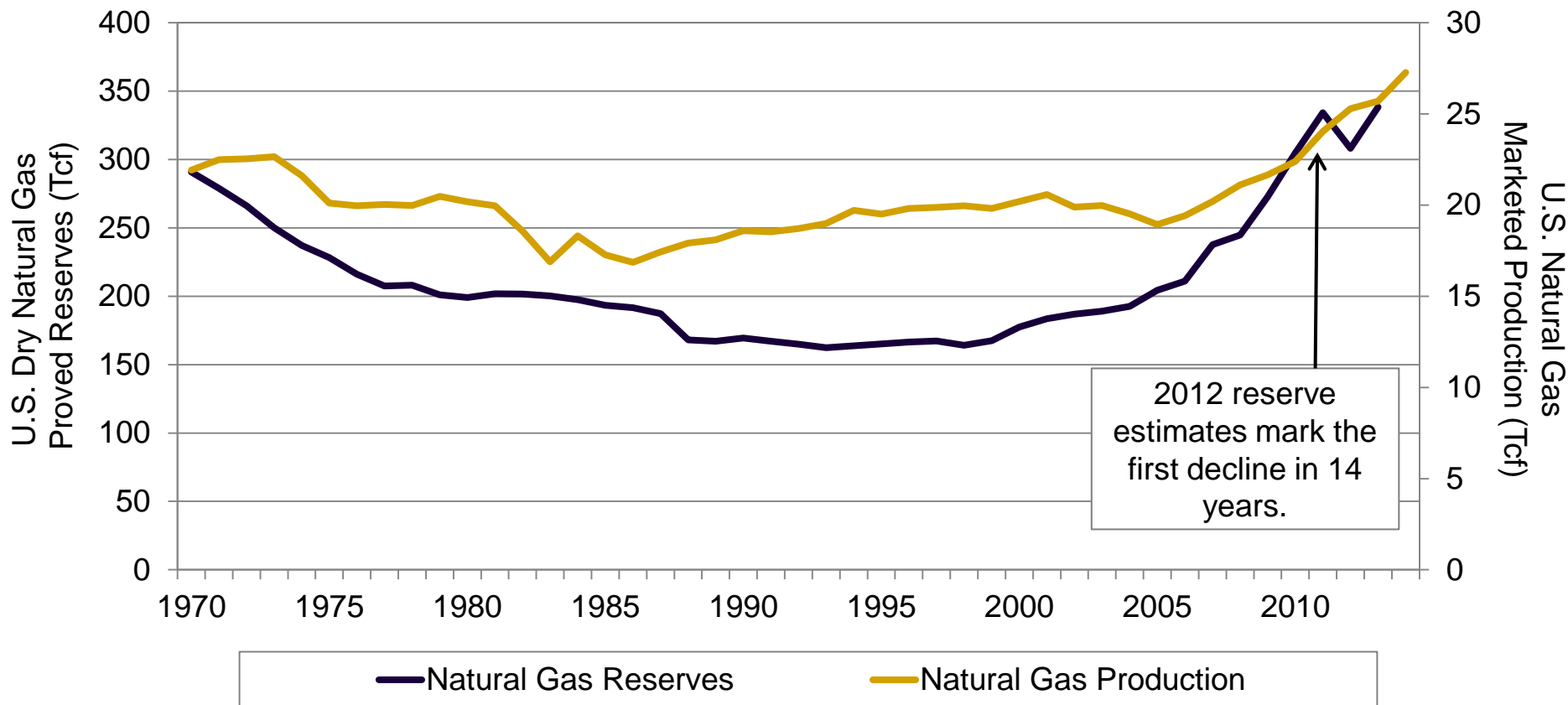
# Unconventional Natural Gas





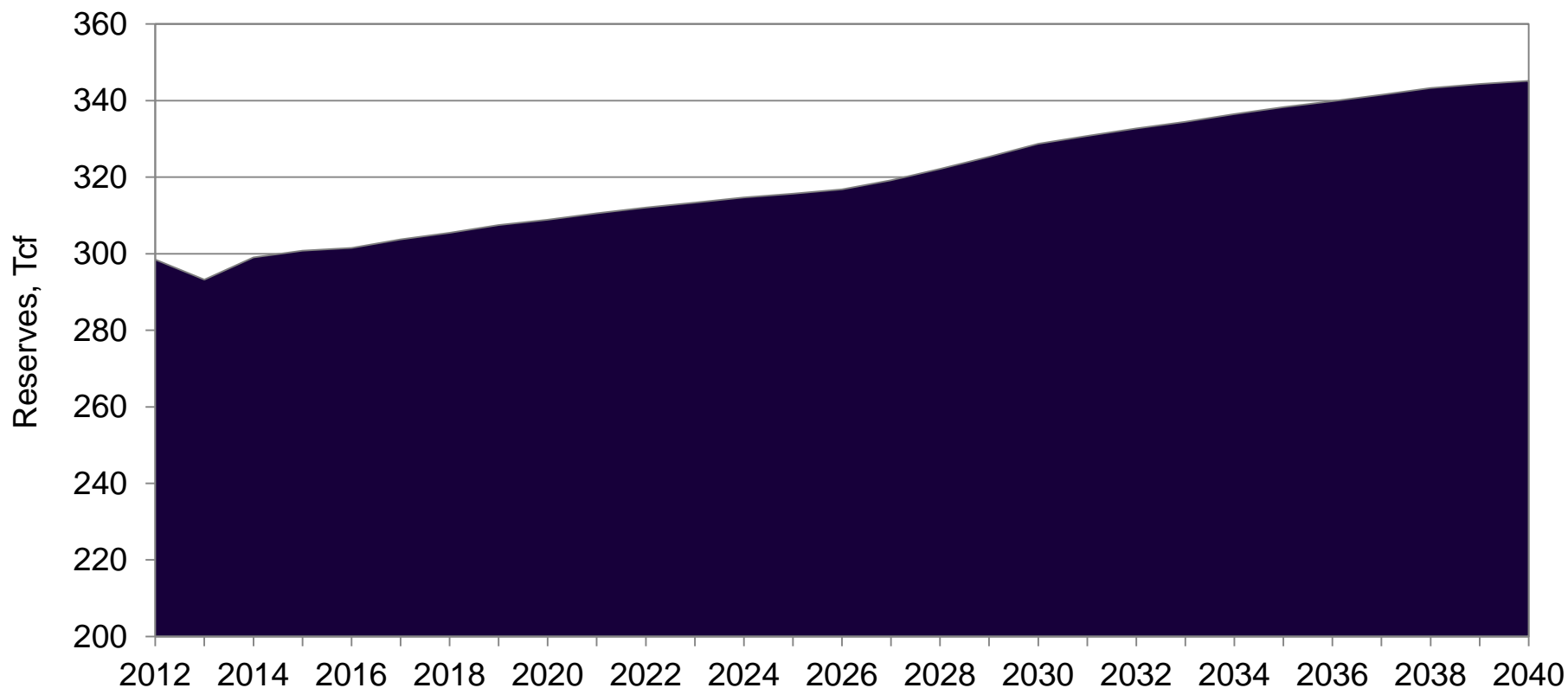
**Changes in Reserves and Production**

**Natural gas production and reserves are at levels not seen since the 1970s and both U.S. natural gas production and reserves are now at an all time recorded peak.**



## Annual Energy Outlook, Natural Gas Reserves

**Unconventional resources are not a “flash in the pan” and are anticipated to continue to increase over the next two decades or more.**

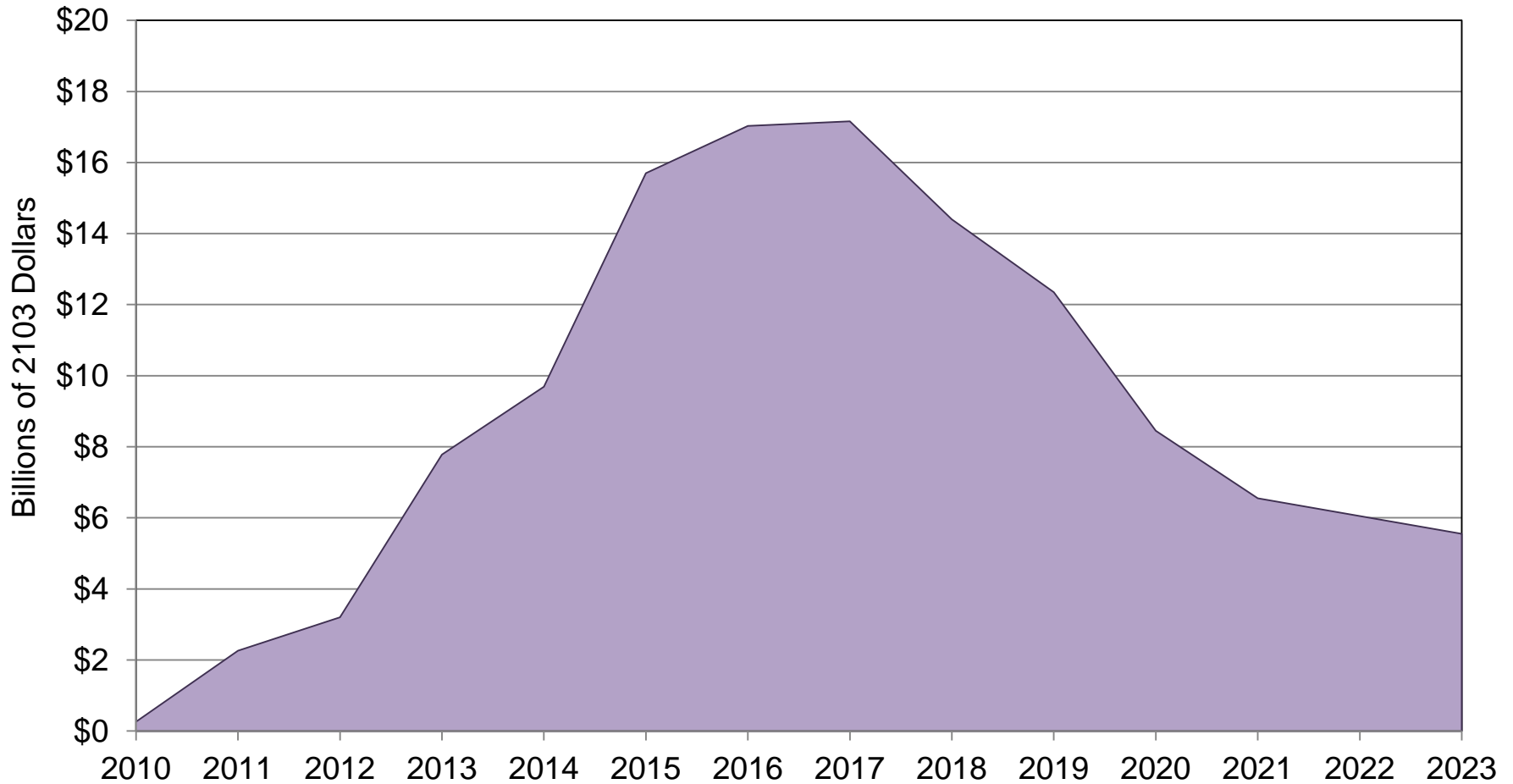




**Natural Gas and Economic  
Development: Moving from  
“Revolution” to “Renaissance”**

**U.S. Chemical Industry Capital Investment: Incremental Due to Shale Gas**

**The U.S. chemical industry is expected to invest up to \$17 billion per year in incremental expenditures, totaling over \$125 billion in the next 12 years.**

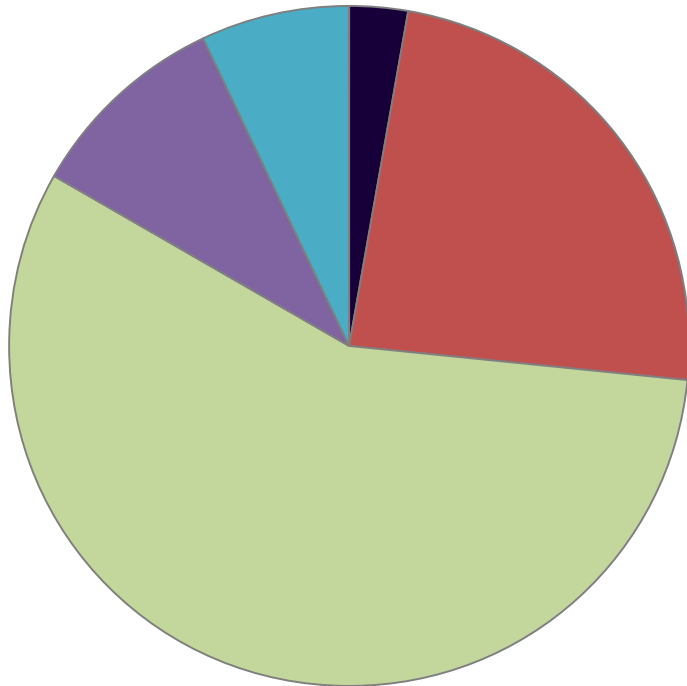


Source: T.K. Swift. 2014. Unconventional Oil & Gas Reignites the Economy. Presentation at NABE Annual Meeting, September 28, 2014.

**Composition of Announced Projects**

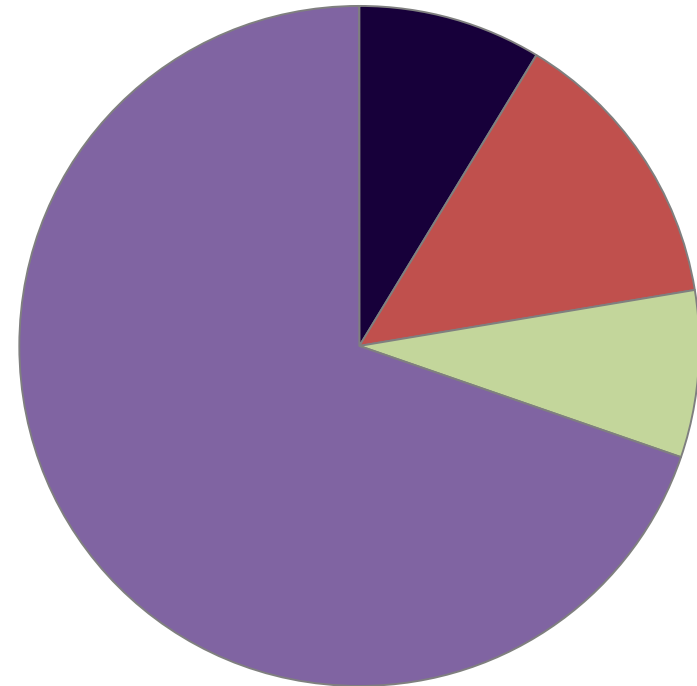
**The majority of chemical industry investment is in petrochemicals; and in the Gulf Coast region.**

**Investment by Industry Segment**



- Inorganic Chemicals, 3%
- Fertilizers, 24%
- Bulk Petrochemicals, 57%
- Plastic Resins, 9%
- Other, 7%

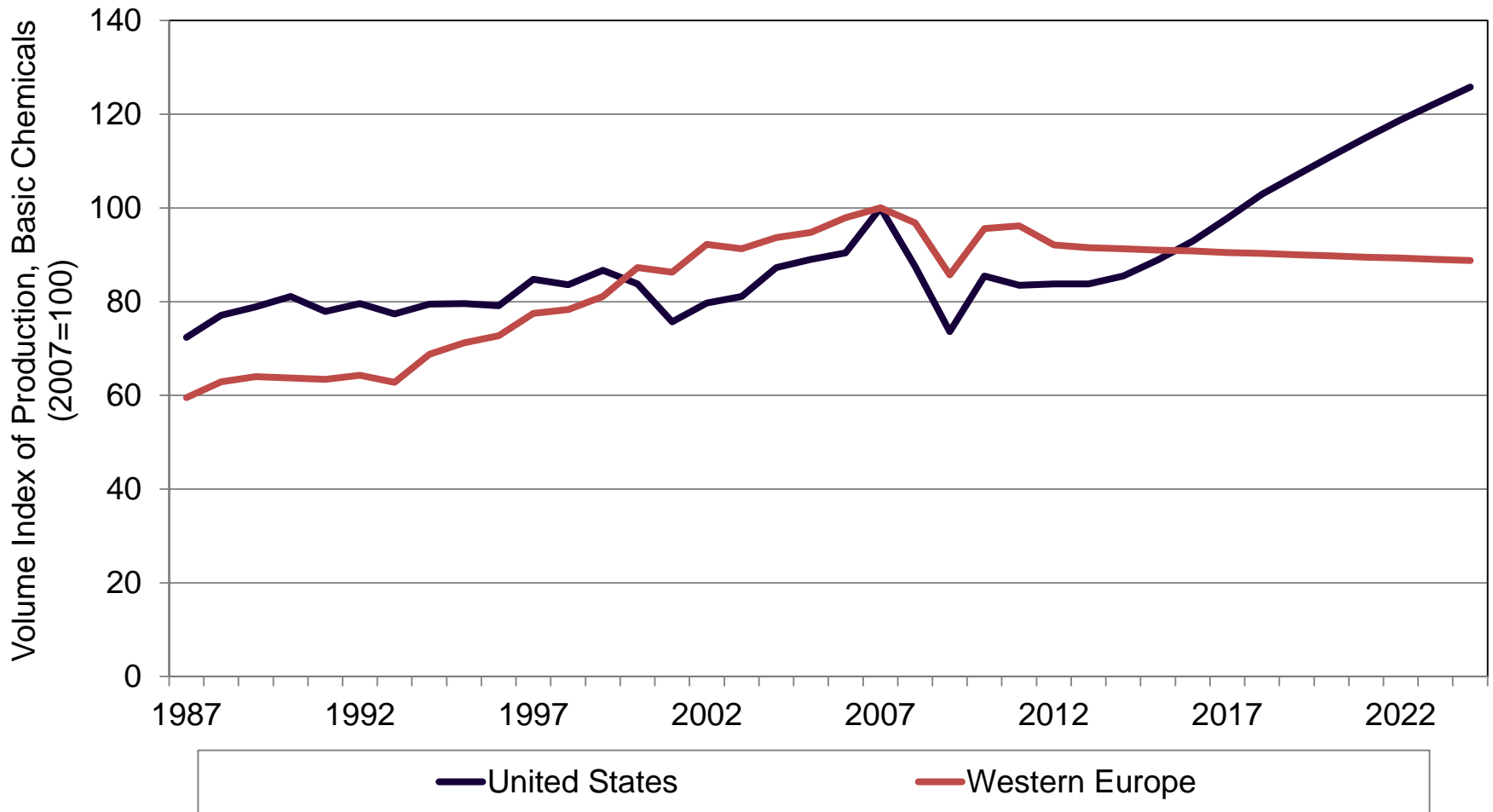
**Investment by Region**



- Ohio Valley, 9%
- Midwest, 13%
- Other, 8%
- Gulf Coast, 70%

**U.S. Captures Market Share from Western Europe**

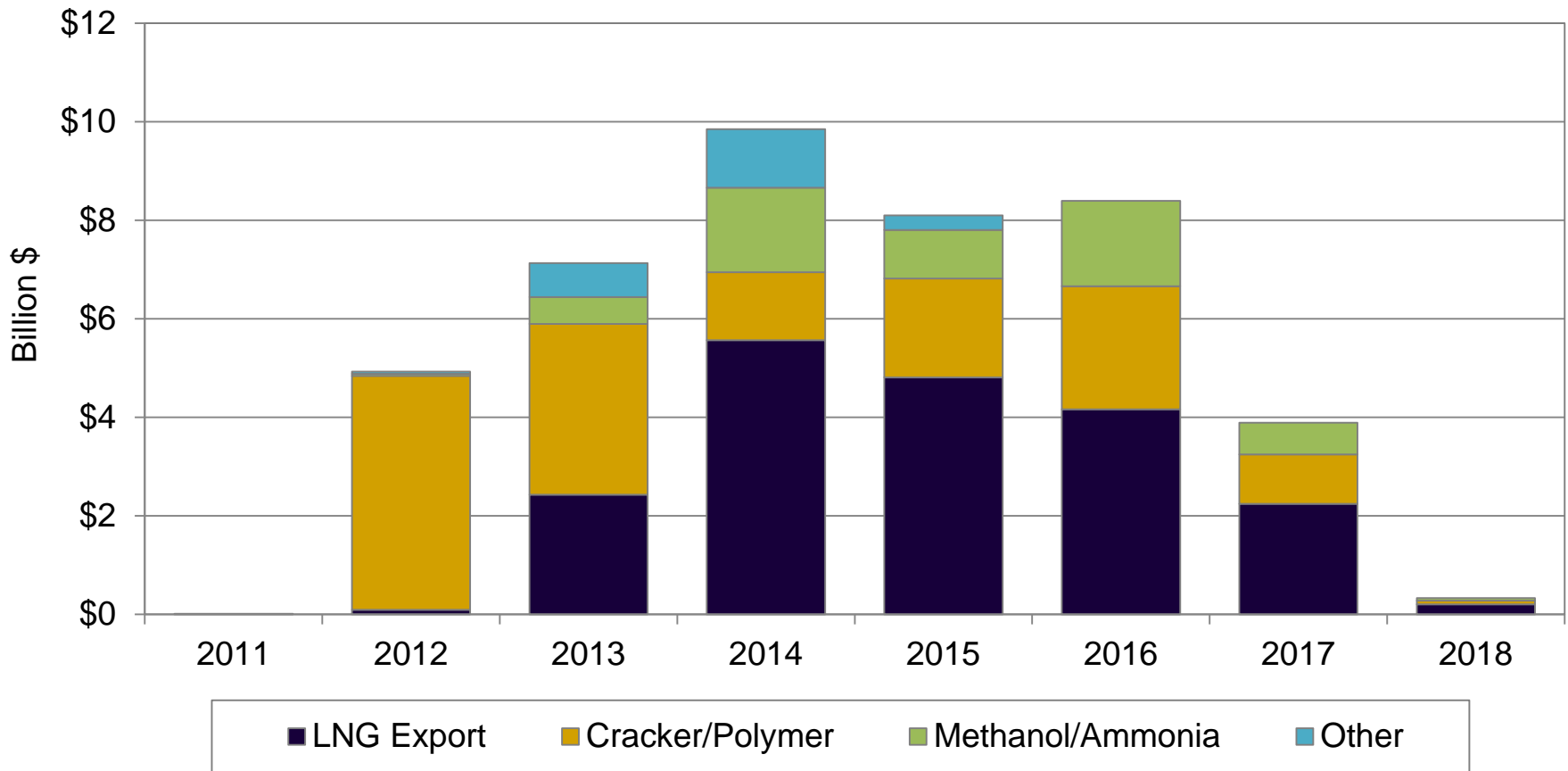
**By 2016, U.S. chemical production is expected to reclaim global market share by exceeding that of Western Europe.**



Source: T.K. Swift. 2014. Unconventional Oil & Gas Reignites the Economy. Presentation at NABE Annual Meeting, September 28, 2014.

### Louisiana Total Capital Expenditures by Sector

**Total capital investment associated with all announced natural gas-driven manufacturing investments in Louisiana totals over \$42 billion.**

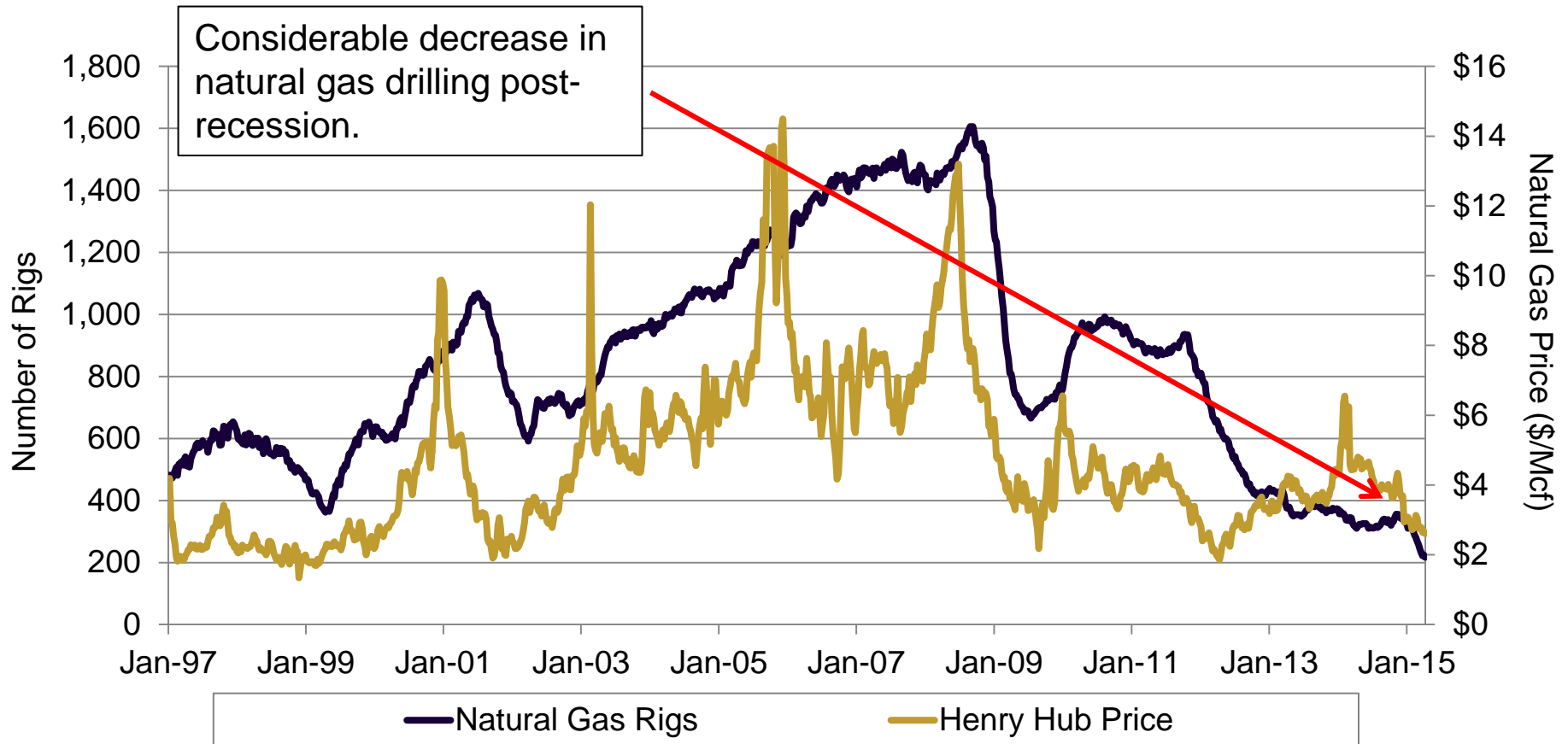


**Unconventional Crude Oil  
Development**



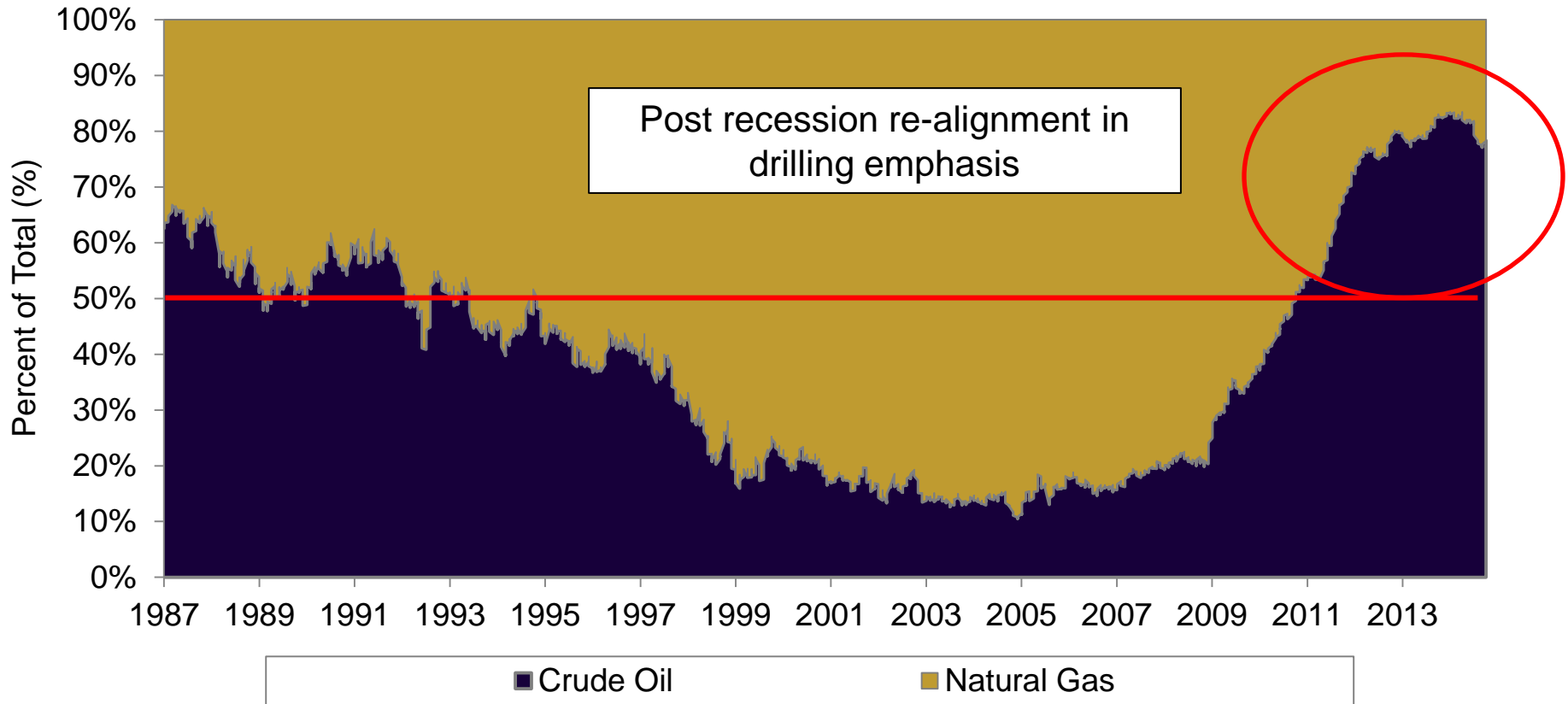
**U.S. Natural Gas Rig Count and Henry Hub Price**

**Natural gas rigs closely follow the natural gas spot price. Price decrease that started in 2007 has reduced natural gas drilling attractiveness.**



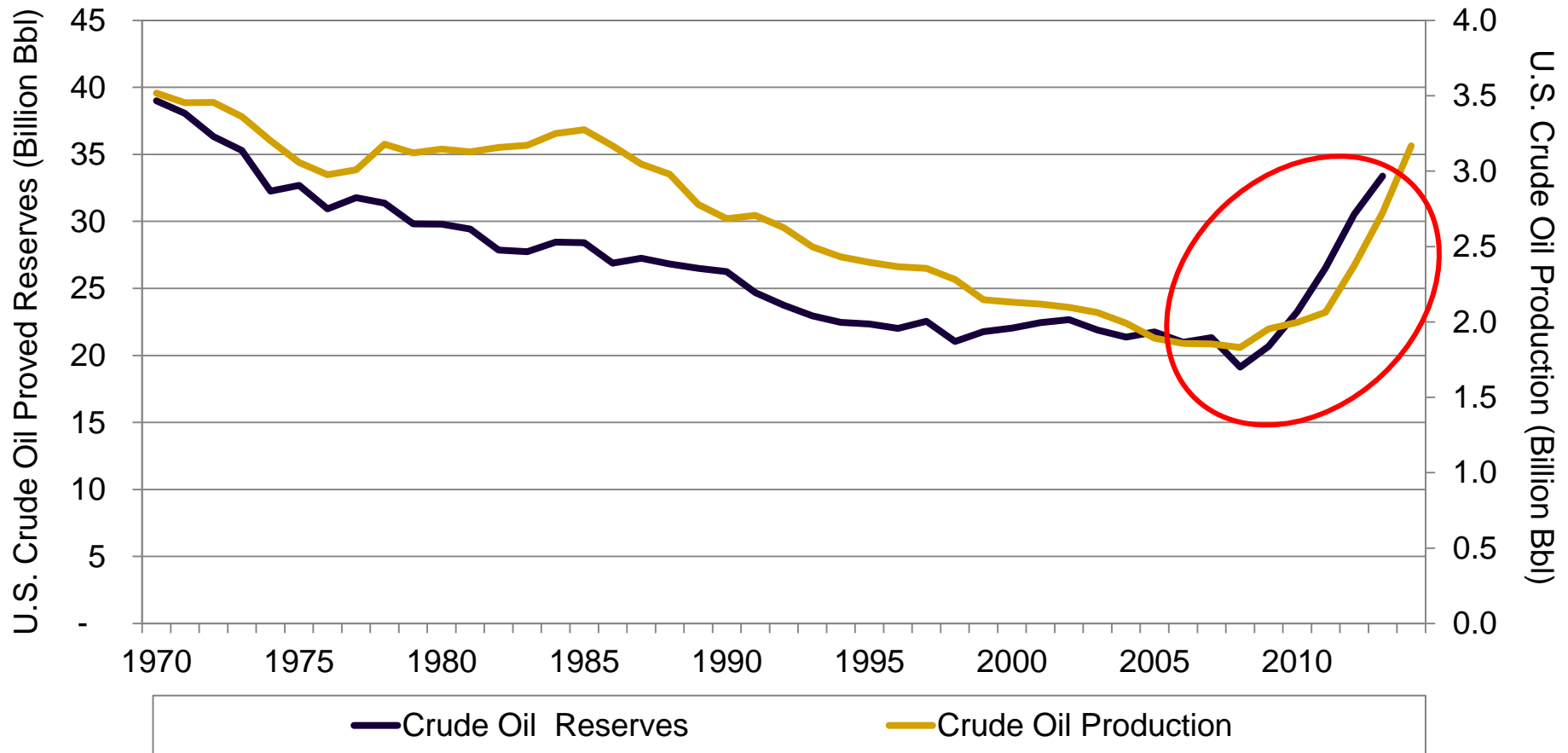
**U.S. Oil/Gas Rig Split**

**Drilling emphasis over the past 20 years has almost exclusively concentrated on developing new natural gas wells. This has shifted to crude oil drilling emphasis over the past two years.**



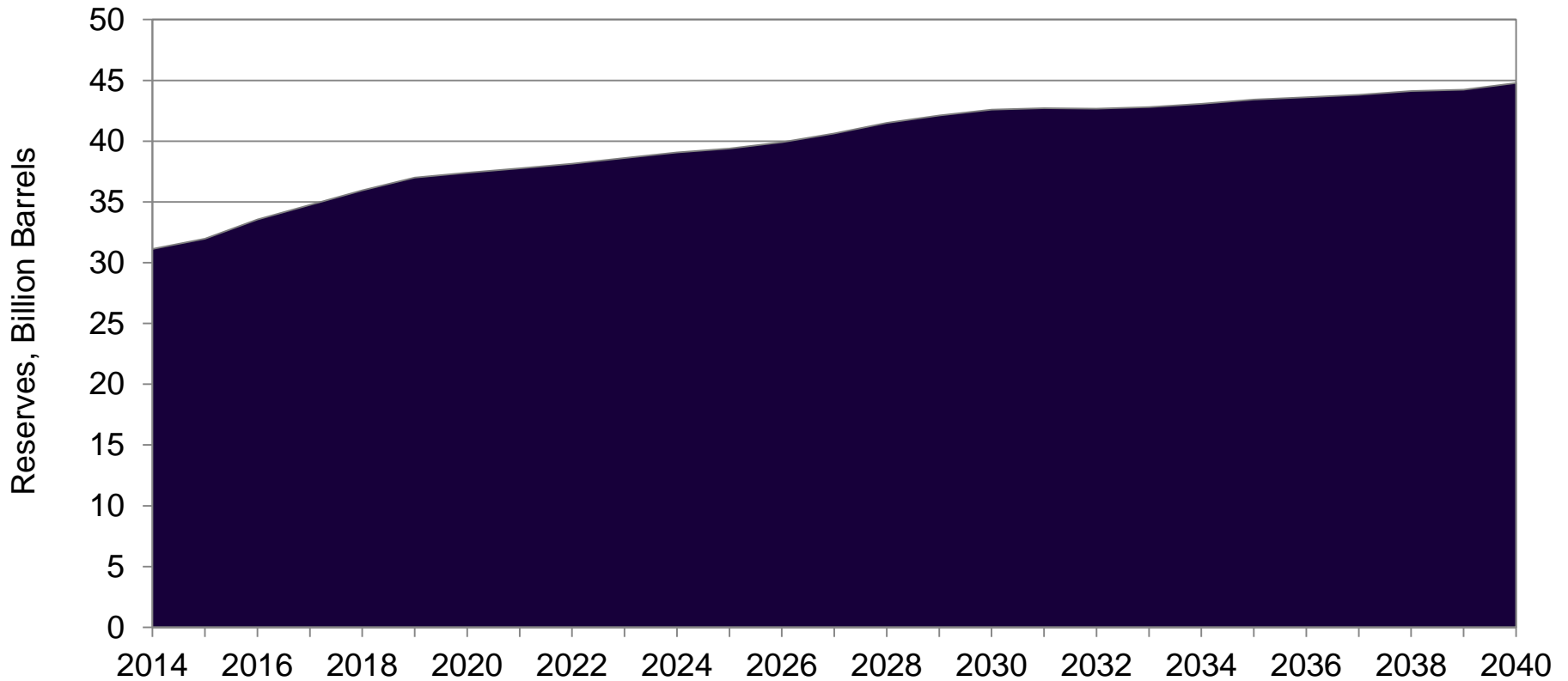
**Changes in Crude Oil Reserves and Production**

**Crude oil production and reserves are climbing back to levels not seen since the early 1980s (reserves).**



Annual Energy Outlook, Crude Oil Reserves

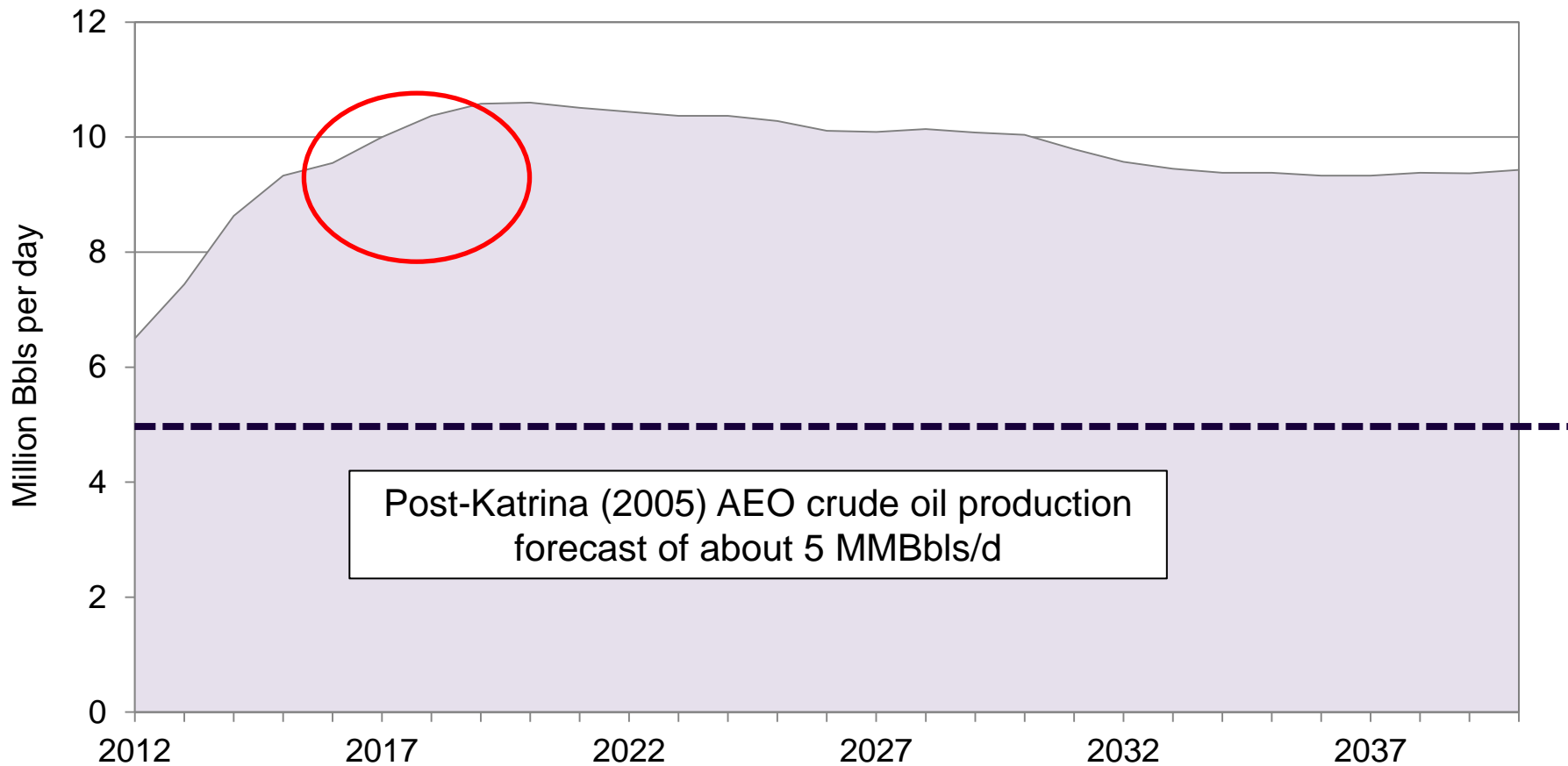
**Crude oil reserves are expected to increase 20 percent by 2020 and increase by another 20 percent by 2040.**



## Recent Market Changes

**Forecast U.S. Crude Oil Production**

**U.S. production of crude oil is expected to increase at an average annual rate of 6.4 percent through 2019, and decreases thereafter at a average annual rate of 0.6 percent through 2040.**





## Understanding Recent Changes

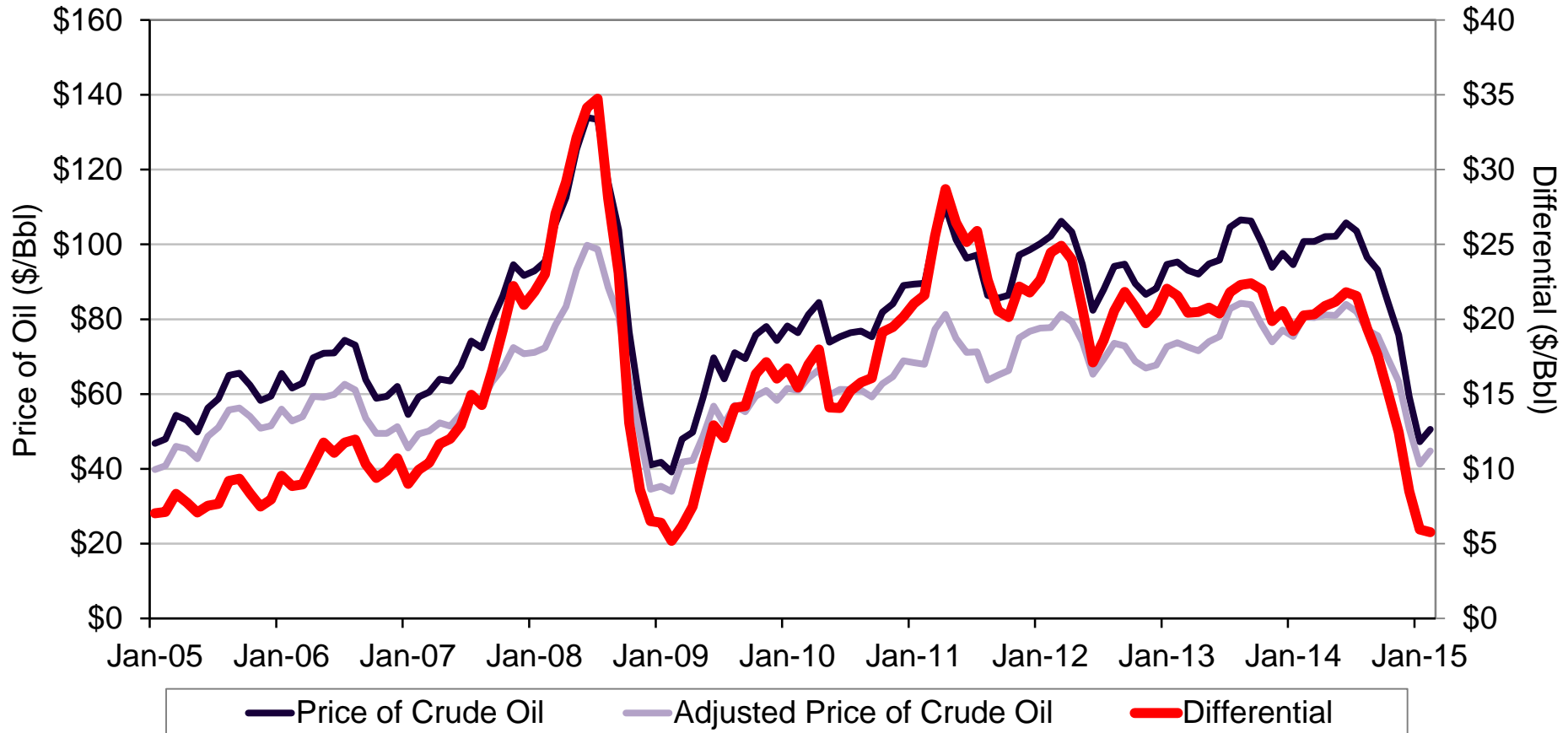
Recent market changes not entirely unexpected:

- Changes in dollar valuations due to the anticipated end of U.S. monetary easing.
- Increasingly apparent global economic contraction, particularly in China.
- Increases in non-OPEC production, including U.S. unconventional activity.



**Dollar Value and Oil Prices**

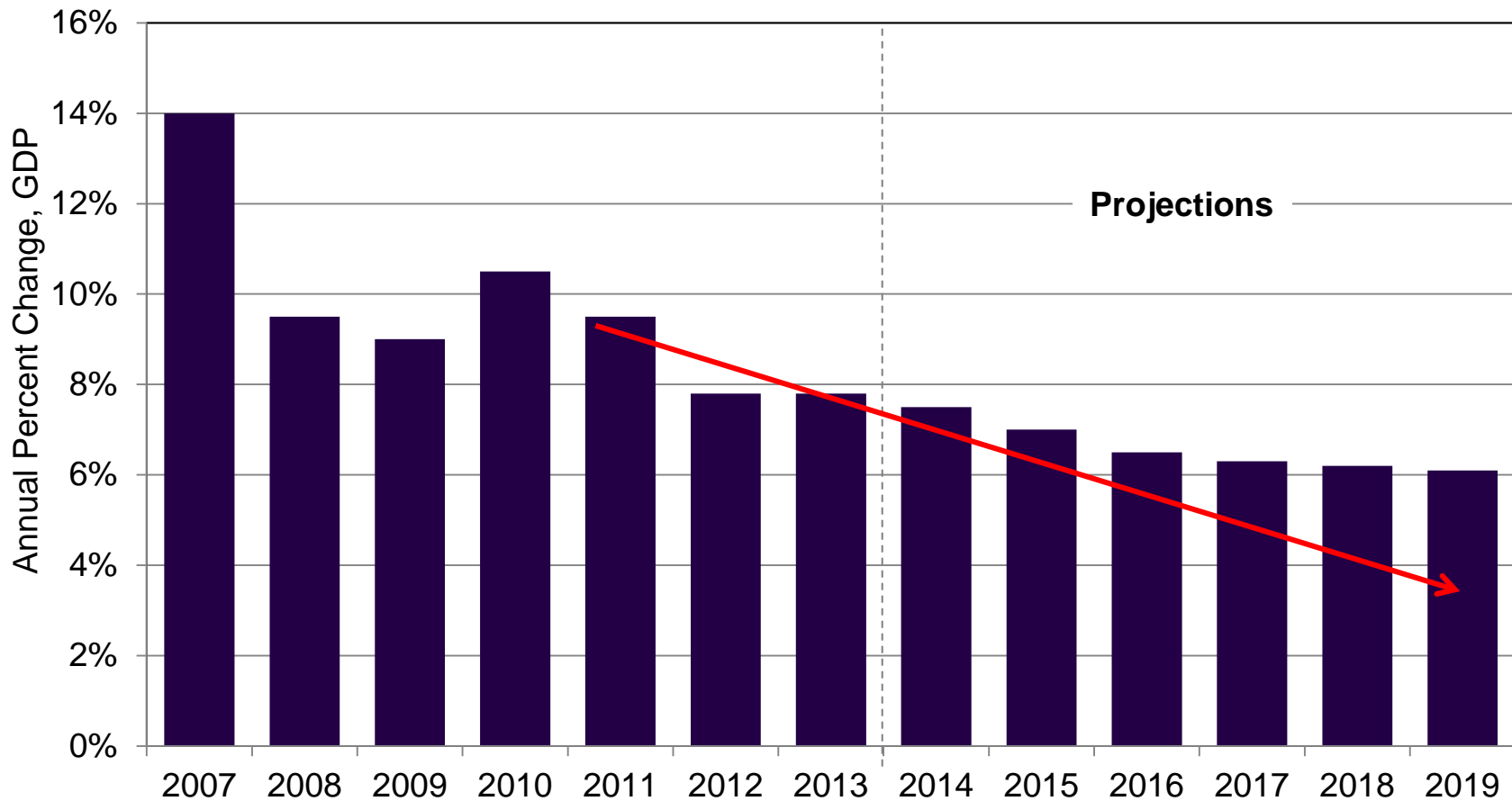
**Exchange rate adjusted value of crude oil starting to fall back to levels not seen since the financial crisis of 2008-2009.**



Note: The adjusted price of crude oil is the nominal WTI adjusted by the Federal Reserve Bank's Broad Index. The Broad Index is a weighted average of the foreign exchange values of the U.S. dollar against the currencies of a large group of major U.S. trading partners. Base year is 2002.

**Changes in Chinese GDP**

**Chinese economic growth slowing considerably from 2007 peaks.**

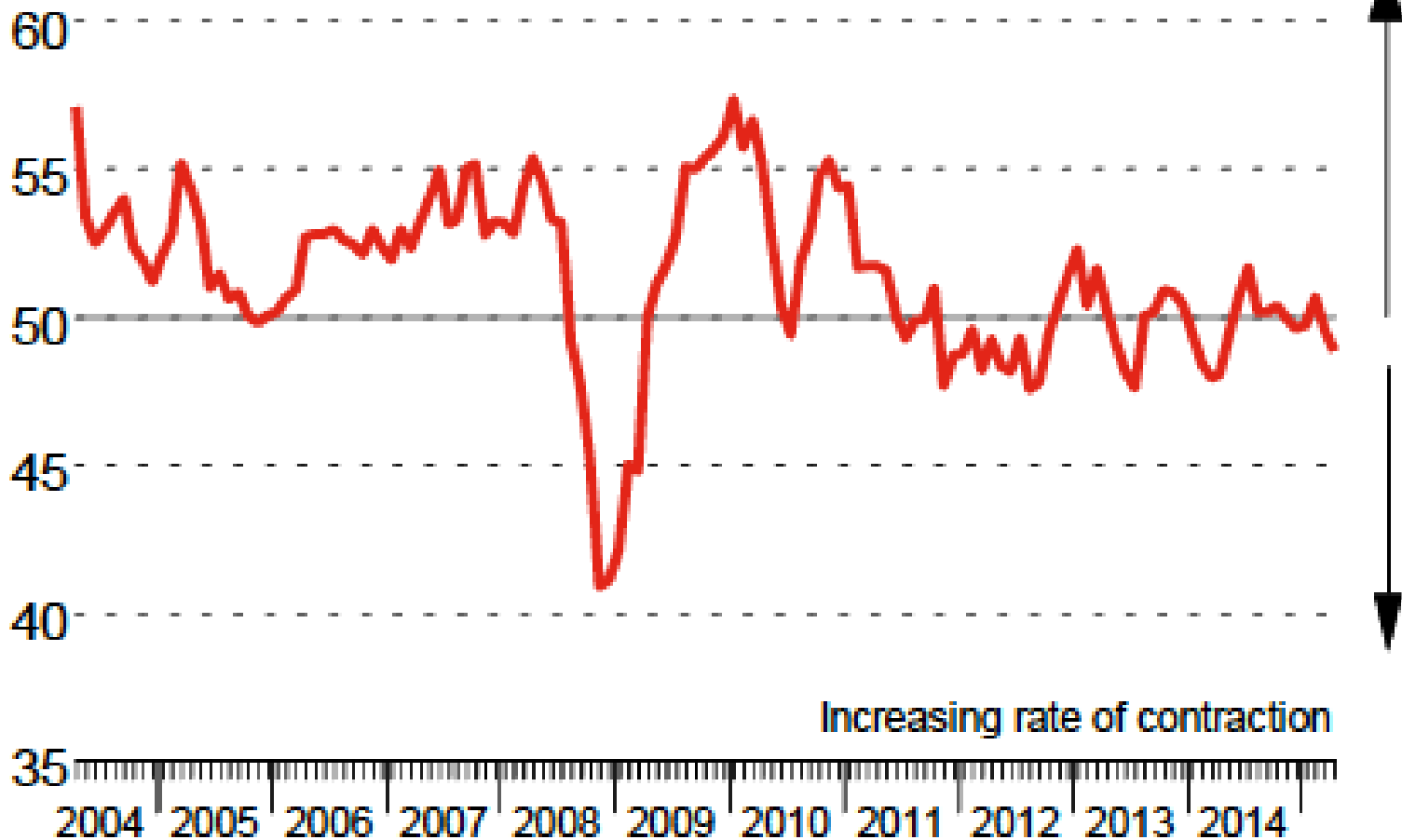


Chinese Manufacturing PMI

# HSBC China Manufacturing PMI

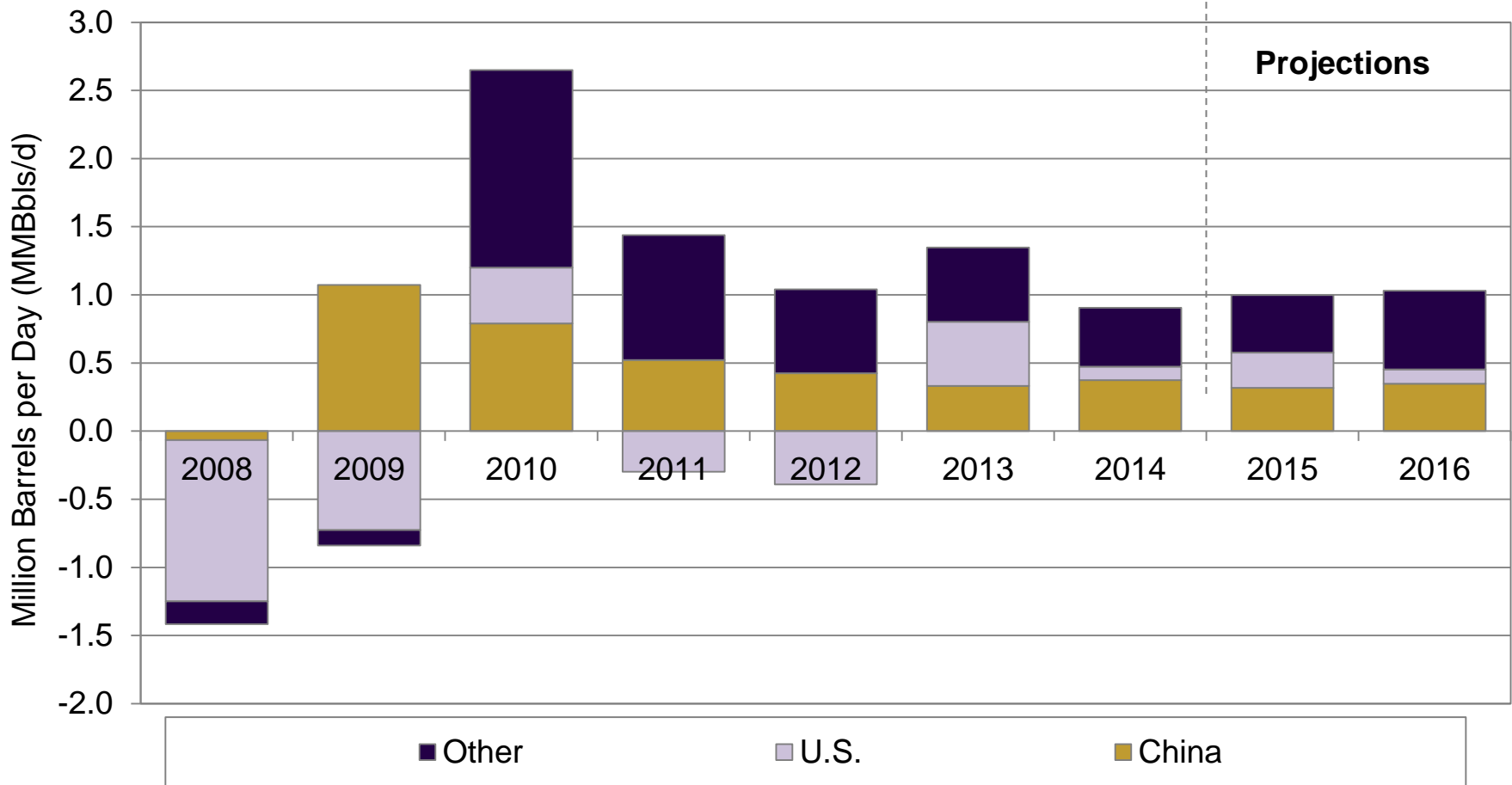
50 = no change on previous month, S.Adj.

Increasing rate of growth



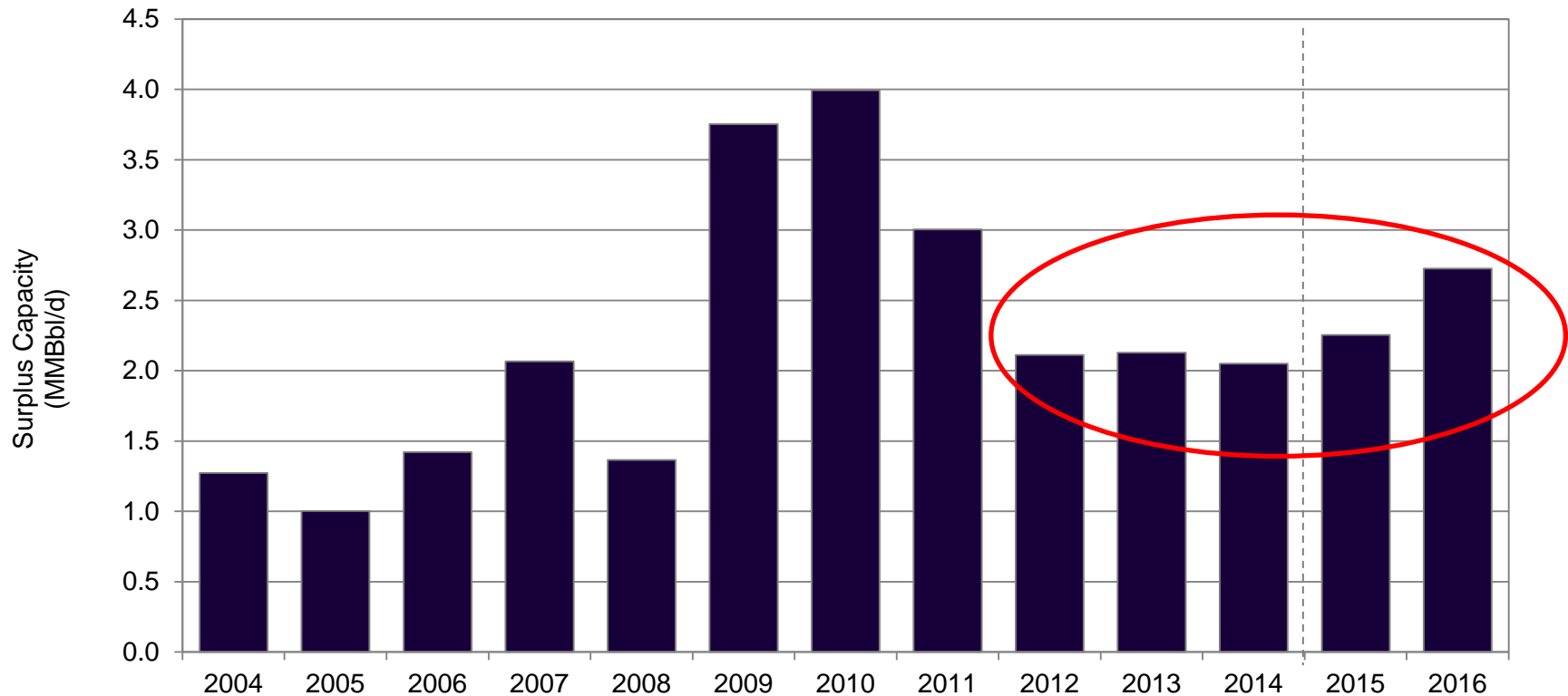
## Global Liquids Fuels Demand Contraction

**Change in liquids fuel growth slowing considerably, particularly since 2010. Gold portion of bar (China) getting smaller.**



**Increased Excess Production Capacity**

**“Conventional wisdom” suggests excess capacity responsible for the big crude oil price contraction. However, excess capacity has been relatively steady for the last three years.**





## Challenges and Risks by Sector

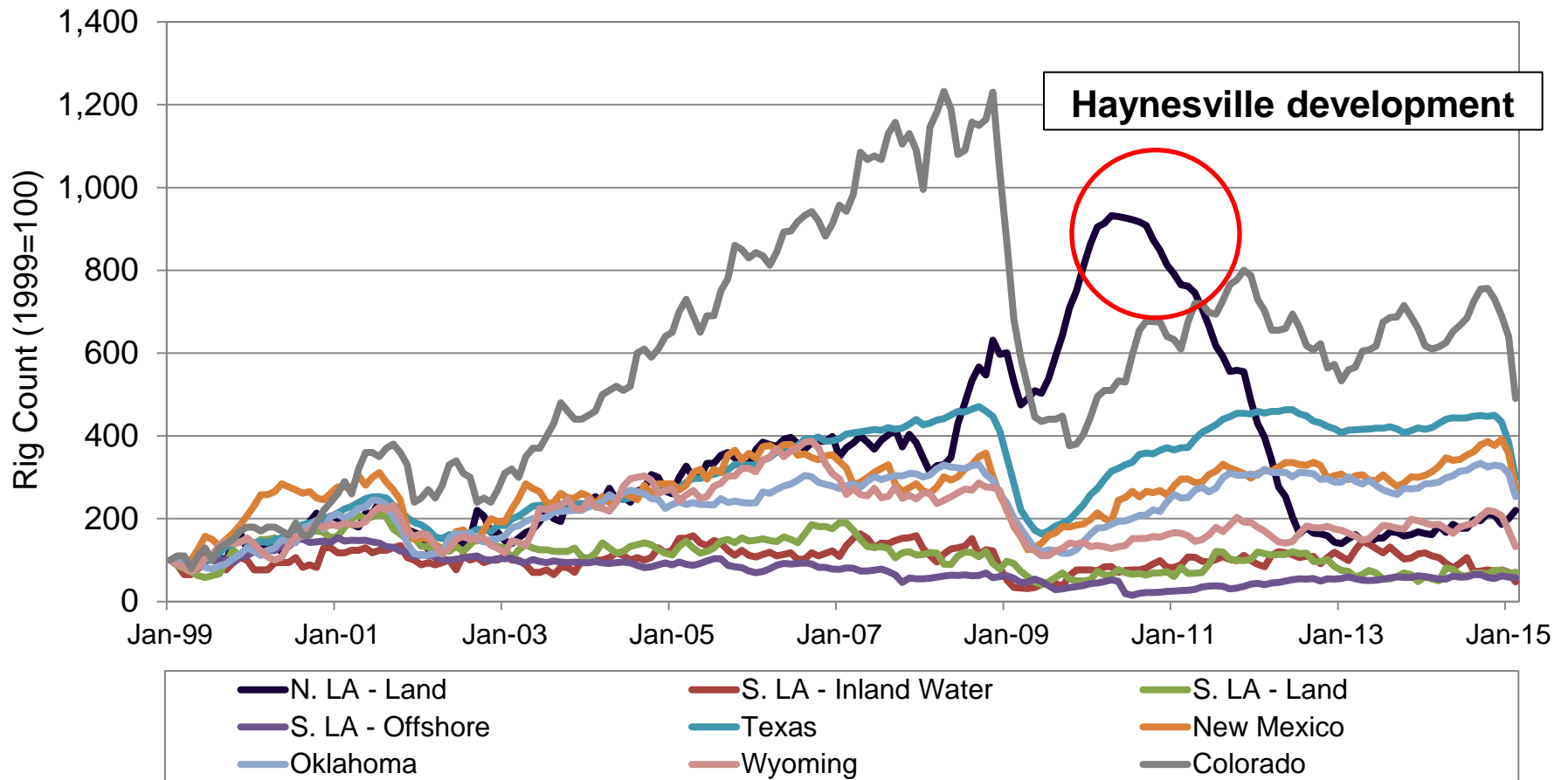
Three sectors important to Louisiana that will be impacted by these recent changes. Impacts will differ for differing reasons.

- **Drilling**: crude oil drilling in Louisiana has been contracting for years so there will be limited impact to in-state activity –
- **Service Sector Activity**: the contraction in total U.S. drilling activity will result in service sector contraction which is large in Louisiana.
- **Industrial Development**: some projects in outlying years will be at risk due to the collapse in energy price differentials (gas to crude).
- **Market Realignment**: crude supply and price outlook still clouded could create new incentives drilling in dry plays like Haynesville if associated gas production starts to fall considerably.

## Louisiana Drilling Impacts

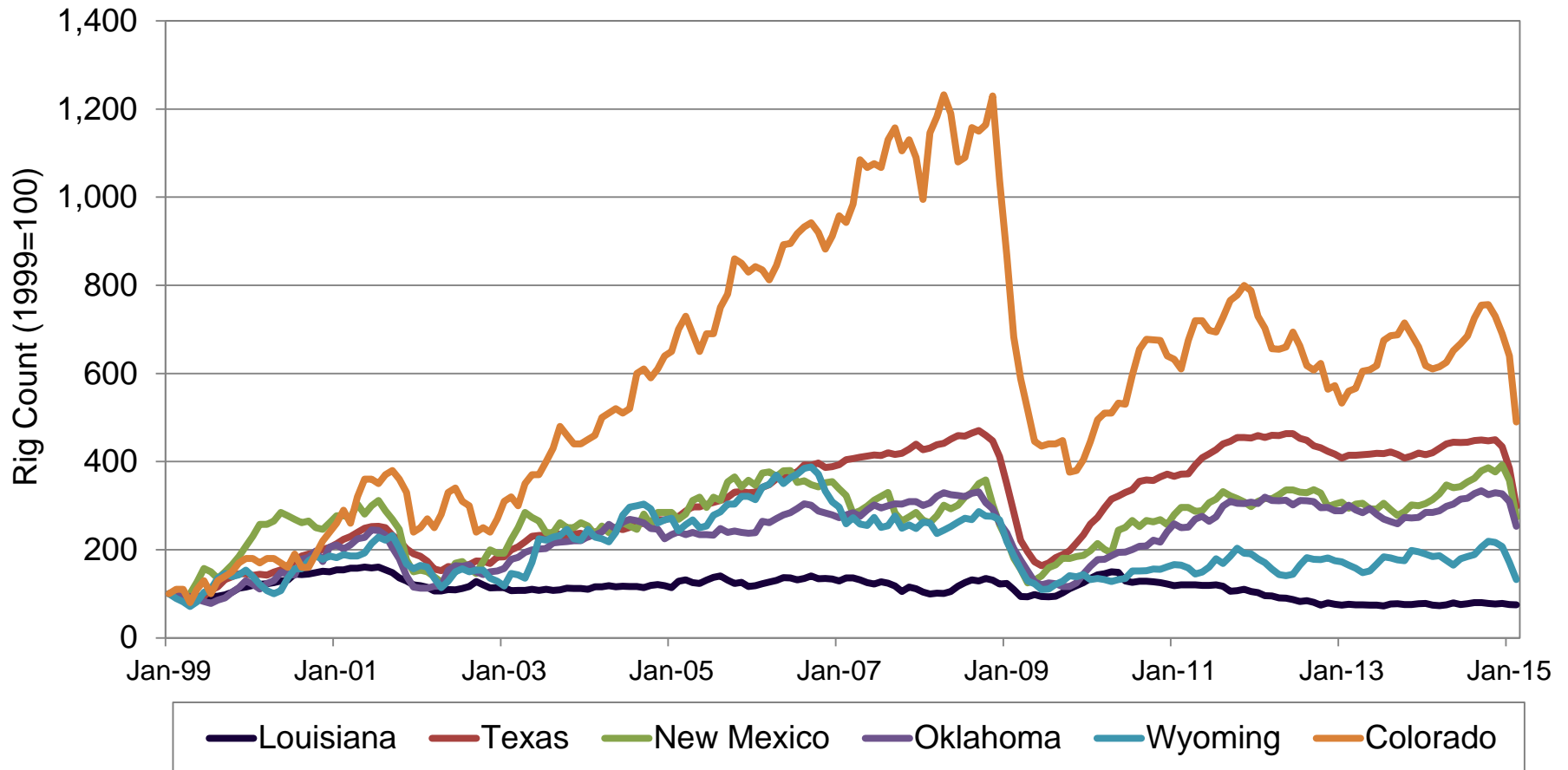
**Historic Rig Count by State**

**Louisiana rig counts driven by Haynesville. All areas down considerably post-recession.**



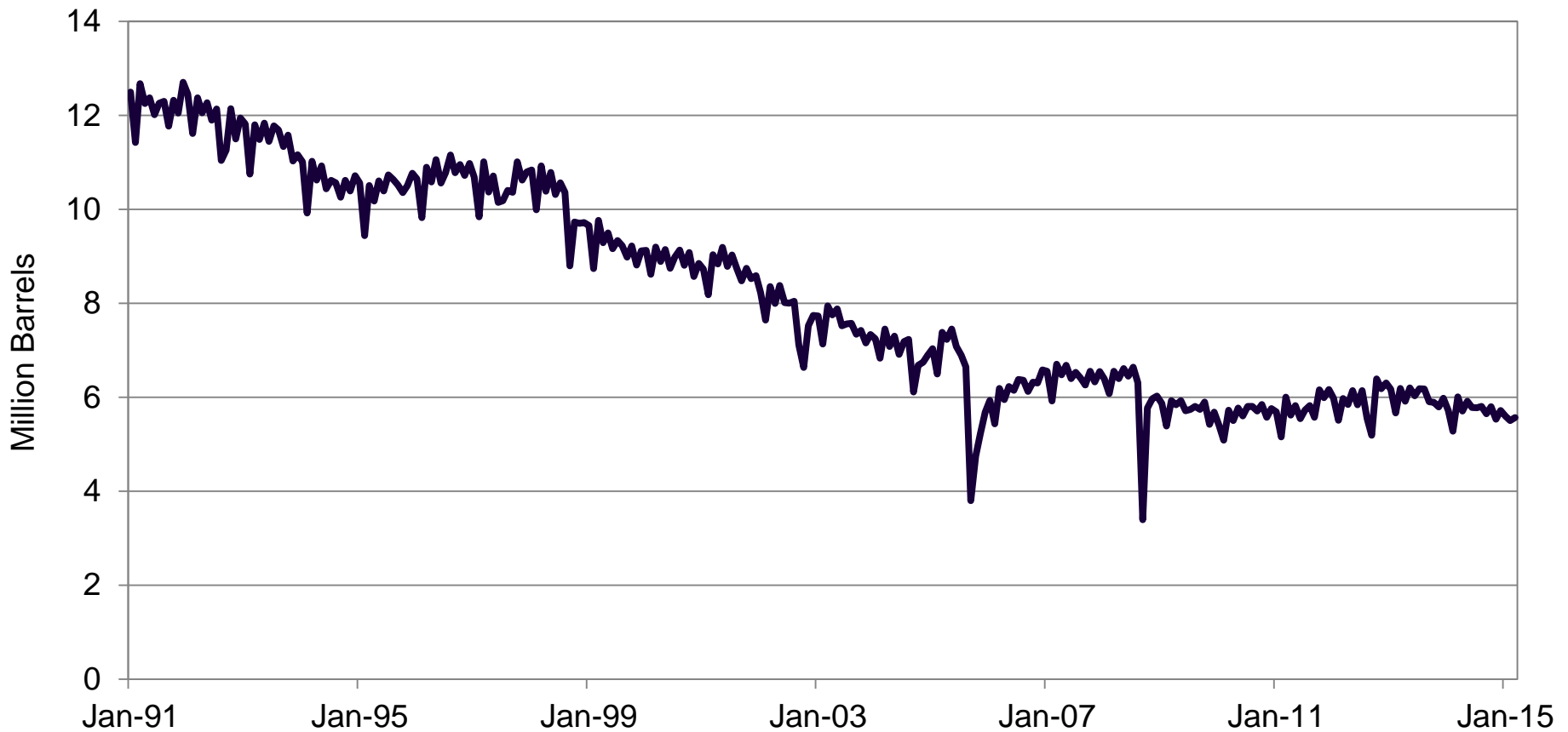
Historic Rig Count by State

Oil rig activity has been weak for a considerable amount of time (absolute and relative terms).



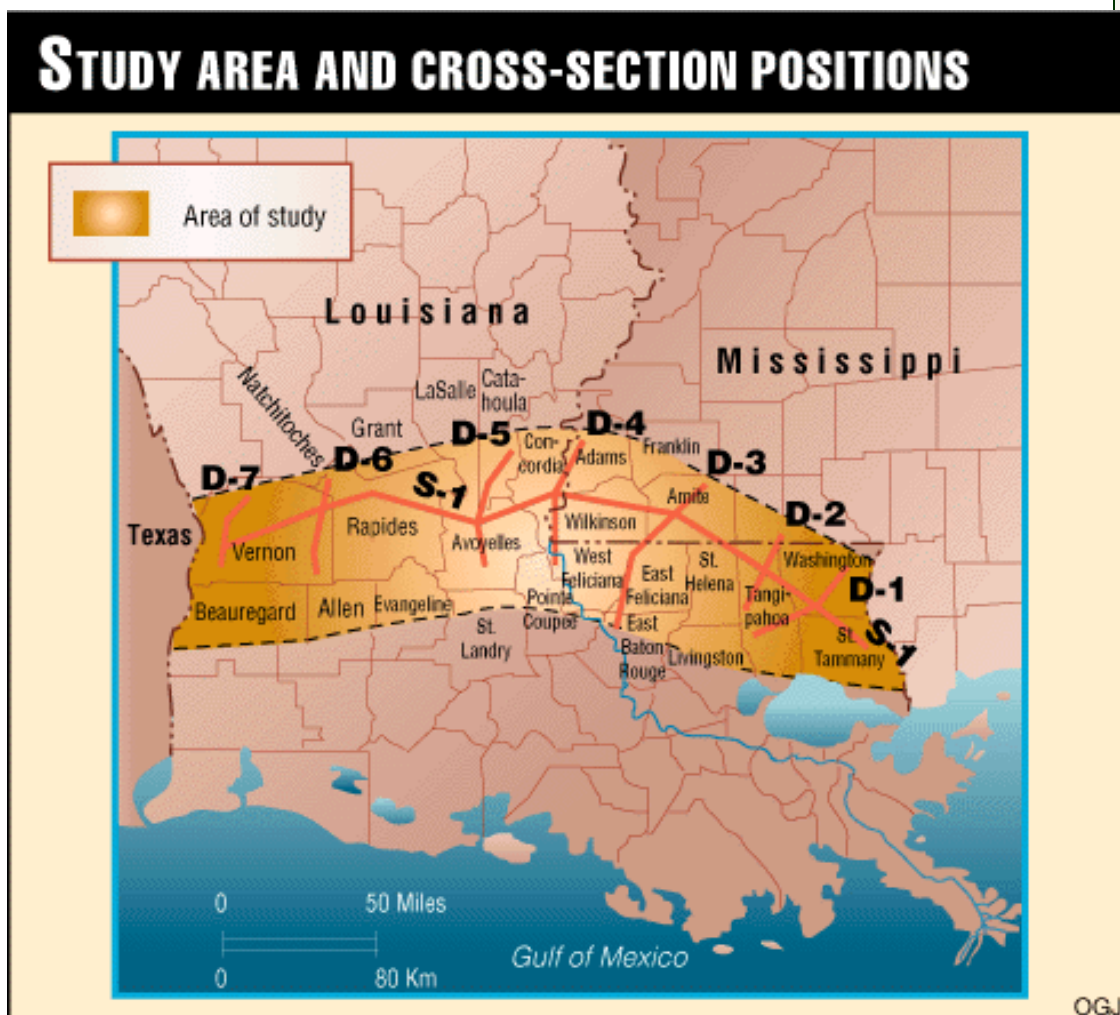
**Louisiana In-State Crude Oil Production Trends (excludes Federal OCS)**

**In-state production has been falling rapidly over the past several decades. Current production is about half the 1990 level.**



## Upstream Opportunities in the Tuscaloosa Marine Shale

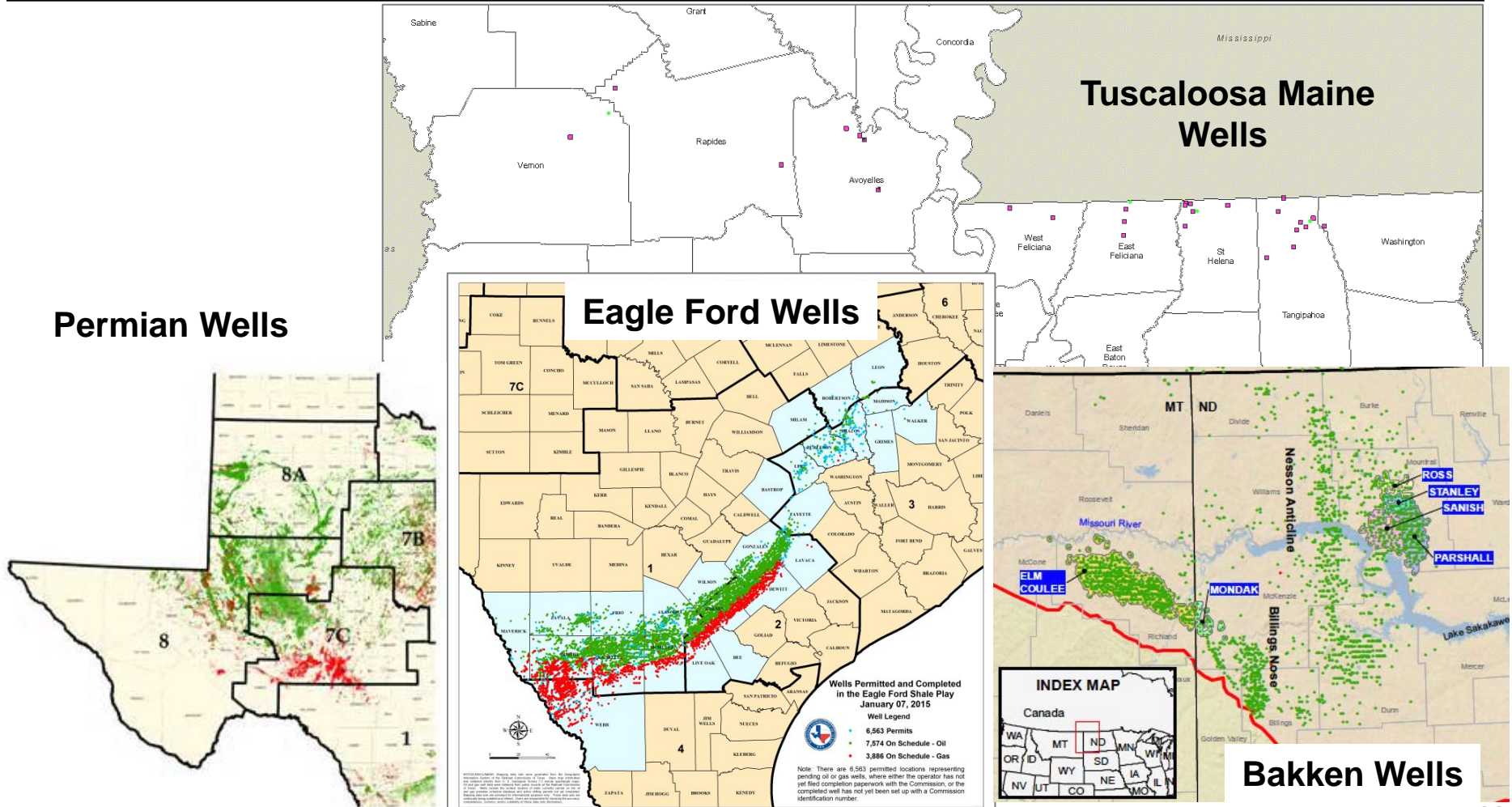
- **1998 LGS Study** primary publicly-available source of information on the formation.
- Lies between sands of the upper and lower Tuscaloosa.
- Approximately **2.7 MM acres**.
- Varies in thickness from **500 feet (MS) to around 800 feet (LA)**.
- -Shallowest opportunity around 10,000 feet – mostly between **11,000 to 12,000** – some areas as deep as 16,000 (EBR).
- Estimated potential resource of **7 BBbls (LGS)**.
- Other estimates (Amelia Resources) have Original oil in place estimated at **153 BBbls, potential at 9 BBbls**.





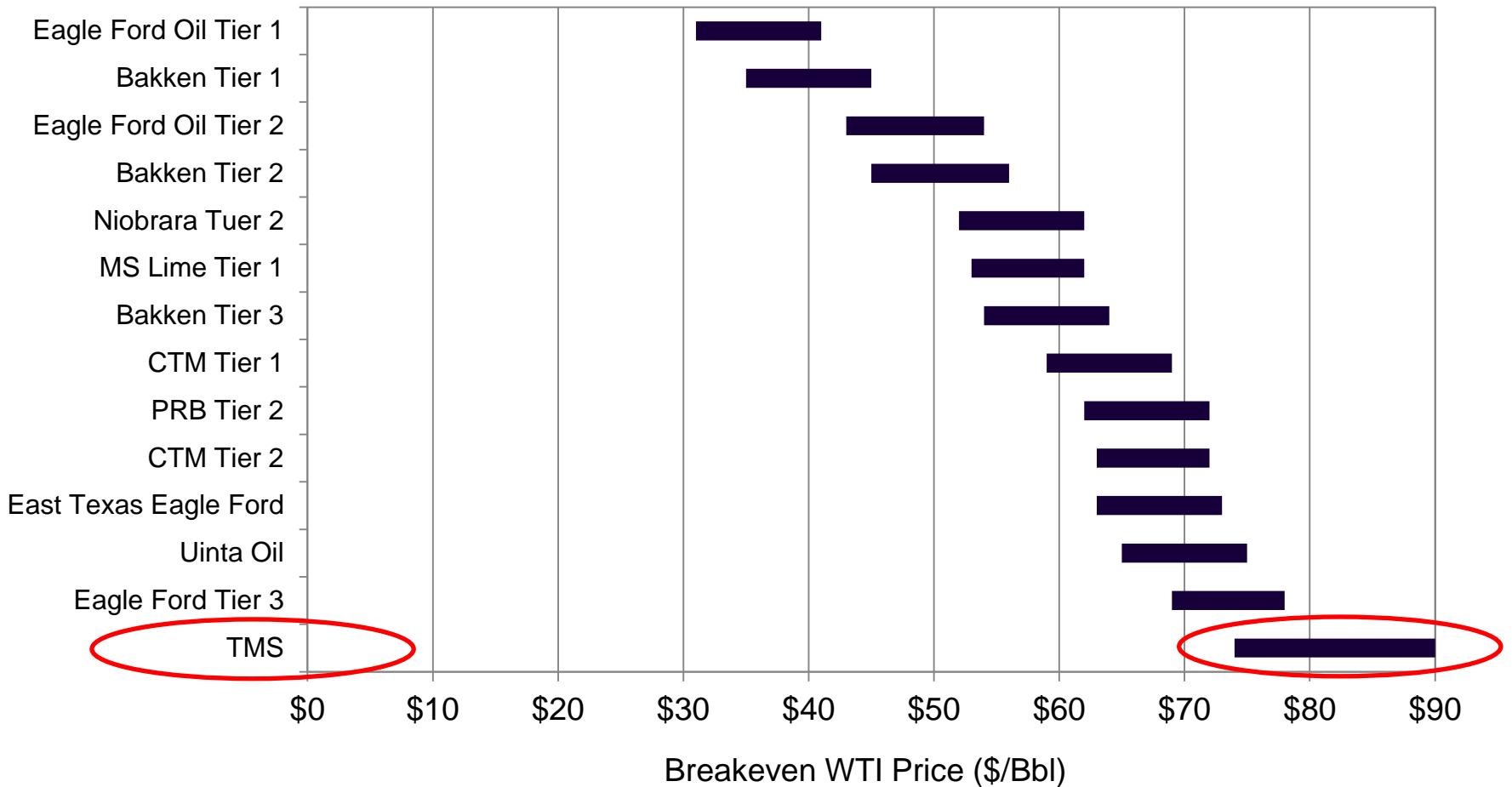
## Unconventional Drilling by Major Basin

**TMS drilling activity is still in its infancy relative to other maturing unconventional crude oil basins.**



**U.S. Unconventional Production Costs by Basin**

**TMS is estimated to have the highest development costs of the major unconventional basins.**

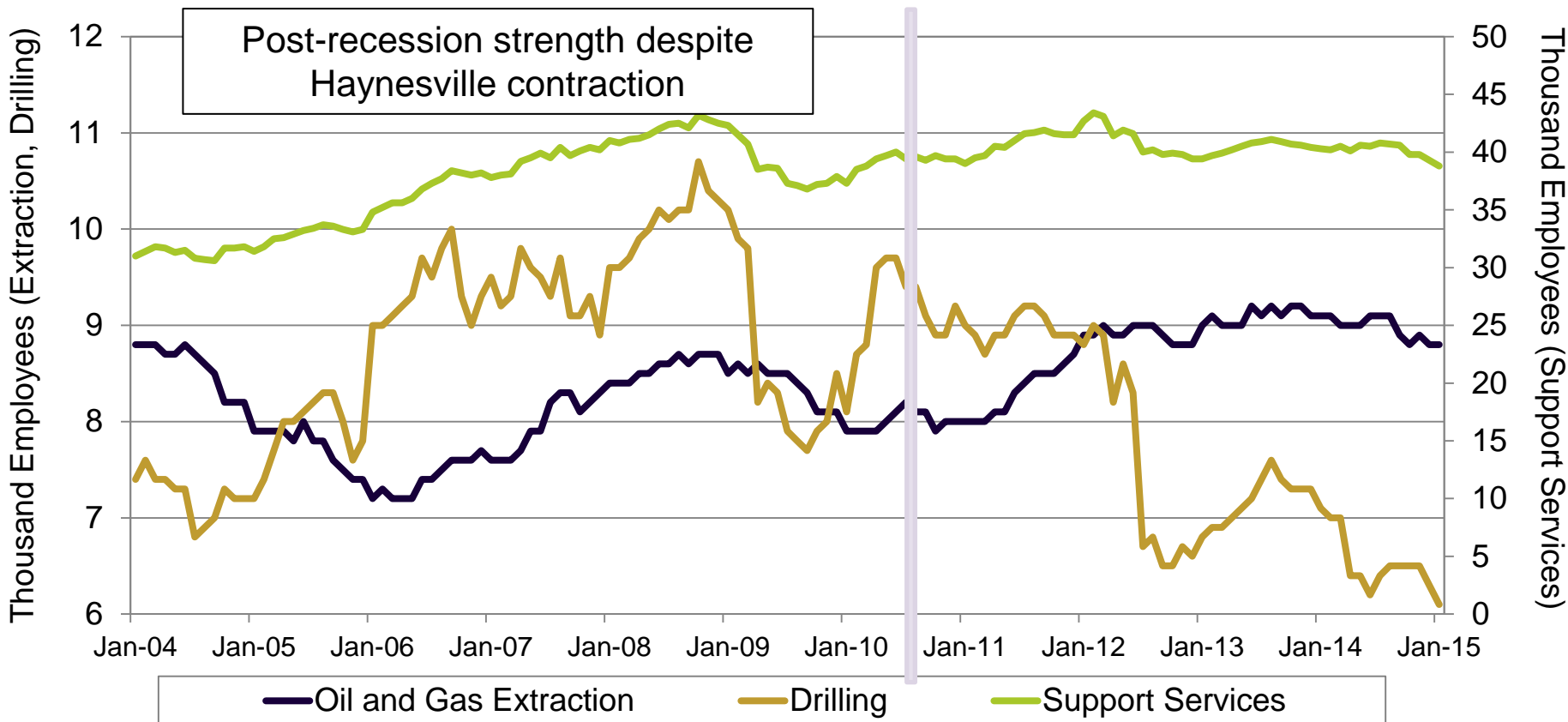




## Louisiana Service Sector Impacts

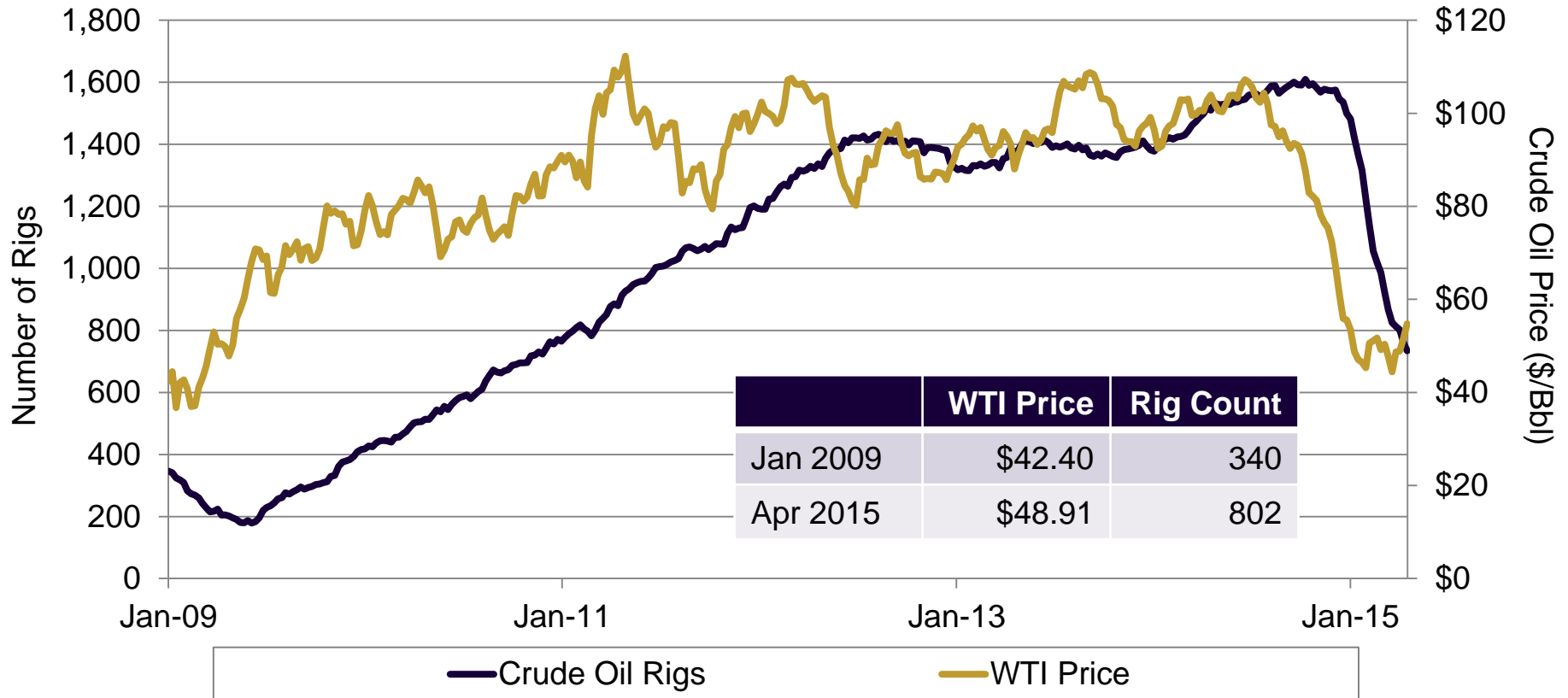
Louisiana Natural Gas Service Jobs

Starting to see some employment movement – services still strong (38,000) considering Haynesville contraction but down about 1,500 jobs; drilling down about 1,000 since January 2014.



**U.S. Crude Oil Rig Count and Spot Price**

**Note that while rig counts are falling, they are no where near the post-recession activity trough which saw comparable crude oil pricing.**



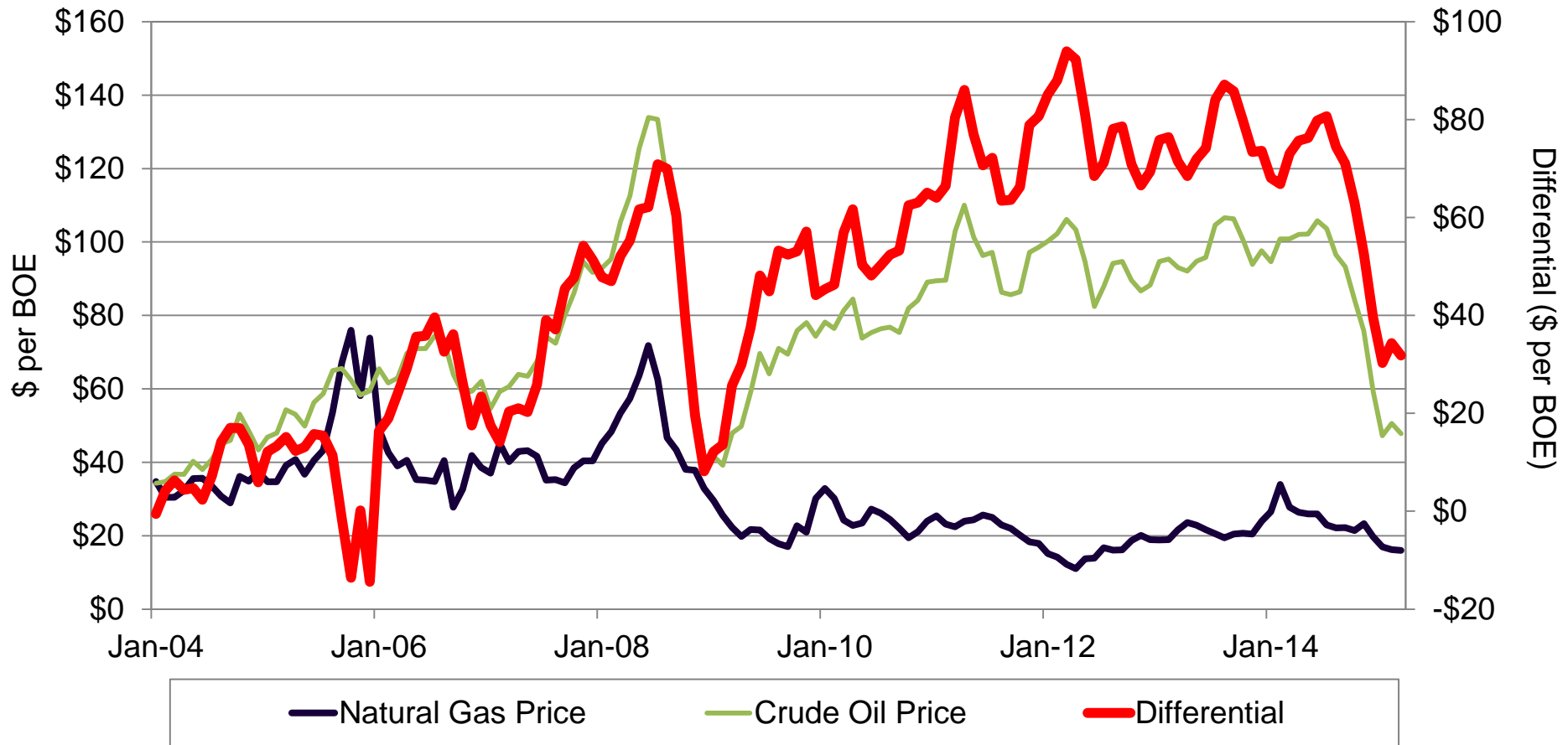
**Louisiana Industrial Development  
Impacts**

## Risks to Industrial Development

- If crude oil prices fall too far, for too long, concurrent with any slight upward movement in natural gas, there could be some project development “squeeze.”
- All of these projects convert BTUs of natural gas to (petrochemical) product. The competing input for natural gas BTUs is crude oil BTUs. If crude oil BTUs fall, it makes some other competing places (short run) attractive.
- GTL is particularly vulnerable.
- Offsetting this near term “squeeze” is the longer-run perspective that includes abundant natural gas supply availability and volatility. This still tilts in favor of US natural gas-based projects -- BUT -- could put some projects in the “wait and see” position.

**Natural Gas and Crude Oil Prices**

**Natural gas/crude oil price spreads well in excess of \$60 Bbl and as high as \$80/Bbl. These differentials have collapsed by about half.**



## Example: Changes in Competitiveness of US Sourced LNG

**Economics of LNG development are important, but there are additional factors that can influence development such as geopolitical and supply stability concerns that could sustain continued projects.**



**Feedgas**  
40-60%  
(\$/MMBtu)



**Liquefaction**  
12%-20%  
(\$/MMBtu)



**Shipping & Fuel**  
20%-40%  
(\$/MMBtu)



**Regas**  
5%-8%  
(\$/MMBtu)

**Delivered Cost**  
(\$/MMBtu)

**Equivalent Oil Price\***  
(\$/BOE)

### Europe:

Low	\$3.00	\$1.25	\$1.40	\$0.50	\$6.15	\$35.65
High	\$5.00	\$1.25	\$1.65	\$0.50	\$8.40	\$48.72

### Asia:

Low	\$3.00	\$1.25	\$2.90	\$0.50	\$7.65	\$44.37
High	\$5.00	\$1.25	\$3.45	\$0.50	\$10.20	\$59.16

### Caribbean:

Low	\$3.00	\$1.25	\$0.75	\$0.50	\$5.50	\$31.90
High	\$5.00	\$1.25	\$1.00	\$0.50	\$7.75	\$44.95

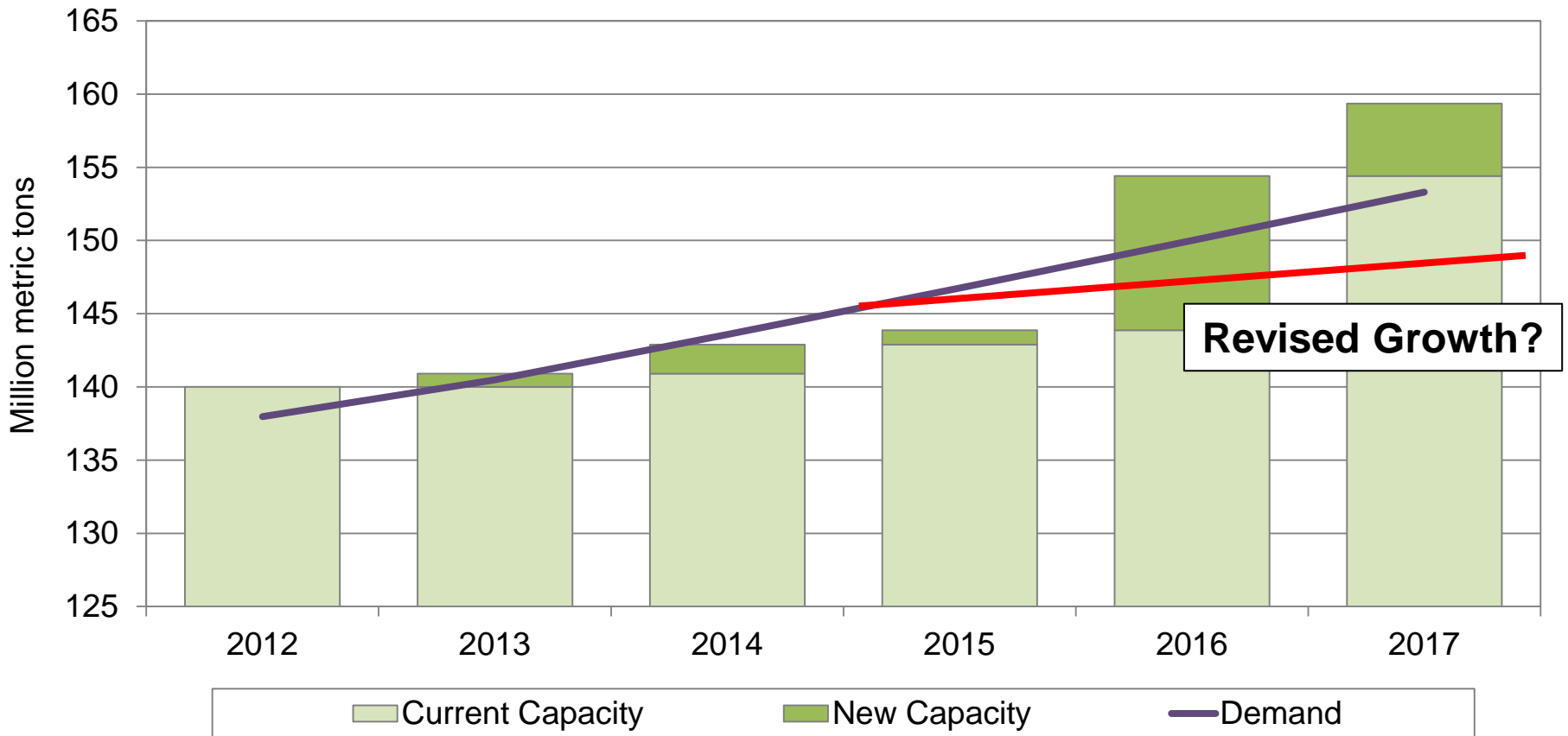
<b>Henry Hub</b> (Mar 2105): <b>\$2.83</b>	<b>WTI</b> (Mar 2015): <b>\$47.82</b>	<b>Brent</b> (Mar 2015): <b>\$55.89</b>
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Note: \*uses a BOE conversion of 5.8 Mcf/BOE.

Source: Various sources

**Example: Agricultural Chemicals (Ammonia)**

**Ammonia demand forecast is based upon slightly weaker than historic average world growth rates. The degree to which the market potentially becomes over-supplied will be function of project cancellations (if any) and continued growth assumptions.**

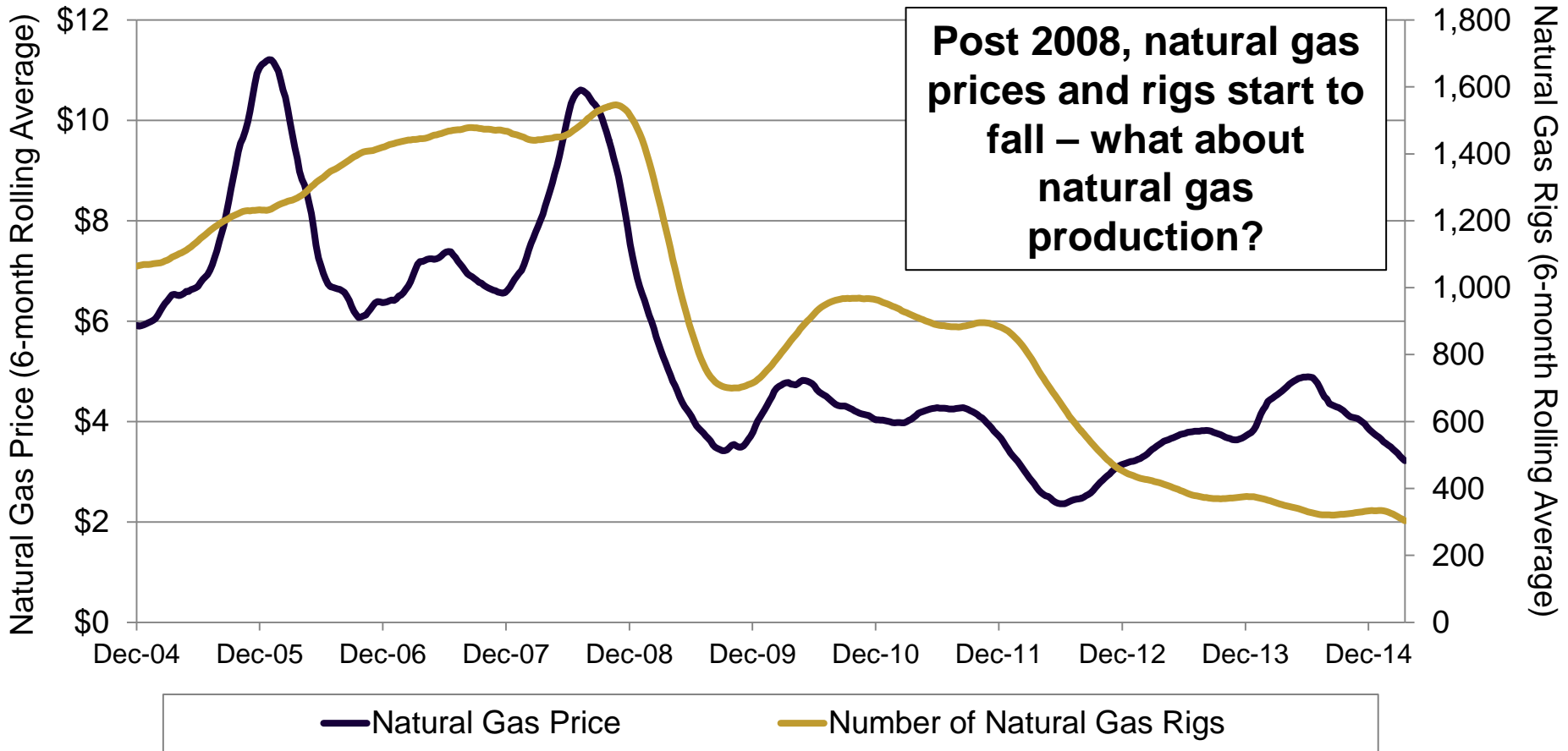




# Market Realignment

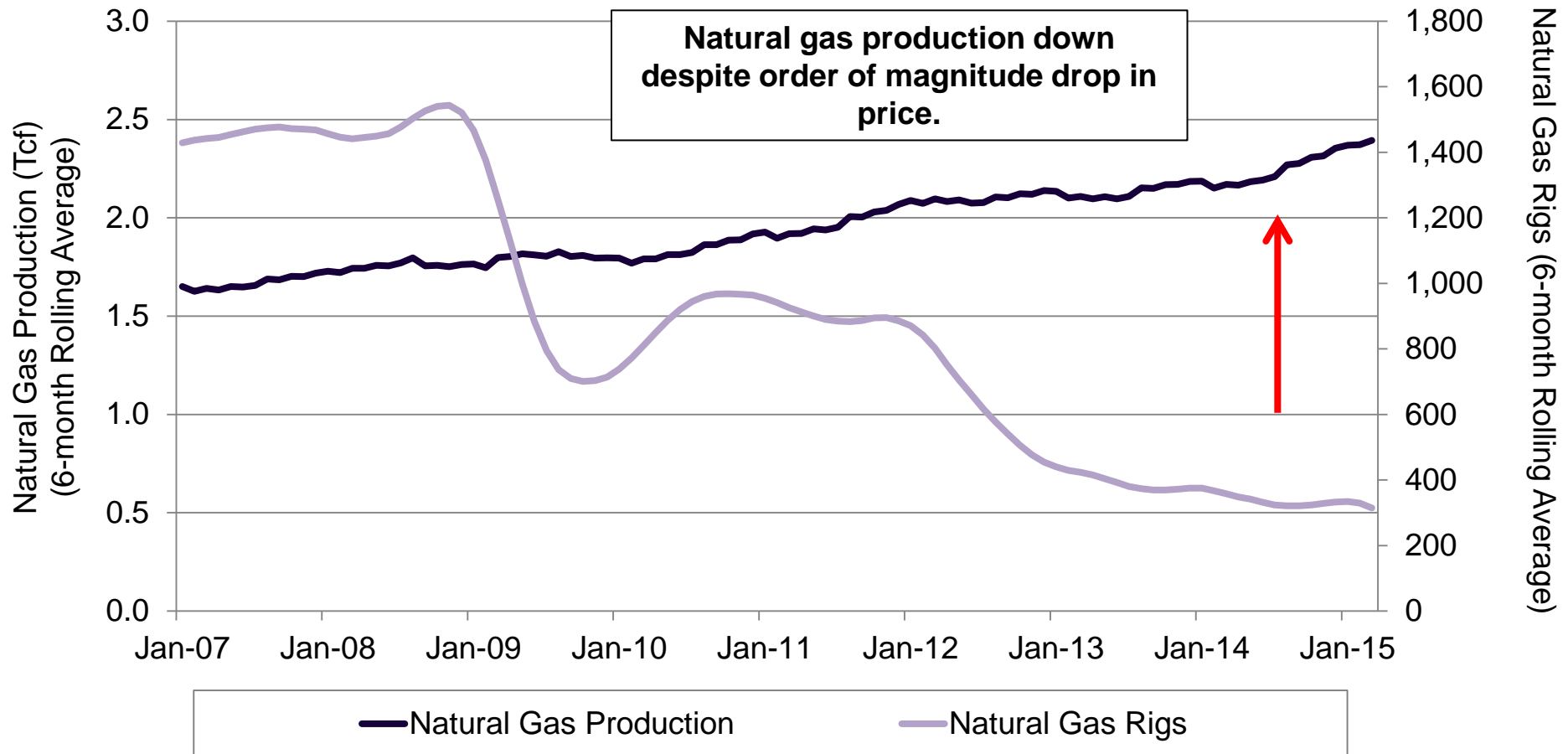
**Natural Gas Prices and Rigs**

**Will crude oil follow trends similar to natural gas post recession? Recall that natural gas drilling rigs activity is very responsive to price, both of which started to decrease rapidly post-recession.**

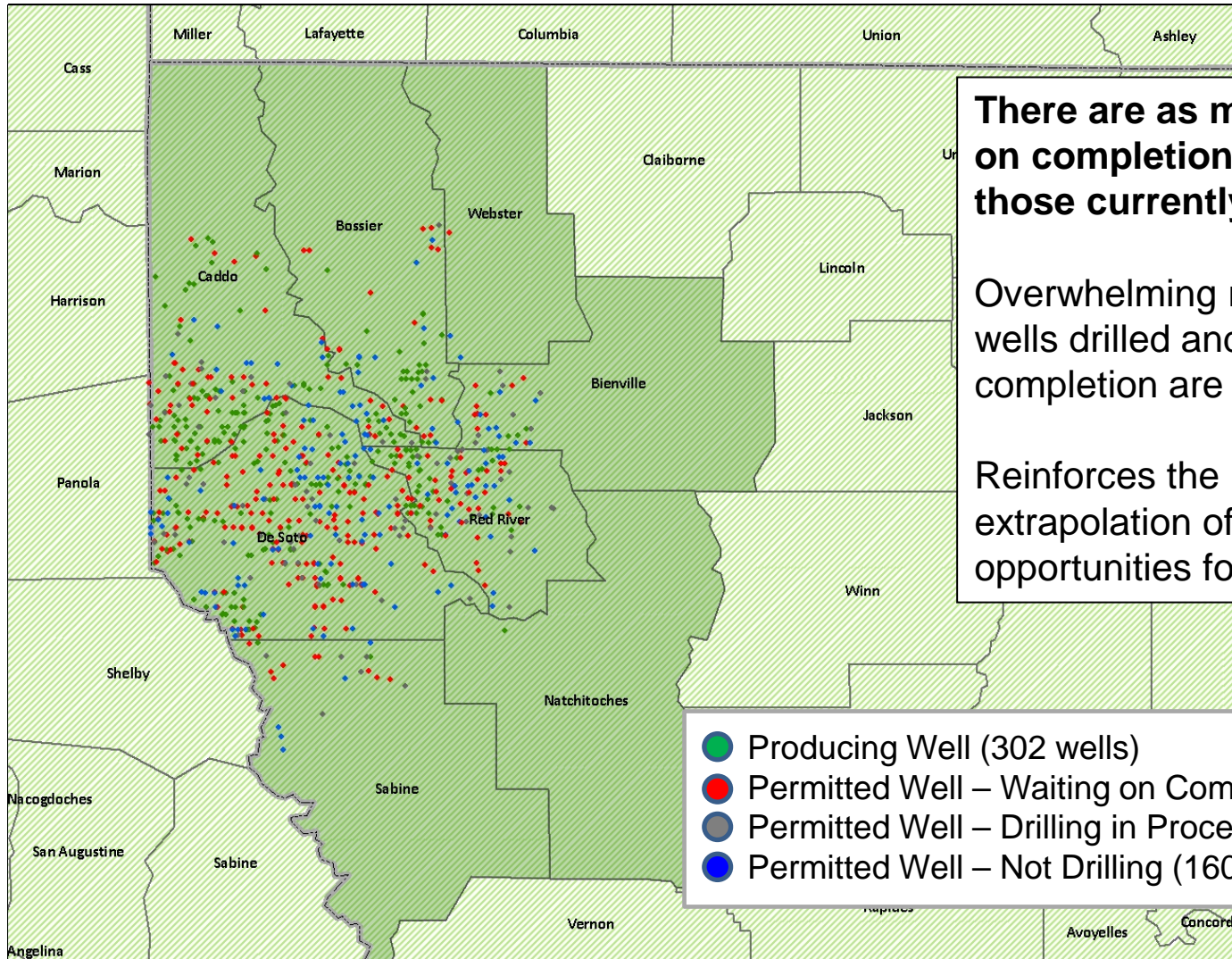


**Natural Gas Production and Rigs**

**Interestingly, natural gas production continued to rise in the face of rapid decreases in rig activity (pre-cursor/corollary for crude oil?)**



## Example: 2010 Well Status, Haynesville Shale – Well Completion Backlog



**There are as many wells waiting on completion (306) as there are those currently producing (302).**

Overwhelming majority of those wells drilled and waiting on completion are in De Soto parish.

Reinforces the Navigant extrapolation of production opportunities for the region.

- Producing Well (302 wells)
- Permitted Well – Waiting on Completion (306 wells)
- Permitted Well – Drilling in Process (97 wells)
- Permitted Well – Not Drilling (160 wells)

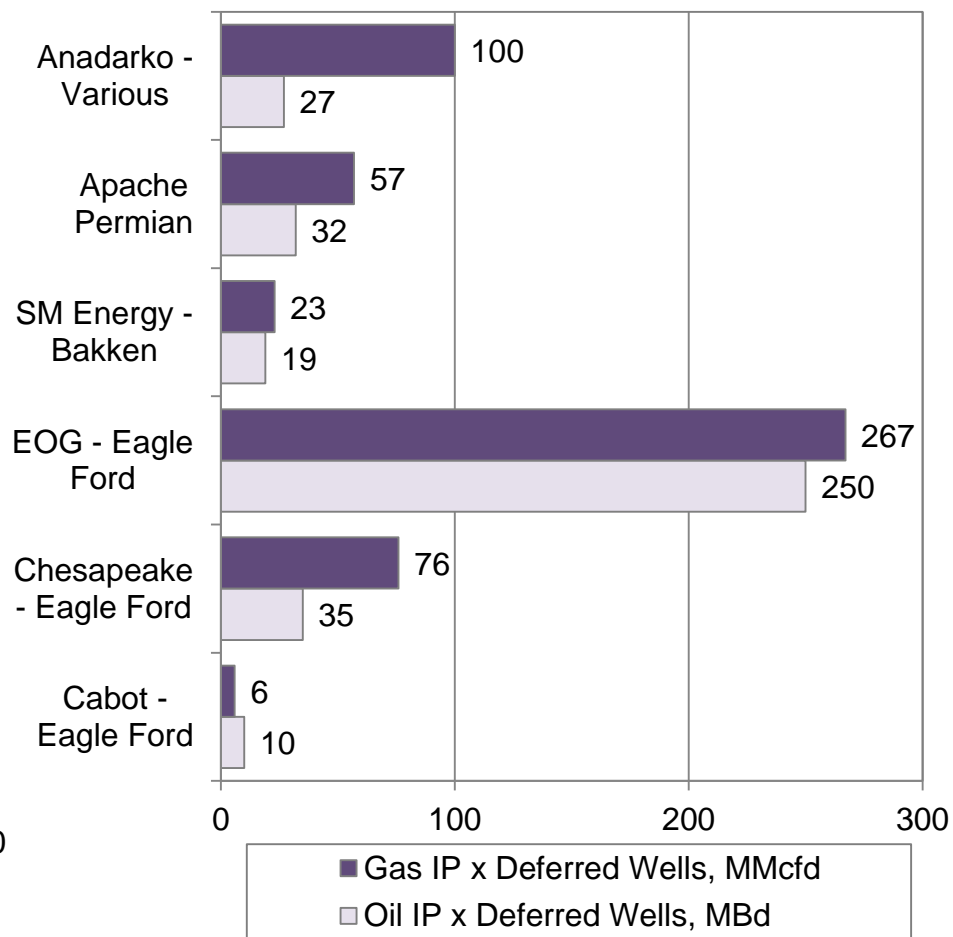
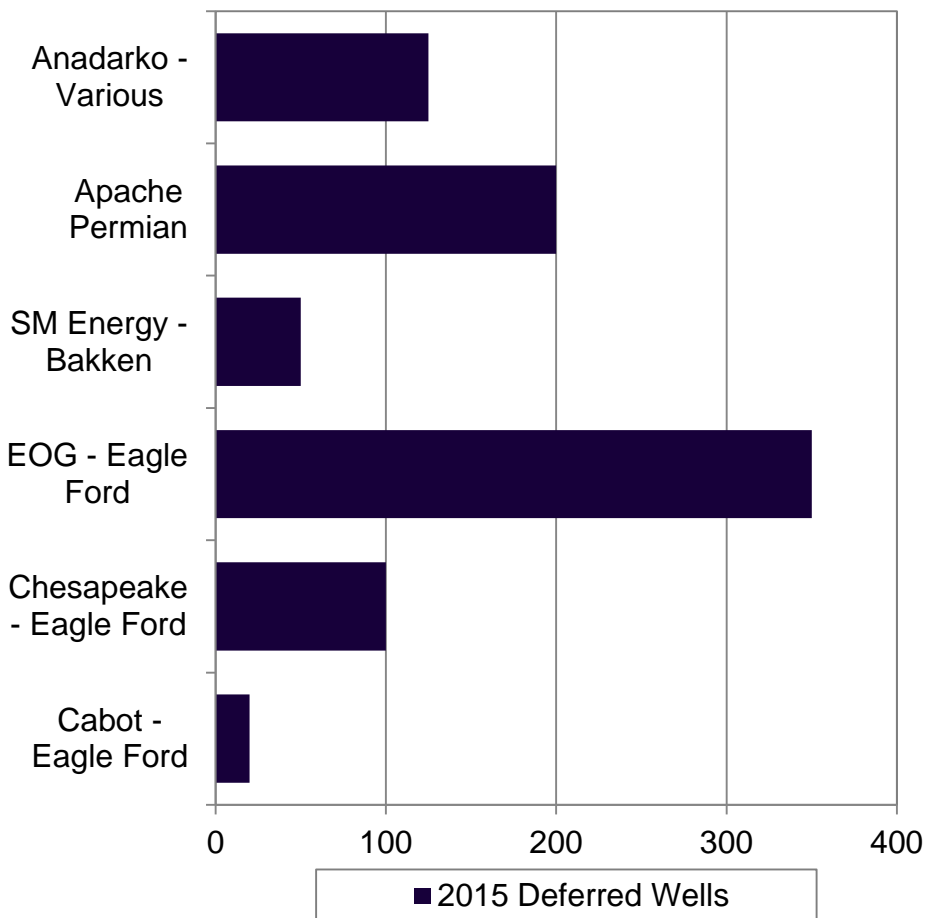
Producers' Response to Contango

**A number of producers have announced their intention to drill wells, but defer completions.**

2015 Completion Deferrals	2013-14 Completions per Year	2015 Planned Completion Deferrals	2015 Deferrals vs. 2013-14 Completions per Year
Anadarko – Various	817 per year	125	15%
Apache – Permian	163 per year	200	123%
SM Energy – Bakken	55 per year	50	91%
EOG – Eagle Ford	303 per year	350	116%
Chesapeake – Eagle Ford	214 per year	100	47%
Cabot – Eagle Ford	20 per year	20	100%
<b>Total</b>	<b>1,571 per year</b>	<b>845</b>	<b>54%</b>

## Producers' Response to Contango

**The impact of these 845 wells would be about 373 Mbd of oil and 528 MMcfd of gas.**





Citi Research Estimates (February 3, 2015)

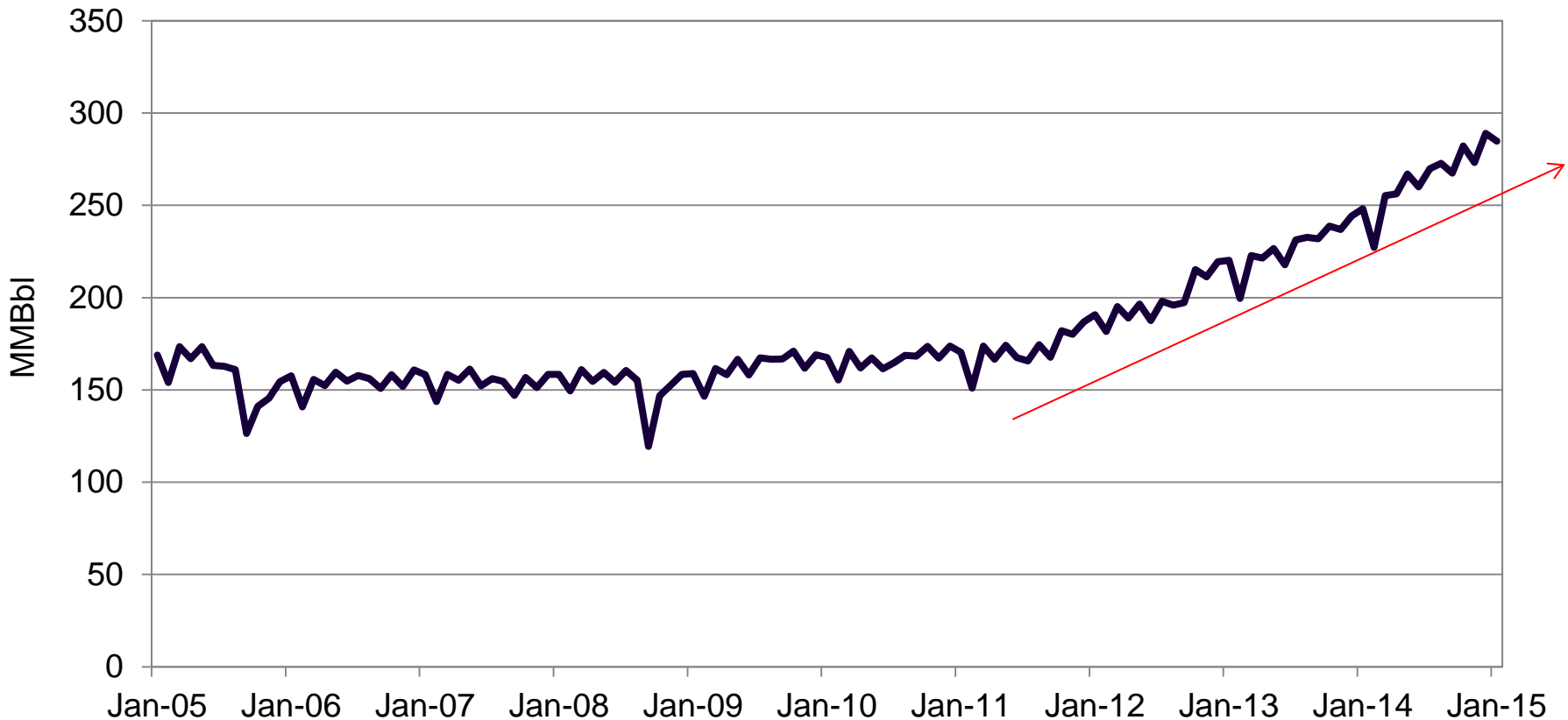
**Anticipated contraction of \$57 billion in capex, but 1.122 MMBOE/d in new production**

	<b>Change in Capex (\$MM)</b>	<b>Percent Change in Capex</b>	<b>Change in Production (MBOE/d)</b>	<b>Percent Change in Production</b>
<b>Covered Companies</b>	31,718	-34%	740	11%
<b>Non-Covered Companies</b>	26,151	-24%	382	5%
<b>Total</b>	57,870	-28%	1,122	8%

**Total production expected to increase from over 1.0 MMBOE/d.**

**U.S. Crude Oil Production**

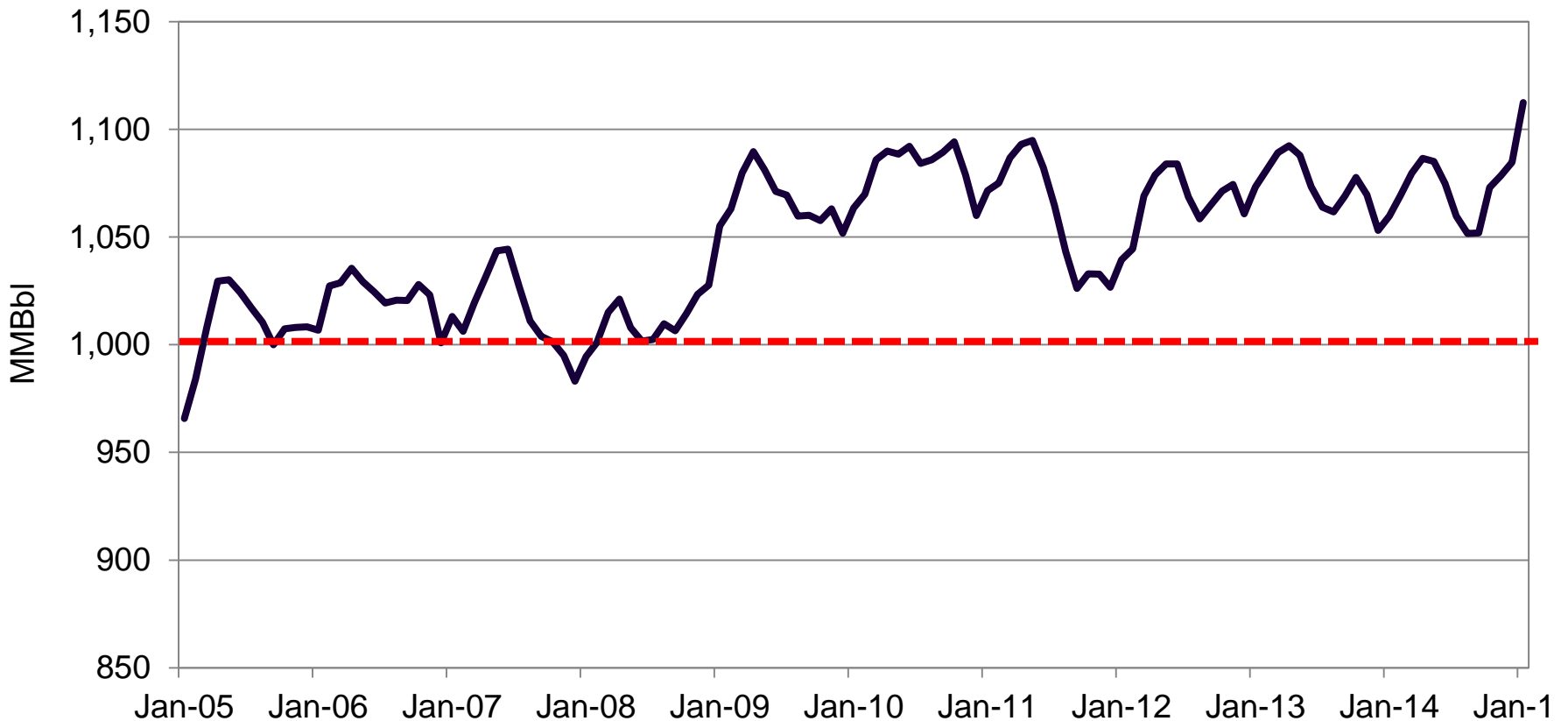
**Crude oil production has increased over 70 percent since 2009, at an average annual rate of 10 percent.**





## U.S. Crude Oil Stocks

**Stocks of crude oil in the U.S. have remained above one billion barrels for the last five years.**



## Conclusions

## Conclusions: Outlook

- Likely to continue to see near-term pricing volatility. Market having a tough time processing information.
- Lower prices will reduce upstream activity, but a slow recovery is very likely.
- The “genie is out of the bottle,” U.S. shale production is a relatively known and secure resource opportunity, if anything, low prices are the market’s best support for that belief.
- U.S. producers in survival mode: reduce costs; increase capital & operating efficiencies; and increase well productivity. (“the best solution for low prices is low prices”)
- Ultimately will see a turn around, and likely one that sees greater supply diversity and less OPEC supply dominance.

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